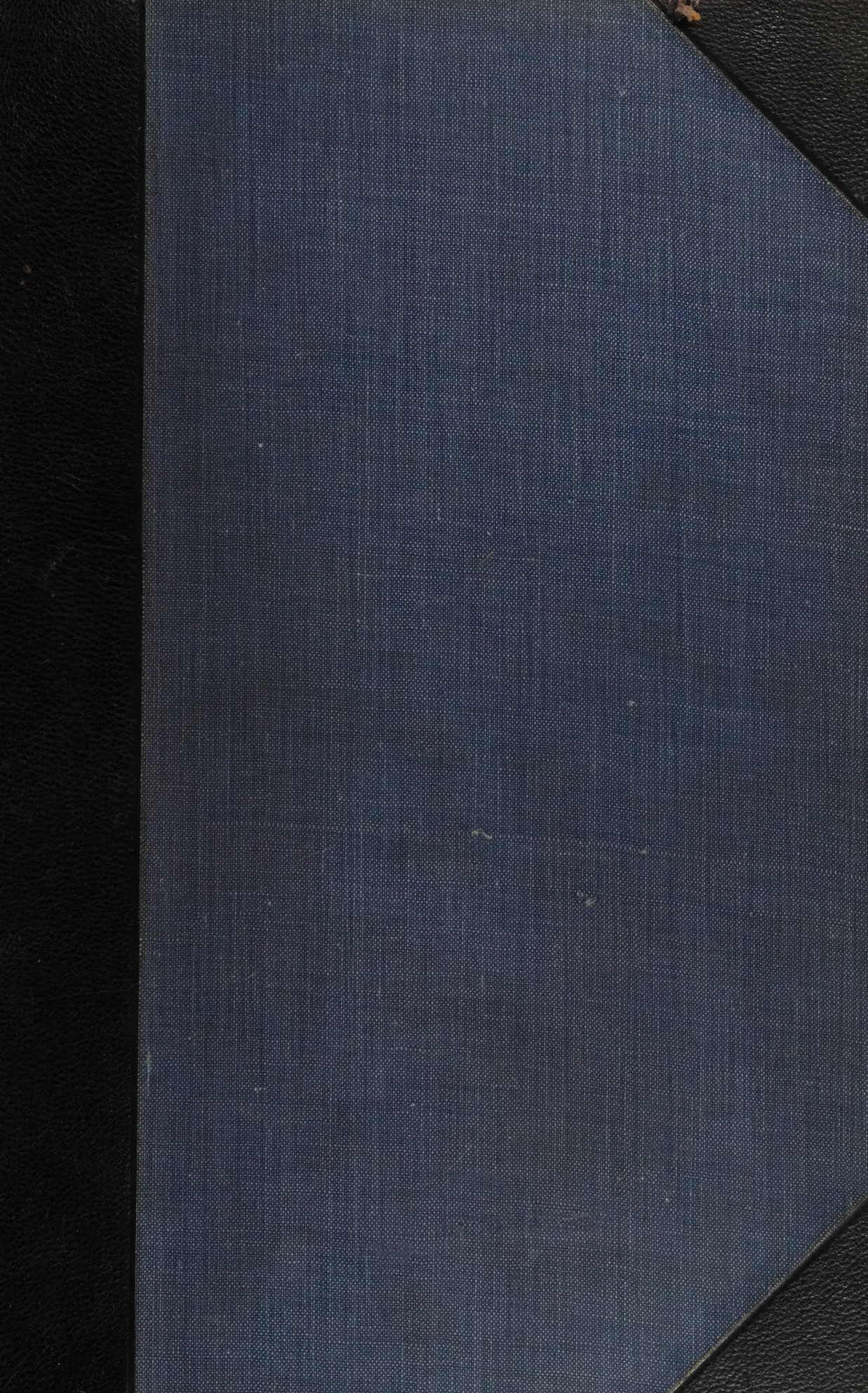
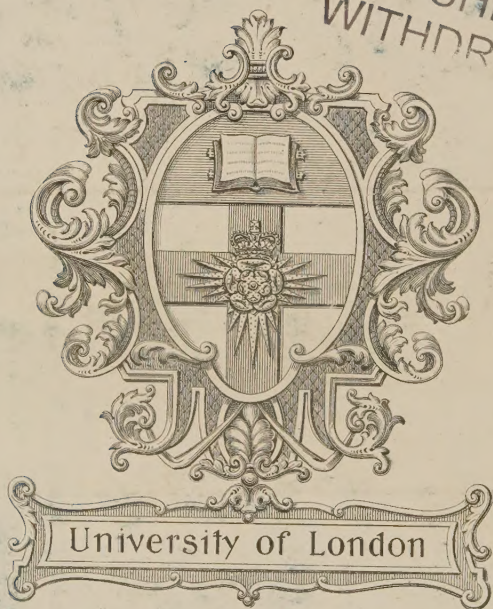




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A DICTIONARY OF UNIVERSAL KNOWLEDGE

EDITED BY

DAVID PATRICK M.A. LL.D.

AND

WILLIAM GEORGE M.A. LL.D.

VOLUME IX

WACFAMENT TO TROGNMORTH

W. & A. CHAMBERS LIMITED

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NEW EDITION

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WILLIAM GEDDIE, M.A., B.Sc.

VOLUME IX

SACRAMENT TO TEIGNMOUTH

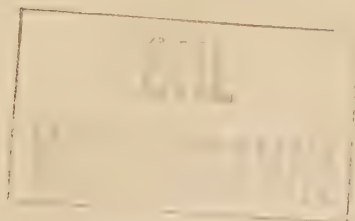
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A great many of the articles named above are new; others written for earlier issues of this Encyclopædia have been so thoroughly revised by their authors as to be virtually new. In addition to these many other revisers have taken part, including Professor J. A. S. WATSON (Agriculture), Professor DAVID HEPBURN (Anatomy), Dr DRINK-WATER (Chemistry), Dr R. CAMPBELL (Geology), Miss M. A. MURRAY (Egypt), Mr G. E. SHEPHERD (India), Dr THOMAS ASHBY (Italy), Mr W. A. FLEMING, Advocate, and Mr NORMAN MACDONALD, Advocate (Law), Professor RALPH STOCKMAN (Materia Medica), Dr J. D. COMRIE (Medicine), Admiral Sir REGINALD TUPPER (Navy), Dr ALFRED DANIELL (Physics), Professor A. BERRIEDALE KEITH (Sanskrit Subjects), Dr S. A. COOK and Mr HERBERT LOEWE (Semitic Subjects), and Professor J. ARTHUR THOMSON (Zoology). Thanks are due to many town-clerks and others for information and corrections.



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sacrament (Lat. *sacramentum*, *mysterium*, Gr. *mysterion*), the name given by theological writers to certain religious rites, the number and effects of which are the subject of much controversy between various bodies of Christians.

The word *sacramentum*, in primitive classical usage, meant either the oath taken by soldiers on their first enrolment, or the sum of money deposited by suitors on entering upon a cause, and forfeited 'to sacred uses' by the unsuccessful party; and the corresponding classical Greek word *mysterion* meant not merely the secret religious ceremonies practised in the worship of certain gods, but also any revealed secret. At a very early period of the Christian Church both the Latin word and its Greek equivalent came to be applied specially to certain rites of the Christian ceremonial, and chiefly (or as is commonly held by Protestants, exclusively) to those of Baptism and the Eucharist. Of the catechetical lectures of St Cyril of Jerusalem the lectures devoted to the subject of Baptism and the Eucharist are called 'mystagogic lectures.' Here it will be enough to state concisely what are the views of the several religious communities on this much controverted subject, which formed one of the main grounds of division between the Roman Catholic Church and the Reformers of the 16th century.

In the Roman Catholic Church it is held that there are seven sacraments—viz. Baptism, Confirmation, the Eucharist, Penance, Extreme Unction, Holy Orders, and Matrimony. The special teaching of Catholics on each of these rites will be found under the several heads; but there are certain general principles regarding them all on which the Roman Catholic doctrine differs widely from that of the Reformed communities. Catholics define a sacrament to be a visible or sensible sign permanently instituted by God, and conveying real interior grace to the recipient, and they teach that all sacraments contain within themselves, as instruments, and, when they are received with proper

dispositions, produce, such grace by the virtue imparted to them by God, and not merely through the faith of the recipient; although they hold that proper dispositions on the part of the recipient, as sorrow for sin, love of God, pious resolves, &c., are conditions indispensable for the efficacy of the sacramental rite (see *OPUS OPERATUM*). They divide the sacraments into two classes, 'sacraments of the living' and 'sacraments of the dead.' The first class comprises the Eucharist, Confirmation, Holy Orders, and Matrimony—all which sacraments can only be received fruitfully by persons in a state of grace or justification. The second includes Baptism, Penance, and Extreme Unction, the special purpose of which is to remit sin, and which therefore can be received by persons in a state of sin, but penitent for that sin, and resolved to amend their lives. Of three of the sacraments—viz. Baptism, Confirmation, and Holy Orders—it is held that they imprint a 'character,' and therefore that they can only be received once. The others may be repeatedly received, but under conditions which will be learned under each separate head. Two things are held to enter into the constitution of the sacrament—viz. the 'matter' and the 'form.' By the former is meant the material element or the physical action whereby that element is applied to the recipient of the sacrament; as water in baptism, oil in extreme unction, and in both the act of washing or of anointing. By the latter is understood the form of words employed by the minister in communicating to the recipient the external rite in which the sacramental act consists. The minister of a sacrament is the person who is supposed to be divinely authorised to impart it. The Council of Trent anathematises those who teach that there are more or less than seven sacraments. The Greek Church also recognises the seven sacraments.

The Reformed Churches have for the most part rejected these views. By the majority of them the sacraments are held to be merely ceremonial observances, partly designed as a solemn act, by which each individual is admitted to membership,

or desires to make solemn profession thereof; partly intended to stimulate the faith and excite the fervour and the pious dispositions of the recipient, to which dispositions alone all the interior effects are to be ascribed. As to the number of rites called by the name, almost all Protestants agree in restricting it to two—viz. Baptism and the Lord's Supper; although some of the rites which Catholics regard as sacramental are retained by some of the Protestant communities as religious observances. Calvin defends the ceremony of ordination by imposition of hands, once even calling it a sacrament, though evidently not in the strictest sense of the word. In the English Church, however, there has always been a school in which opinion tending towards the Catholic view has prevailed. Not only have English Churchmen ascribed to the two rites of Baptism and the Eucharist or Lord's Supper (q.v.) the power of producing an interior grace (which in the former is called Regeneration, q.v.), but since the Tractarian movement many of them have been willing to call the other rites, especially Confirmation, Penance, and Holy Orders, by the name of sacrament, although of a secondary character, and not 'generally necessary to salvation.'

See the separate articles on the sacraments, especially BAPTISM, and LORD'S SUPPER, and works there cited; also ROMAN CATHOLIC CHURCH; and for the sacraments as recognised by the Orthodox Eastern Communion, see GREEK CHURCH.

Sacramentarians, a term used in more senses than one. (1) Ordinarily in England it means one who holds a 'high' or extreme doctrine of the efficacy of the sacraments, especially of the Eucharist (see LORD'S SUPPER). (2) Technically, however, the word is used in church history in an almost diametrically opposite sense for persons holding a 'low' doctrine on the subject of the sacraments—for the party among the Reformers who separated from Luther on the doctrine of the Eucharist. Luther taught the doctrine of the real presence of the body and blood of Christ along with the bread and wine (see LORD'S SUPPER). Carlstadt, Capito, and Bucer were the leaders of those who called this doctrine in question. This sacramentarian party became so considerable that in the diet of Augsburg they claimed to present a special confession known in history by the name of the Tetrapolitan Confession—so called from the four cities, Strasburg, Constance, Lindau, and Memmingen. The Tetrapolitan Confession rejects the doctrine of a corporeal presence, and although it admits a spiritual presence of Christ which the devout soul can feel and enjoy, it excludes all idea of a physical presence of Christ's body. Simultaneously with this German movement, yet independent of it, was that of the Swiss reformer Zwingli, whose doctrine on the Eucharist was identical with that of Carlstadt, and who himself presented a private confession of faith to the Augsburg diet in which this doctrine is embodied. The four cities named above continued for many years to adhere to this confession presented to the diet of Augsburg in their name; but eventually they accepted the so-called Confession of Augsburg, and were merged in the general body of Lutherans. On the contrary, the article of Zwingli upon the Eucharist was in substance embodied in the confession of the Helvetic Church.

Sacramento, the largest river of California, rises in the north-eastern part of the state, its head-stream, Pitt River, draining Goose Lake, and flows south-west through the Sierra Nevada to Shasta, south to Sacramento, and thence south-south-west into Suisun Bay, through which its waters pass into San Pablo Bay and so to the Pacific Ocean. Its length is about 500 miles, and

it is navigable for small vessels to Red Bluff, nearly 250 miles. A few miles above its mouth it receives the San Joaquin; and with this and other tributaries it drains the great central valley of the state.

Sacramento, the capital of California, is on the east bank of the Sacramento River, at the mouth of the American River, 178 miles N.E. of San Francisco. The streets are laid down at right angles on a level plain. The business portion is built of brick, the dwellings of wood, with shade-trees and gardens. The principal public buildings are the state capitol, the county court-house (formerly the capitol) and hospital, the post-office, a Roman Catholic cathedral, the Crocker Art Gallery, and the Masonic and Odd-fellows' halls. Sacramento is an important point of shipment for fruit and agricultural produce. It has rice and flour mills, brick works, manufactories of pottery and leather, and machine and railroad shops. It was settled in 1839 by a Swiss named Sutter, who built a fort here in 1841; but it was not till 1848, after the discovery of gold, that the city—at first as a canvas town—was laid out. Inundations led to the building of a levee in 1862. In 1854 Sacramento became the state capital. Pop. (1880) 21,420; (1920) 65,908.

Sacrarium (Lat., 'a place where sacred objects are deposited'), the part of a church where the altar is.

Sacred Heart of Jesus, FEAST OF, a modern festival of the Roman Catholic Church. Its origin is traced to a vision which is recorded of a French Visitation nun named Marguerite Marie Alacoque (1647–90), who lived at Paray-le-Monial (q.v.). This devotion was gradually propagated in France, approved by Clement XIII. in 1765, and extended to the whole church in 1856, Sister Marguerite Marie being beatified in 1864. The festival is held on the Friday (in England on the Sunday) after the octave of Corpus Christi. Of many churches dedicated to the Sacred Heart by far the most splendid is that erected on Montmartre, the highest point of Paris, in 1874–91, at a cost of nearly a million sterling. The faithful worship the heart of Jesus, considered 'not as mere flesh, but as united to the divinity;' and the heart is chosen because it is a symbol of charity and of the inner life. The heart of the Blessed Virgin, on the same principle, is *venerated* by the Roman Catholic Church.

See Nilles, *De Rationibus Festorum Sacratissimi Cordis* (1875); and works in French by Bainvel (1906) and Garriquet (1920), and in English by Petrovits (St Louis, 1918).

Sacred Music. See MUSIC; ANTHEM, CHANT, CHOIRS AND CHORAL SINGING, CHORAL, HYMN, INTONING, MASS, ORATORIO, PLAIN-SONG, SERVICE.

Sacred Wars. See AMPHICTYONIC COUNCIL, PHILIP OF MACEDON.

Sacrifice is one of the fundamental institutions in all types of religion. 'The root of these sacrificial observances,' as Tiele says, 'consists in the yearning of the believer for abiding communion with that superhuman power whose operations compel him to recognise its existence as a postulate of his thinking faculty, of whose sublimity his imagination has formed a conception, to which he feels himself inwardly akin, and in which he strives, so far as humanly possible, more and more to assimilate himself.'

Many theories have been propounded as to the origin of sacrifice. (1) The older theologians used to argue that sacrifice was a Divine institution established by an express command of God given in the form of a primitive revelation. The facts,

however, derived from the comparative study of religion have put the theory of a primitive revelation out of court. The only tenable form of the theory is to suppose that sacrifice originated in a universal instinct implanted in the human heart by God, and that it was in obedience to the Divine prompting within his soul that man began to seek communion with God by means of offerings and sacrifices. But this hypothesis does not solve the problem. It only raises the further question, In what way did this instinct work? What specific value did it attach to sacrifice? (2) In answer to this question many modern anthropologists—Tylor and Herbert Spencer among them—hold that the original motive of sacrifice was the bestowal of a gift upon the supernatural beings who were the object of worship. Herbert Spencer, for instance, says, 'The origin of the practice is to be found in the custom of leaving food and drink at the graves of the dead, and as the ancestral spirit rose to divine rank the refreshments placed for the dead developed into sacrifices' (*Principles of Sociology*, § 139 ff.). This theory seems to afford an adequate explanation of certain forms of sacrifice, e.g. the thank-offering. Primitive religions were very largely anthropomorphic. And naturally the worshippers felt that what would please their fellow-men would be equally acceptable to the gods. The object of the gift was partly to avert wrath and partly to express gratitude and so secure future favours. But though the 'gift theory' explains the origin of certain types of sacrifice, it does not seem to account for its more complex forms. The offering of the blood of the victim slain in sacrifice requires further elucidation, since it seems impossible to bring it under the category of thank-offering. (3) Another hypothesis finds the root idea of sacrifice in the attempt to establish communion or fellowship with the deities through a sacrificial meal of which both gods and worshippers alike partook. The common meal was the symbol of friendship, and established a kindly relationship between the gods and their worshippers. 'On this view,' as W. P. Paterson says, 'sacrifice has more virtue than a mere gift: it knits the god and the worshippers together by the interchange of hospitality.' It is not easy, however, to suppose that primitive man was on such terms of friendly equality with his gods as to admit of such an explanation of sacrifice. (4) The theory that the sacrificial meal represented a sacramental communion with the gods has more to be said for it. It has been elaborated in modern times by Frazer in *The Golden Bough* and by W. Robertson Smith in his *Religion of the Semites*. Frazer, referring to the 'widespread custom of eating the god sacramentally, either in the shape of the man or animal who represents the gods or in the shape of bread made in human or animal form,' says, 'By eating the body of the god the worshipper shares in the god's attributes or powers.' Robertson Smith starts from the premise that 'the notion that, by eating the flesh, or particularly by drinking the blood, of another living being, a man absorbs its nature or life into his own is one which appears among primitive peoples in many forms' (p. 295), and maintains that in the primitive stage of Semitic religion certain animals, which were usually proscribed as food, were regarded as sharing in the life of the god and possessing divine attributes. The sacrifice of these animals, and the fact that the worshippers partook of them, involved the establishment of a mystic sacramental union between God and man. 'The fundamental idea of sacrifice,' he says (p. 327), 'is not that of a sacred tribute, but of communion between the god and his worshippers by joint participation in the living flesh and blood of a sacred victim.' It cannot be denied that the

sacramental idea was very widespread, and that it entered very largely into religious practice. As Macculloch says, 'The sacramental principle, the partaking of a divine life, energy, or holiness through some material vehicle, which, generally speaking, is eaten or drunk, is universal and primitive. Everywhere men have desired to be filled with the fullness of divine life as a means of protection or a source of strength.' But in spite of this fact, the theory which makes the sacramental idea the root principle of sacrifice is open to question. The hypothesis has not won the acceptance of the majority of English anthropologists, and has been subjected to severe criticism by the French scholar Marillier. There is no doubt that it has always been an element in the development of the sacrificial system, but there is much less ground for supposing that it formed the basic principle from which sacrifice originated. (5) A fifth theory finds the explanation of the origin of sacrifice in the desire of man to seek expiation for his sin. Conscious that he had offended his gods, primitive man sought expiation for his crimes by offering an animal sacrifice to bear the punishment which ought to have fallen upon his own head. Once again it must be acknowledged that the idea of expiation is constantly present in the conception of sacrifice. Even Robertson Smith admits that 'the sacramental rite is also an atoning rite which brings the community again into harmony with its alienated God, and the idea of sacrificial communion includes within it the rudimentary conception of a piacular ceremony' (p. 302). But whether the expiatory idea was original or derivative is open to serious question. The very fact that in almost every religion there are types of sacrifice which do not seem to contain the expiatory idea at all points decisively to the conclusion that it cannot be regarded as the originating cause of sacrifice.

The conclusion to which we seem to be inevitably led from a consideration of these various theories is that in all probability there is no single principle which can be said to be the germinal idea out of which sacrifice developed. The interpretation placed upon sacrifice is always coloured by the particular type of religion with which it is associated. When fear is the predominant note of religion, then the sacrifices were used as a means of expiating the wrath of the Divine Being and securing his favour and support. When, on the other hand, joy and worship are its outstanding features the sacrifices are used as a way of expressing the thankful devotion of the worshippers. There seems to be an invariable relationship between the prevalent conception of the objects of worship and the prevalent interpretation of the significance of sacrifice, and as the one conception grows, the other is gradually modified to suit the new development.

The most complex system of sacrifice known to us is to be found in the Old Testament, especially in the Priestly Code embodied in the Book of Leviticus. The sacrifices may be divided into two kinds: (a) the peace-offerings which assumed that the covenant relation between God and his people was unbroken and gave expression to the spirit of gratitude and intercessory prayer; (b) the burnt-offering (with its later developments, 'the sin-offering' and 'the guilt-offering'), which attempted to restore a broken relationship between God and his people. There can be little doubt that with the increasing emphasis which was laid upon the holiness of God, in the later developments of the religion of Israel, there arose in the heart of the nation a new and deeper sense of sin; and the growing importance of the second class of sacrifices in the Priestly Code is to be explained by the

desire to find some remedy, some 'act of atonement,' which could blot out and destroy the sin of the people. What exactly was the mode in which this end was effected by the sacrifices is not easy to determine. There are some factors, especially in the sacrifices on the great Day of Atonement, which seem to suggest that the victim was offered to God as a substitute for the sin of the nation or the individual worshipper: the victim was required to be 'free from blemish': the imposition of hands seems to represent the transference of the offerer's guilt to it: the killing of the animal signified the infliction of the penalty upon it: the burning of the body indicated that the substitute had been consigned to 'the eternal fire.' But there is another set of factors which seem to throw grave doubts upon the accuracy of this interpretation. Sacrifices (according to the express statement of Numbers, xv. 30) could only be offered for venial offences and not for sins that merited capital punishment, and hence the death of the victim could not have been a substitutionary atonement. Moreover, atonement might also be made by cereal offerings (Leviticus, v. 11-13), and there could be no equation between this form of sacrifice and the killing of an animal. Another explanation finds the validity of the sacrifice that it symbolised the attitude of soul which the offerer was taking up towards God—his utter abasement in the Divine presence and the complete surrender of his life to the service of God. It is probably quite impossible to obtain a consistent explanation. The Jewish sacrificial system is the growth of centuries. A new interpretation was often superimposed upon old forms, without any attempt being made to remove anachronisms or to square the old ritual to the new theory. The new wine of the developed religious faith of Israel had to be poured into old bottles, and very often these bottles proved unsuitable.

The sacrificial system not only of Israel but of all other religions as well represents a deep instinct in the human which craves for communion with God and seeks for the removal of all barriers which disturb or interfere with that communion. At any rate that seems to have been the ideal that underlies the practice; and from this point of view we say that sacrifice everywhere is a *preparatio evangelica* of the perfect mediation between man and God which was given to the world in Jesus Christ. The recognised inadequacy of all sacrificial systems, and their impotence to destroy the real barrier of sin, only intensified the sense of need, and made men see in the death on Calvary 'the one perfect oblation and offering' for the sin of the world.

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Sacrilege is not now a legal, but is a popular term used to denote the breaking into a place of worship and stealing therefrom. In England whoever breaks and enters any place of divine worship and commits any felony therein, or whoever, being in such a place, shall commit any felony therein, and break out of the same, is guilty of felony and liable to penal servitude for life, or to imprisonment for a term not exceeding seven years. The legal offence of breaking and entering a place of worship with intent to steal comes under the head

of burglary or housebreaking. In Scotland there is no increase of severity in the punishment by reason of the sacred character of the things stolen.

Sacristan, an official attached to a church who is charged with the care of it, and in particular of the sacred vestments and utensils. These are kept in the *sacristy*, or vestry, which in Continental churches is often a spacious building.—The English name *sexton* is an early corruption of this word.

Sacro Bosco, JOANNES DE (or JOHN HOLYWOOD), an English mathematician of whom little is known, except that he seems to have been a native of Halifax, to have studied at Oxford, and taught at Paris as professor of Mathematics, where he died in 1244 or 1256. He was one of the first doctors of the middle ages who made use of the astronomical writings of the Arabians. His treatise, *De Sphaera Mundi*, a paraphrase of a portion of Ptolemy's *Almagest*, enjoyed great renown as a manual among the scholastics. First published in 1472, it passed by 1647 through forty editions, besides translations and commentaries. See an article by C. L. Kingsford in vol. xxvii. of the *Dict. Nat. Biog.* (1891).

Sacrum, or OS SACRUM, is a triangular bone situated at the lower part of the vertebral column (of which it is a natural continuation), and wedged between the two innominate bones so as to form the keystone to the pelvic arch. It is readily seen to consist of five vertebrae with their bodies and processes, all consolidated into a single bone. Its anterior surface (see illustrations at PELVIS) is concave, not only from above downwards, but also from side to side. The posterior surface is convex, and presents in the middle vertical line a crest, formed by the fusion of the spines of the vertebrae, of which the bone is composed. The last sacral vertebra has, however, no spine, and the termination of the vertebral canal is here very slightly protected. The sacrum of man differs from that of the lower animals by its greater breadth in comparison with its length. This proportion is expressed in the following way: $\frac{100 \times \text{breadth}}{\text{length}} = \text{sacral index}$. In

the male European the average sacral index is 112, in the negro 106, in the Australian aboriginal 99, in the orang 87, in the gorilla 72. In the female the sacrum is broader than in the male, the sacral index of the European female being about 116 (Turner, *Challenger Reports*, Zoology, xvi.). The sacrum and its connections are illustrated at PELVIS.

Various reasons have been assigned for the name given from of old to this bone; Littré accepts the view that it was because it was a part that had special significance with the ancients in sacrifices. Another reason is based on the view maintained by the Jewish rabbins, who held that this part of the skeleton, which they called 'luz,' resisted decay, and became the germ from which the body would be raised.

Sacy, ANTOINE ISAAC, BARON SILVESTRE DE, the founder of the modern school of scientific Arabists, was born at Paris on 21st September 1758. He was trained for the civil service, and whilst labouring in the Mint he made himself master of the chief Semitic languages as well as of Persian, and to some extent of Turkish. He had already gained the reputation of a sound Oriental scholar through papers contributed to Eichhorn's *Repertorium* and other learned journals, when the excesses of the republicans caused him to retire from government service, and devote himself wholly to his favourite pursuits. He published in 1793 his first ambitious work, a translation of the Persian *Annales de Mirkhond* along with *Mémoires sur Diverses Antiquités de la Perse*.

Two years later he was called to fill the chair of Arabic in the newly-founded Institute of Oriental Languages; and to this he added in 1806 the duties appertaining to the professorship of Persian. He held besides several public appointments, nearly all simultaneously with his professorships, such as that of a member of the Corps Législatif (1808), rector of the university of Paris (1815), perpetual secretary of the Academy of Inscriptions, founder and member of the Asiatic Society, and member of the Chamber of Peers. As a teacher he was held in the very highest esteem; he wrote valuable text-books—*Grammaire Arabe* (2 vols. 1810), the fruits of fifteen years' labour; *Chrestomathie Arabe* (3 vols. 1806), and its supplement, *Anthologie Grammaticale* (1829)—which helped to train many of the best Arabic scholars of the 19th century; and he himself had for his pupils several of the best teachers of that language who laboured in both France and Germany in succeeding years. He died in Paris on 21st February 1838. Besides the works already noted he also published Abd-Allatif's *Relation de l'Égypte* (1810), an edition of the tales of Bidpai (*Calila et Dimna*, 1816), Farid ed-Din Attar's *Pendnamah* (1819), Hariri's *Makamat* (1822), *Exposé de la Religion des Druses* (1838), &c. See *Lives in French* by Reinaud (1838) and by Derenbourg (1895).

Sacy, SAMUEL USTAZADE SILVESTRE DE (1801–79), a journalist, son of the preceding, was long one of the leading writers on the staff of the *Journal des Débats*, and in 1864 was appointed a member of the Council of Public Instruction. In 1855 he was elected a member of the Academy, and in 1867 of the senate. In 1858 he published a collection of his literary articles as *Variétés Littéraires, Morales, et Historiques* (2 vols.); and he edited in 1861–64 the *Letters of Madame de Sévigné* in 11 volumes.

Sadd. See SUDD.

Saddleback, or BLENCATHARA, a Cumberland mountain (2347 feet) of the Skiddaw group, 4½ miles NE. of Keswick.

Saddleworth, a town in the West Riding of Yorkshire, 14 miles NE. of Manchester, 12 SW. of Huddersfield. It has cotton and woollen manufactures, and in the neighbourhood are numerous early earthworks and tumuli. Pop. 13,000.

Sadducees, one of the Jewish parties mentioned by Josephus, in the Talmud and in the New Testament. The name is derived (1) through the Greek, from the Hebrew *Qadusi* or Zadokite, denoting the descendants of Zadok, the chief of the priesthood in the days of David and Solomon (1 Kings i. 34, ii. 35; 1 Chron. xxix. 22). (2) According to the Talmudic account preserved in *Aboth de R. Nathan* v., the name comes from Zadok, a disciple, like Boethus, of Antigonus of Socho who studied under Simon the Just [date doubtful; either Simon I., a contemporary of Alexander the Great, or Simon II., high priest from 226–198 B.C.]. Antigonus's motto was 'be not as servants who serve the master for the sake of receiving a reward,' but serve from a sense of duty. This motto was adopted by the Zadokite and Boethusian schools, which, according to the hostile account in *Aboth de R. Nathan*, in consequence rejected the belief in the future life and inculcated worldly happiness as the desirable goal (p. 26, ed. S. Schechter, London, 1887). (3) A. E. Cowley (*Ency. Bib.*, 4236) maintains that the name is a corruption of *Zindik*, a Persian word meaning Zoroastrian and hence *infidel* when used by non-Zoroastrians. (4) The name may be an intentional variation of *Qaddis*, Hebrew *righteous*, applied derisively by opponents. (1) is the most probable etymology. For other explanations see *Jew. Ency.*

The Sadducees were a priestly, aristocratic party. When Ezra reorganised the community in Judæa, he imposed the Mosaic Law as the constitution, and caused a solemn oath of fidelity to its tenets to be taken by the people (Neh. x. 30). The law thus became the only authority, and the priests, Ezra's successors, were the official teachers and interpreters. They were the *Soferim*, or scribes, so called because, like Ezra the *Sofer* (scribe), they taught the *Sefer*, book or Bible, and nothing else. During the third pre-Christian century conditions changed. Under Greek rule the authority of priests weakened and a new class of lay teachers, later called Pharisees, arose. As this influence of non-priests is late, the distinction between Sadducees and Pharisees cannot be extremely old, the original teachers being, so far as existing evidence tends to show, Sadducees exclusively.

With regard to the differences between Sadducees and Pharisees it must be remembered that our main sources of information are not impartial. The Pharisaic supremacy, no doubt, colours the Talmudic evidence: Sadducean tenets tended to be forgotten when obsolete and when the practical necessity for recording them ceased. It is chiefly, therefore, with regard to controversial matters that statements concerning Sadducean enactments and practices are preserved. New Testament writers, on the other hand, had no reason to be interested in Jewish religious divergencies. By the time of the early church the Sadducees were extinct. Of Sadducean literature practically nothing remains. The principal exception is the 'Zadokite' work discovered by Schechter (*Documents of Jewish Sectaries*, Cambridge, 1910) in the Cairo Genizah; even this book, moreover, is regarded by R. H. Charles (*Apocrypha and Pseudepigrapha*, Oxford, 1913, vol. ii. p. 791) as not typically Sadducean but as representing the standpoint of 'a reformed Sadduceanism.' It follows that our information about this religious body is by no means complete. According to Josephus (*Antiquities*, xiii. 10, 6, § 297, and xviii. 1, 4, § 16) and the Talmud (see, for example, *Sanhedrin* 33b, *Horayoth* 4a) the Pharisees and Sadducees differed in their attitude towards the traditional laws not contained in the Pentateuch. Josephus says 'they deny destiny (= God) and they assert that everything lies in our power . . . they deny the immortality of the soul and future punishment and reward.' According to Mark xii. 12 they rejected the doctrine of resurrection. That their disbelief in the world to come may have been a logical and inevitable corollary from the teaching of Antigonus of Socho, cited above, is very probable. But the controversy over the non-Pentateuchal laws has been difficult to explain. Seeing that the Sadducees were conservatives and the Pharisees progressives one would have expected the reversal of their respective rôles: it is reformers rather than traditionalists who may be expected to repudiate the past and emphasise the needs of the present. The most satisfactory solution of the problem is that given by J. Z. Lauterbach in 'The Sadducees and Pharisees' (pp. 176 fol. of the *Studies in Jewish Literature . . . in honour of K. Kohler* . . . G. Reimer, Berlin, 1913) and his subsequent works. Lauterbach shows brilliantly and conclusively that the Sadducees were literalists; their ordinances were *Geziratha*, or temporary enactments. Thus in *Megillath Ta'anith* (ed. Neubauer, p. 8) the abrogation of this book of ordinances, on 14 *Tammuz*, is recorded. S. Zeitlin (*Megillath Ta'anit*, Philadelphia, 1922, pp. 77 and 83) holds a different view, but Lauterbach's footnote (p. 186 *op. cit.*) may be said to afford a satisfactory answer to Zeitlin's objections. The Sadducees maintained the rigour of the old institutions and refused to acknowledge the modifications

which the Pharisees introduced, e.g. compensation instead of *lex talionis*. They based their principles on the maxim 'the scriptures speak in human language'; the plain sense and literal exegesis of the Penateuch was to be paramount. The Pharisees, on the other hand, took the attitude later typified by Aqiba and Aquila, that every particle must be considered; delicate shades of meaning were to be observed by a study of grammatical usage, by etymology, by lexicographical research and comparison, and by an investigation of particles seemingly otiose. The inner meaning might thus not infrequently be obtained, the spirit deduced from the letter itself and the requirements of future ages found to be implicit in the ancient words of scripture which had a validity for all time.

The main points of difference thus included, besides the rejection of the future life, a denial of angels (Acts xxiii. 8); a maintenance of the strict *lex talionis* (the day on which their code was abrogated by Simon b. Sheṭaḥ, in the reign of Salome Alexandra, was observed as a holiday); they held a master answerable for damage done by a slave, whereas the Pharisees made the master responsible only for damage by his animals; they took Deut. xxii. 17 literally; they allowed a daughter to inherit as a son's daughter, if the son were dead; they began to count the *Omer* (seven weeks from Passover to Pentecost, Lev. xxiii. 15-16) from the 'day after the Sabbath,' and, in consequence, always observed Pentecost on a Monday; they caused the cost of the daily sacrifice to be borne by the High Priest, because of their priestly privileges, while the Pharisees maintained that this was a national obligation and devolved on the Temple exchequer; they insisted that the meal offering was the priests'; they advocated strict levitical purity with regard to the red heifer (Num. xix.); they held that on the day of atonement the high priest should kindle the incense *outside* the Holy of Holies, for mystic reasons which the Pharisees repudiated; they made the power of contamination more rigorous; they would not tolerate the ceremonial willow-beating at the Tabernacles water-libation on Sabbath; they did not hold that the scrolls of the law were holy; they did not accept the *Erub*, a declaration and act rendering carrying on Sabbath permissible in certain limits; they dated their documents 'After the High Priest.'

On the whole it may be said that the Sadducees were priestly aristocrats, friends of Rome, less pious than their opponents, and less concerned with the poor. 'The Sadducees were the hypocrites of the Jewish world, just as the Epicureans were the hypocrites of the Greek world' (Hart, *Ency. Brit.*, 11th ed., vol. xxiii. p. 990). Their interests were centred on the Temple, with which their privileges and rank were bound up, and when the Temple fell, the Sadducees disappeared from Judaism. In the New Testament they are scarcely known, and by the time of the Church Fathers they were frequently confounded with the Samaritans. Nevertheless the party had its great men; and mass verdicts, such as that of Hart, need a saving clause.

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Synoptic Gospels, London, 1909 (a new ed. much enlarged is now passing through the press), invaluable for New Testament references to Sadducees; J. V. Bartlett, *St Mark*, Century Bible, Edinburgh, 1922, pp. 332 ff.; M. Segal, *Expositor*, xiii, 1917, pp. 80 ff.; O. Hölscher, *Der Sadduzäismus*, Leipzig, 1906.

Sade, DONATIEN ALPHONSE FRANÇOIS, MARQUIS DE, a notorious French romancer, was born at Paris, 2d June 1740, fought in the Seven Years' War, and was in 1772 condemned to death at Aix for his unnatural sexual vices. He made his escape, but was afterwards imprisoned at Vincennes and in the Bastille, where he wrote his fantastically scandalous romances, *Justine* (1791), *La Philosophie dans le Boudoir* (1793), *Juliette* (1798), and *Les Crimes de l'Amour* (1800). He became incurably mad, and died at Charenton, 2d December 1814. The term sadism (Fr. *sadisme*), denoting a form of sexual perversion marked by a love of cruelty, is derived from his name. See the study in French by Janin (1835).

Sádi (also spelt *Sa'di*, *Saadi*, and *Sa'adi*), the assumed name of the SHEIKH MUSLÍH ADDIN, one of the most celebrated of Persian poets, who was born at Shiraz about the year 1184. Little is known of the circumstances of his life. His father's name was Abdallah, and he was a descendant of Ali, Mohammed's son-in-law; notwithstanding his noble lineage, however, he held but an insignificant position. Sádi was early left fatherless. He received his education in science and theology at Bagdad, and from here he undertook, together with his master, his first pilgrimage to Mecca, a pilgrimage which he subsequently repeated no less than fourteen times. He travelled for a great number of years, and is said to have visited parts of Europe, Barbary, Abyssinia, Egypt, Syria, Palestine, Armenia, Asia Minor, Arabia, Persia, Tartary, Afghanistan, and India. Near Jerusalem he was taken prisoner by the Crusaders, not while fighting against them, but while practising religious austerities in the desert. He was ransomed for ten dinars by a merchant of Aleppo, who recognised him, and gave him his daughter in marriage; this union, however, did not prove happy. He married a second time, but lost his only son. The later part of his life Sádi spent in retirement near his native town, and he died at a very old age in 690 A.H., or 1263 A.D.; according to others, however, he did not die until 1291 or 1292 A.D. In person he is described as having been of rather insignificant appearance, short, slim, and spare. His was a contemplative, pious, and philosophical disposition. The years of his retirement he occupied in composing those numerous works which have made him justly famous through East and West. Although European critics would hardly be inclined to endorse to the full the judgment passed upon him by his countrymen, that he was 'the most eloquent of writers, the wittiest author of either modern or ancient times, and one of the four monarchs of eloquence and style,' yet there is no doubt that this 'nightingale of thousand songs' fully merited the honours showered upon him by princes and nobles, both during his lifetime and after his death. A mausoleum, with a mosque and college attached to it, was erected in his honour at the foot of the hills about 2 miles to the north-east of Shiraz, and the people, who soon wound a halo of legend around his life, flocked thither in pilgrimage.

The catalogue of his works comprises twenty-two different kinds of writings in prose and verse, in Arabic and in Persian, of which *ghazels* and *kassidas* ('odes,' 'dirges') form the predominant part. The most celebrated and finished of his works, however, is the *Gulistan*, or Flower-garden,

a kind of moral work in prose and verse, consisting of eight chapters on Kings, Dervishes, Contentment, Taciturnity, Love and Youth, Decrepitude and Old Age, Education, and the Duties of Society, the whole intermixed with a number of stories, maxims, philosophical sentences, puns, and the like. Next to this stands the *Bostan*, or Tree-garden, a work somewhat similar to the *Gulistan*, but in verse, and of a more religious nature. Third in rank stands the *Pend-Nameh*, or Book of Instructions. Elegance and simplicity of style and diction form the chief charm of Sâdi's writings. For wit he has been likened to Horace, with whose writings he may not have been unacquainted, since he is said to have known Latin.

The first complete printed edition of his works, called the *Salt-cellar of Poets*, by Harrington, was published in Calcutta (1791-95), and has been reprinted since by native presses in India. The *Gulistan*, first edited with a Latin translation by Gentius (Amsterdam, 1651), has been reprinted very frequently, and has been translated into a number of European tongues, into English by Gladwin, Ross, Eastwick, and Platts; and see Robinson's *Persian Poetry for English Readers* (1883). The *Bostan* was first published complete in Calcutta in 1823 (Vienna, 1858), and has likewise been translated into other languages; *With Sa'di in the Garden*, by Sir Edwin Arnold (1889), is a translation of part of the *Bostan*. Many manuscript copies of Sâdi's works exist. A carefully collated MS. of the *Bûstân of Shaikh Muslihu-d-Din Sa'adi*, prepared by Platts, was photographed and published in London, with annotations by Rogers, in 1891.

Sadler, MICHAEL THOMAS (1780-1835), English social reformer, was born at Snelston, Derbyshire. He engaged in business at Leeds as an importer of Irish linens, but gave his strength to public life, and in 1829-32 sat in parliament. He advocated a poor-law for Ireland, took part in the Malthusian controversy, championed the cause of the agricultural poor in England, but is principally remembered as a leader in the agitation for the abolition of child labour in factories. He died at Belfast, whither he had retired. See Seeley, *Memoirs of M. T. Sadler* (1842), and Hutchins and Harrison, *History of Factory Legislation* (1903, new ed. 1926).

Sadler, SIR RALPH, was born in 1507, and was employed by Cromwell, Henry, and Elizabeth in diplomacy with Scotland. He was left one of the twelve councillors of Edward VI.'s minority, fought at Pinkie, sat in the commission on Queen Mary at York, and was her gaoler at Tutbury. He was perhaps sent to carry the news of her execution to her son, and died himself soon after in 1587.

His *Papers*, of great value for Border and Scottish history generally, were edited by A. Clifford, with a Memoir by Sir Walter Scott (3 vols. 1809).

Sadler's Wells Theatre, familiarly known as 'The Wells,' a historic theatre of London, in Clerkenwell. It stands on the site of a holy well long celebrated for the reputed miraculous healing virtues of its mineral waters. From early times mystery plays had been here performed, but with the Reformation the spring was overlaid. In 1572, however, one Forcer sought leave from parliament to carry on a place of amusement on the spot, and in the following century a 'music-house' and garden were conducted on the site by one Sadler, his name becoming associated with the by then forgotten well following its fortuitous rediscovery by his servants (1683) and its repopularisation by him. In 1765, in the time of one Rosoman (also Rosamon, born Rosamond), the old wooden building was replaced by one of brick, and this in 1879 was reconstructed. The well has associations with Edward IV., with Queen Elizabeth, with Samuel Pepys; the stage with Grimaldi, Edmund Kean, Braham, the Dibbins, but most notably with Samuel Phelps (q.v.), who in 1844-62 put on almost the complete

cycle of Shakespeare's plays. Later, however, the prosperity of the theatre departed, and when closed in 1916 it was a cinematograph house, and in 1925 was derelict when purchased by public subscription with a view to its development as a popular home of Shakespeare and of grand opera.

Sadoletto, JACOPO, was born at Modena in 1477. His father, a distinguished jurist in Ferrara, was in a position to give his son every advantage of a liberal education. Sent by his father to Rome in 1502, he there found a patron in Olivero Caraffa (under whose roof he lived for some years), and eventually entered the church. On the accession of Leo X. the polished Latin style of Sadoletto gained him the position of apostolical secretary, an appointment he held under two other popes, Clement VII. and Paul III. By Leo he was also made bishop of Carpentras in 1517, though he did not leave Rome till four years later. Settled in his charge, he performed its duties with a devotion that commanded the respect even of those who had broken with the Church of Rome. Both by Clement VII. and Paul III. he was successively summoned to Rome to give his aid in the councils of the church. By the latter of these popes he was in 1536 made cardinal, greatly, he affirms, against his own will, as his chief desire was the pursuit of his favourite studies and the faithful performance of the duties of his charge. In 1544 he acted as legate to Francis I. on a fruitless mission to effect peace with Charles V. He died at Rome in 1547.

By his high character and his literary gifts and accomplishments Sadoletto ranks as one of the most distinguished churchmen of his age. While he cultivated classical studies with all the enthusiasm of the dissolute Bembo, he still preserved his Christian feeling and the sense of the responsibilities of his profession. He had sincerely at heart the reform at least of the discipline of the church, and had his counsels and example been followed Rome would have played a worthier part in the religious revolution of the 16th century. He corresponded with many of the Protestant leaders, and did his utmost to find a common basis on which reunion might be possible. His works mainly consist of his personal and official letters, and of commentaries on the Psalms and on the Epistles of St Paul. On these last Erasmus passes the curious criticism 'that their very polish of expression will with some take off the edge of their pious suggestion.' Sadoletto's complete works were published at Rome in 1759, with an annotated life prefixed. See Joly's *Étude sur Sadoletto* (Caen, 1856).

Sadowa. See KÖNIGGRÄTZ.

Safad, or ZEPHAT, one of the four holy cities of the modern Jews in Palestine, spreads in horseshoe shape round a hill 2700 feet above the Mediterranean, 6 miles NW. of the Sea of Galilee. Population, about 9000. The town was overthrown by earthquakes in 1759 and 1837. A castle of the Christians, built during the Crusades, was destroyed by the sultan of Damascus in 1220, and, having been rebuilt by the Templars, was again taken and destroyed by Beybars of Egypt in 1266. The Jewish colony has been settled here since the 16th century, and embraces many immigrants from Poland. There is an American Zionist hospital.

Safe-conduct. See PASSPORT.

Safes. The foundation of the plan on which fireproof safes are still constructed was laid by a Mr Richard Scott in 1801. Mr Thomas Milner in 1840 patented a fireproof safe embodying the same principle, but with some improvements. In 1843 letters-patent were granted to Messrs Tann for the use of a mixture of pounded alum and gypsum, previously heated and cooled, as a fire-resisting medium placed between two plates of

iron, from 3 to 6 inches apart, which together form the wall of the safe. Milner's plan was to fill the jacket formed by the double-plated sides with sawdust, in which were packed a number of small tubes filled with an alkaline salt. These tubes burst when exposed to heat, and the sawdust becomes pervaded with moisture. When alum or sulphate of alumina is used there can be no charring till the large quantity of water these salts contain is expelled; and this is a slow process, as the heat causes a protecting crust of the anhydrous salt to form on the inside of the outer plate. Fireproof safes are still made on similar principles.

In the past safes were made of composite hard and soft iron or steel plates with a view to defeating the drill and cutting tools or the explosives of the burglar, but the introduction of the oxy-acetylene cutting flame has rendered it necessary to seek other means of protection, since, given privacy and a reasonable time, a section can be removed from the strongest metal door. Safes are now more usually placed where they can periodically be seen by watchmen or the police, and consist of steel plates and bars, associated with layers of refractory material arranged as described above to afford protection from fire, while at the same time making the process of flame cutting as lengthy as possible.

Public safe-deposits for the safe-keeping of important documents, cash, gold and silver plate, and other valuables, have now been built in most large business centres. Some of these contain a large number of safes, the building of the National Safe Deposit Company, Queen Victoria Street, London, having room for as many as 20,000. The brick walls of this company's great safe-vault are 3 feet thick, faced externally with firebrick and lined internally with cast-iron plates, $4\frac{1}{2}$ inches thick, strengthened by imbedded wrought-iron bars. The separate compartments of the vault have doors, 12 inches thick, formed of metal plates of different degrees of hardness. These weigh 4 tons each, and are raised and lowered, portcullis-like, by hydraulic power. The chief portion of the Chancery Lane safe deposit consists of four strong rooms 'armour-plated' and built on iron columns in vaults, but completely isolated from the external walls, so that armed patrols (armed watchmen guard the above safe-vault also) can, during the night, walk round, over, and under them. These rooms contain about 5000 separate safes and have doors weighing 2 tons each, which by a clockwork arrangement can only be opened at certain hours. The lock of a single safe cannot be opened unless both renter and custodian are present, as each has a different key for the same safe. In the case of the Safe Deposit, opened in 1891, in St James Street, London, the walls, roof, and floor are formed of a triple thickness of Siemens-Martin steel together having a minimum thickness of $1\frac{1}{2}$ inch. The middle plate is of hard and the two outer plates are of soft steel, and these three plates were riveted together by hydraulic pressure in such a way that the rivets swell out into the wider holes of the centre plate and therefore cannot be punched. As the rivets are made with a strand of hard steel, neither can they be drilled. Fireproof chambers are built with vaulted roofs and sides of strong masonry.

Protection from theft is obtained by the use of locks requiring the simultaneous production of two or more keys to open, or Time-locks, which will only respond to the keys at a certain predetermined time, or, with or without either of the above, a Combination lock, which requires certain discs or pointers to be set to an arranged combination of letters or figures before the lock will

respond to the keys, the agreed Combination being capable of change if necessary.

See H. W. Chubb on 'Locks and Safes' in the *Journal of the Society of Arts* (1893).

Safety-fuse. See BLASTING, and FUSE.

Safety-lamp. The *firedamp* of the miner is principally marsh-gas or methane (CH_4). When mixed with air the gas is explosive between the limits 5.4 and 14.3 per cent. It still forms one of the principal dangers the miner has to face, and before the invention of the safety-lamp it was the most important of his foes. A safety-lamp is not intended to enable men to work where there is an ignitable percentage of firedamp; men are not allowed to work in British mines, even with safety-lamps, where $2\frac{1}{2}$ per cent. of the gas occurs; but the safety-lamp protects a person who unwittingly or otherwise enters air containing a dangerous proportion of firedamp, or when the gas invades his working-place to an unexpected degree. The first safety-lamp was invented and used by Dr W. R. Clanny in 1813; in the original form air was blown by a bellows, through a water-seal, to a candle in a closed vessel having a glass window; the products of combustion escaped through a second water-seal above the vessel. Later, he dispensed with the water-seals, forcing the air through the oil in the oil-vessel of the lamp and allowing the products to escape through a narrow metal chimney. There were other modifications. Their clumsiness prevented these early forms coming into general use. George Stephenson, the famous railway engineer, was in early life engaged in mining, and invented a safety-lamp in which air was admitted to the flame through one or more metal tubes passing up through the oil-vessel; afterwards he substituted a perforated sheet of metal for the tubes, and otherwise improved it. Stephenson's lamp appears to have antedated that of Davy by a few months, and to some extent anticipated the latter's invention. Sir Humphry Davy's lamp (1815) was the outcome of a brilliant research on the nature of flame. He was the first to demonstrate, and to state the reason for, the protection afforded by a cylinder of iron wire-gauze surrounding the flame. The 'Davy' (see figure) consisted of an oil-vessel surmounted by a gauze cylinder, 6 inches long and $1\frac{1}{2}$ inch in diameter, with a short gauze cap placed over the top of the cylinder. Perhaps the greatest life-saving invention of all time, the 'Davy' remained in use for one hundred years. It is now obsolete. Subsequent forms have evolved from it and still retain the gauze he introduced. Should gas ignite within the lamp, the gauze (unless red-hot) prevents the flame from passing out by cooling the issuing gases to a temperature below that at which firedamp burns. It was soon found that the 'Davy' was unsafe in rapid currents, and eventually (1865) it was protected by being placed in a cover having a glass window. This variant was known as the 'tin-can Davy.' A great objection to the Davy was its feeble illuminating power, amounting only to about one-fifth of that of a candle.



Davy Lamp.

An important new principle was established by the Mueseler lamp (1840) invented in Belgium. The lowest part of Davy's gauze cylinder was replaced by a thick glass cylinder, $3\frac{1}{4}$ inches high. A narrow, tapering metal chimney was fitted within the gauze and over the flame. Fresh air entered through the gauze, passing downwards to

feed the flame; the products of combustion passed up the metal chimney and out at the top of the gauze. About 1842 Dr Clanny, who had never ceased working at the problem, brought out, independently of Mueseler, a lamp with a glass surrounding the flame. The 'Clanny,' as it is still called, does not possess the metal chimney of the Mueseler. The introduction of the glass added considerably to the illuminating power; all modern lamps have such glasses. Of the safety-lamps used in Britain in 1868, 60 per cent. appear to have been Davy's, 30 per cent. Stephenson's, and 10 per cent. Clanny's. About this time lamps were devised having an additional gauze ring placed under the glass; the air entered through the latter ring; the lighting power was thereby improved. Some modern lamps are of this class. Two important improvements were introduced about 1870. The first was the sheet-metal shield or bonnet surrounding the gauze and efficiently protecting it from the effects of high-velocity currents; the second was the arrangement of double or treble concentric gauzes due to the French engineer, Marsaut. The majority of flame safety-lamps used in Britain to-day are double-gauze Marsauts, and all modern safety-lamps are bonneted. A few *electric safety-lamps* were in use as far back as 1883. Their introduction was, however, slow, and in 1909 only 2155 were employed. The equivalent figure for 1923 was almost 328,000. For modern development of flame and electric safety-lamps see MINING.

Safety-valve, an apparatus, the duty of which is to allow the steam to escape from a boiler when it reaches a certain pre-determined safe pressure, and thus to prevent undue stress on the boiler-plates. The apparatus consists of a valve, which is kept in a closed condition by various methods until the internal steam pressure rises to the blow-off pressure, when the valve at once opens automatically. When closed, the valve is held upon its seat either by the action of a spiral spring or by means of a dead weight applied directly or through the intervention of a lever. The valve-box should be fitted directly on the top of the boiler; the valve-face should be narrow— $\frac{1}{8}$ inch to $\frac{1}{4}$ inch in width; and the lift of the valve from its seat, when freely discharging any surplus steam, should not exceed $\frac{1}{16}$ th of its diameter. It is important to make the valve of such a shape that the reaction of the escaping steam will assist in maintaining the requisite pressure on the underside of the valve in order to keep the valve fully open as long as steam is being discharged. The valve should at once return to its seat, and close tightly when the internal steam pressure has, owing to the discharge of the steam, fallen to a pressure of 3 or 4 lb. below the blowing pressure. When a spring is employed, the length of the spring should be sufficiently great to prevent an undue increase of pressure on the valve as the spring is compressed. The area of the valve-opening is determined by considering both the area of the grate surface upon which the fuel is burned, and also the amount of heating surface provided in the boiler. In large boilers it is desirable to distribute the necessary valve area so determined over two independent valves. One of these may be, in the case of land boilers, a lever safety-valve, the other a dead-weight valve. To test the efficiency of a safety-valve, the stop and feed valves of the boiler should be shut when the boiler is under full steam, and the firing continued steadily for a period of about twenty minutes. Under these conditions, the steam pressure in the boiler should not rise more than 10 per cent. above the pressure at which the safety-valve is set to blow off steam. There are stringent official rules with regard to the design, size, and general arrangements of safety-valves.

Similar valves are frequently fitted to the receivers in compound steam-engines, and to many other types of vessels containing liquids or gases under pressure.

Safflower (*Carthamus tinctorius*), an annual herbaceous plant with large orange-red flower-heads, belonging to the Compositæ. It is believed to be indigenous to India and adjoining countries, but it may have had a wide distribution in the wild state, as safflower seeds have been found in ancient tombs in Egypt. Safflower is cultivated all over India, and to some extent also in Persia and Egypt, for the dye obtained from its flowers. It has likewise been cultivated in southern France and other countries. Formerly it was largely exported from India, but its importance in western Europe as a dyestuff has greatly diminished since the introduction of the coal-tar colours. It is still used in India for ceremonial purposes. The flowers yield both a red and a yellow dye, but the latter is of little value. A peculiar treatment of the flowers with an alkaline solution is required to obtain the red dye, which is called Carthamine (q.v.). It is not permanent. It is used as a colouring matter of toilet Rouge (q.v.). Safflower is now grown in India as an oil-seed crop, mainly for local use. The oil resembles sunflower oil. It is used for cooking and burning, and for making varnish. The young shoots are eaten. The seeds of the safflower plant are given to fatten poultry.

Saffron consists of the dried stigmas of the flowers of the Saffron Crocus (*Crocus sativus*). It is used as a colouring material for some articles of food and medicinal tinctures. Formerly it was employed for dyeing fabrics yellow, and, to a slight extent, is so still in some countries. In Persia it is much consumed as a condiment, and for this purpose it is also used in Spain; whilst, according to Giraldu Cambrensis, it forms with milk the diet of the fairies. Saffron is cultivated in various districts in the south of Europe; and in England, where it is said to have been introduced from the East in 1339, it was much grown till about 1768 in Essex (round Saffron Walden, q.v.) and Cambridgeshire. It is also cultivated in Persia, Afghanistan, and Kashmir. The gathered stigmas of the plant are pressed under a weight, and heat applied till the cake-shaped mass is quite dry. From so small a portion of the plant being useful, a vast number of flowers are required to make a small quantity of saffron. There is accordingly a strong temptation to adulterate it, the flowers of Safflower (q.v.) being much used for this purpose, for which reason they are sometimes called bastard saffron. The strong tinctorial power of saffron is owing to the presence of a body called *polychroite* or *safranin*.

Saffron was of much greater importance centuries ago than it is now. It was in favour with the ancient Greeks as a dye, and with both them and the Romans as a perfume. In the middle ages it was employed in cookery and as a drug. It is on record that as late as the 15th century persons were burned alive in Nürnberg for adulterating saffron.



Crocus sativus.

The yellow colour of this dyeing substance seems to have been applied to the dress of royal persons at an early time in Greece and in Ireland, and to the shirts of persons of rank in the Western Islands of Scotland down to a comparatively late period.

Saffron Walden, a municipal borough of Essex, 15 miles S. of Cambridge, 27 NNW. of Chelmsford. The Saffron Crocus (see SAFFRON) formerly cultivated here (from Edward III.'s time) gives its name to the town. The parish church, crowning a hill, is a stately Perpendicular structure, with a spire 193 feet high, and brasses and monuments—one to Lord Chancellor Audley (1488–1544). There are also remains of a Norman castle, a corn exchange (1848), a town-hall (1879), a cattle-market (1834), and a grammar-school, founded in 1423. Audley End, 1½ mile SW., the seat of Lord Braybrooke, was built in 1603 by Thomas Howard, Earl of Suffolk, and is still a magnificent mansion, though partly demolished since 1701. Area of borough, 7416 acres; pop. (1921) 5876.

Safi, or ASFI, a seaport of French Morocco, stands on a little bay on the Atlantic coast, 120 miles WNW. of the city of Morocco. It is a compactly built place, dominated by a fine ruined castle of the sultans of Morocco dating from the 16th century. The place was held by the Portuguese for several years; they abandoned it in 1648. The fortifications they built still stand in part. The shrine of the Seven Sleepers here is visited by both Moslems and Jews. Safi was at one time the chief seat of the trade of Morocco with Europe, and, though it has declined since the rise of Mogador, it still exports beans, maize, pease, wool, olive-oil, &c., and imports cottons, sugar, &c. Pop. 26,000.

Saga, a town of Japan, in Kiūshū, 40 miles NW. of Nagasaki. It is important commercially in metal-working, and in the making of electrical plant. Pop. 34,000.

Saga, see ICELAND (*Icelandic Language and Literature*) and the works there cited; also Hermannsson's bibliographies of Icelandic and other sagas in vols. i. (1908), iii. (1910), v. (1912) of *Islandica* (Ithaca).

Sagaing, a decayed town, once capital, of Burma, on the Irawadi, opposite Ava.

Sagan, a town of Prussian Silesia, the chief place (from 1397) in the principality of Sagan, on the Bober, 33 miles by rail W. by S. of Glogau. It has manufactures of cotton and woollen cloths, beer, &c. At the castle, Wallenstein was visited (1629–30) by Kepler. Pop. 15,000.

Sagar, or SAUGOR, a well-built town in the Central Provinces of India, is situated in a hilly tract, on a feeder of the Jumna. There are here a Mahratta fort, now converted into British stores, barracks, and a magazine, as well as a gaol (1846) and a park (1862); and there were formerly a college (removed to Jabalpur) and a mint (removed to Calcutta). Sagar has a trade in salt, sugar, and cloth. Pop. 39,000.—The district has an area of 3962 sq. m.; pop. 528,000.

Sagar, a low, swampy island at the mouth of the Hūgli, the holiest branch of the Ganges; it is particularly sacred in the estimation of the Hindus. Multitudes of pilgrims annually resort to it in January, and after the three days' festival of purification is over a great fair is held. The island has an area of 225 sq. m., but is very thinly inhabited, the greater part being jungle, the haunt of tigers and other wild animals. A lighthouse (1808), a meteorological observatory, and a telegraph station are the chief buildings.

Sagasta, PRAXEDES MATEO (1827–1903), Spanish statesman, was born at Torrecilla de Cameros, Logroño, became an engineer, but taking

part in insurrections in 1856 and 1866 had twice to flee for a time to France. He had a place in Prim's cabinet (1868), supported Amadeus, held office under Serrano, and under the new monarchy became leader of the Liberals, being minister in 1881–83, 1885–90, 1892–95, and again in 1898–99, during the disastrous war with the United States and the peace negotiations. His subsequent programme of internal reforms was hampered by ill-health and political difficulties. Earlier he had carried universal male suffrage and the institution of trial by jury. He died at Madrid.

Sage (*Salvia*), a genus of Labiatæ, containing many species, herbaceous and half-shrubby, natives of temperate and warm regions. There are only two perfect stamens, the filaments of which bear at their summit a cross thread fastened by a joint. Common Sage, or Garden Sage (*S. officinalis*), so much grown in gardens as an aromatic herb for flavouring purposes in cookery, is a native of the south of Europe. It is possessed of active properties, as its powerfully aromatic odour and bitter taste indicate. The leaves and flowering parts of the plant, infused as tea, are considered tonic and astringent. Oil of Sage has been used in liniments against rheumatism; but its reputation has sunk. It contains much stearoptine. Sage grows best in a dry soil, and is easily propagated by slips or cuttings.

Clary (q.v.) is a species of sage. Meadow Clary, or Meadow Sage (*S. pratensis*), is a common ornament of meadows and borders of fields in most parts of the continent of Europe and in the south of England. It has bluish-purple flowers. The Apple-bearing Sage (*S. pomifera*) is a native of the south of Europe and of the East, remarkable for its very large reddish or purple bracts, and for the large gall-nuts which grow on its branches, as on the leaves of the oak. The peasantry of Crete collect these nuts and sell them in the towns for the purpose of making sweetmeats; they have an aromatic sweet taste. Some of the species of *Salvia* have very beautiful flowers, and are prized ornaments of gardens and greenhouses. The finest species, from the gardening point of view, are from Mexico.

Sage-brush, or SAGE-BUSH, a plant-formation characteristic of salt deserts in the western United States, composed of *Artemisia tridentata* and other species (see WORMWOOD).

Sage-cock. See GROUSE.

Saghalien. See SAKHALIN.

Saginaw, a city of Michigan, is built on an elevated plateau on the left bank of the Saginaw (including since 1890 what was once East Saginaw), 108 miles NNW. of Detroit. It has some handsome public buildings, and is a flourishing city. It contains railroad and machine shops, and lumber yards. Large quantities of salt are exported, and coal is mined. Saginaw is the centre of an



Sage (*Salvia officinalis*):
a, a flower.

important beet-sugar producing district. Pop. (1880) 10,525; of East Saginaw, 19,016; of the whole (1920) 61,903.—SAGINAW BAY, an arm of Lake Huron, the largest indentation of the southern peninsula of Michigan, is 60 miles long by 30 wide, and has several fine harbours. The river Saginaw (30 miles) falls into it.

Sagitta, or ARROW-WORM, a genus of small pelagic worms, included along with Krohnia and Spadella in the class Chaetognatha. The arrow-worms occur in all seas; they often measure about an inch in length, and are quite translucent. They feed on diatoms, infusorians, small crustaceans, larval fishes, and the like. The animal is divided by two partitions into three regions, head, body, and tail. In the mouth there are sickle-shaped bristles or 'jaws,' to which the term Chaetognatha refers. There are two pairs of thin lateral 'fins,' and the tail is similarly fringed. The animals are hermaphrodite, the paired ovaries and testes developing from two cells which appear at a very early stage in the history of the embryo. Each cell divides into two—an ovarian and a testicular rudiment.

See *Cambridge Natural History*, vol. ii.; *I Chaetognathi* (1883), by Grassi, in the monographs on the Fauna of the Gulf of Naples; 'Die Chaetognathen' by O. Hertwig, in *Jenaische Zeitschrift. f. Naturwiss.* xiv. (1880).

Sago, a nutritive, farinaceous substance obtained from the pith of several species of palms, principally, however, from *Metroxylon Rumphii*, the spiny, and *M. leve*, which is spineless. For the natives of the Eastern Archipelago this palm is a source of vegetable food naturally more abundant and less variable in its yield than rice. The stem consists of a thin hard wall, about 2 inches thick, and of an enormous volume of a spongy medullary substance, which is edible. Each tree is from 15 to 20 feet high. There are three well-marked varieties of this palm. The tree grows in Java, Sumatra, Celebes, Borneo, Malacca, and Siam. The only countries, however, where it is found growing in large forests are New Guinea, the Moluccas, Celebes, Mindanao, Borneo, and Sumatra. It is widely spread over the Moluccas, but confined to particular parts of the others. There is no regular fixed season for extracting

the farinaceous pith, which is taken as occasion requires, and as the individual tree becomes mature, which is at about fifteen years.

These palms propagate themselves by lateral shoots as well as by seed, and they die after producing fruit, so that a sago-plantation once formed is perpetual. Sago-meal is eaten by the natives in the form of pottage, and also partially baked in earthenware moulds into small square biscuits. Large quantities of the



Sago Palm (*Metroxylon Rumphii*):
a, in florescence; b, fruit.

meal in its pure state are sent from the eastern islands to Singapore, where it is granulated or

pearled, and bleached by the Chinese for shipment to Europe. It comes into commerce in three forms, the common brown sago, pearl-sago, and sago-flour. It is made by two processes, the starch grains being burst in some samples and not in others. Sago is used in Europe for feeding stock, making starch, and by cocoa manufacturers for grinding up and giving thickness or consistence to the dietetic beverage made with it. From the sago palms of Papua alcohol has been produced. Sago is got also from *Arenga*, *Caryota* (q.v.), *Cycas* (see CYCADS), and *Oreodoxa*.

The stem of the sago-palm is cut into lengths, split open, and the pith dug out and placed in a vessel with a sieve bottom. Water is applied to separate the flour and carry it into a second vessel, where it is soon deposited. The water is then run off, and the flour dried and put into little baskets made of sago-leaves. The produce of a tree ranges from 600 to 750 lb. Pearl-sago (which the Chinese of Malacca prepare and send to Singapore) is in small white spherical grains, varying in size from that of a poppy-seed to a grain of millet. There are several varieties which differ much in colour, some being white and others reddish brown like radish-seed. One kind of granulated sago from India has been introduced under the name of tapioca—the real Tapioca (q.v.) being a totally different substance. Sago is not entirely soluble in hot water like ordinary starch, and can therefore be employed in making puddings, &c., and in this way forms a valuable article of food, being cheap, light, nutritious, and easy of digestion.

Saguenay, a large river of Canada, falling into the estuary of the St Lawrence on the north side, about 115 miles below Quebec. It drains Lake St John, and flows in an almost straight line about 100 miles east-south-east. In its upper part, amid a wilderness of hills, it has numerous cataracts; but in the lower course, from the village of Chicoutimi down, it flows between precipitous cliffs, often from 500 to 1500 feet high, and is in many places 2 or 3 miles broad, while the depth varies from 17 to 170, and even, near the mouth, to 500 fathoms. The largest vessels can ascend to Ha Ha Bay, 10 miles S. of Chicoutimi; and during the summer great numbers of tourists visit the river, attracted by its magnificent scenery. On the upper course great possibilities of industrial development have been opened up with the construction of huge hydro-electric powerplants, notably at the Grande Décharge (Lake St John) and at Chute-à-Caron lower down.

Saguntum, a wealthy and warlike town of ancient Spain, in Hispania Tarraconensis, stood on an eminence near the mouth of the Pallantias. Founded, according to Strabo, by Greeks from Zacynthus, it became at an early period celebrated for its commerce, and attained to great wealth. But the one event in its history was its siege and destruction by the Carthaginians, under Hannibal, in 219 B.C. Having held out the greater part of a year against an army of 150,000 and a consummate general, the famished Saguntines concluded their resistance with an act of heroic self-sacrifice. Heaping their valuables into one vast pile, and placing their women and children around it, the men made their last sally against the enemy, and the women fired the pile they had prepared, cast themselves upon it with their children, and so found in the flames the fate their husbands met in battle. The destruction of Saguntum directly led to the second Punic war. The modern Valencian town of Sagunto, formerly known as Murviedro, from the Latin *muri veteres*, 'old walls,' occupies the site. Pop. 10,000.

Sahara (Arab. *Sāh'ra*), the vast desert region of North Africa, stretching from the Atlantic to the

Nile, and from the southern confines of Morocco, Algeria, Tunis, and Tripoli southwards to the vicinity of the Niger and Lake Chad. It is usual to regard the Libyan Desert, lying between Egypt, the central Sudan, and Tripoli, as a separate division. Both are, however, links in the chain of great deserts that girdle the Old World from the Atlantic coast across Africa, Arabia, Persia, Turkestan, and Mongolia to the Pacific. The Sahara has not been fully explored, but owing mainly to the work of French explorers, a roughly accurate knowledge of the region has been obtained. The surface is highly diversified, and attains in one place an altitude of fully 11,000 feet. The more outstanding features of the Sahara will now be considered.

From the neighbourhood of Cape Blanco in the west a vast bow or semicircle of sand-dunes stretches right round the northern side of the Sahara to Fezzan, skirting the Atlas Mountains and the mountains of Algeria. This long belt of sand-hills varies in width from 50 to 300 miles, and is known by the names Igidi and Erg, both meaning 'sand-hills.' The hills rise to 300 feet (in one place, it is said, to more than 1000 feet), though the average elevation is about 70 feet. They are composed of pure quartz sand, reddish-brown in colour; are stationary in character, though constantly changing their outward form and configuration; and lie as a rule in parallel chains, whose outward slopes are fairly gentle, but their inward slopes steep. Water is nearly always to be found below the surface in the hollows between the different chains of these sand-hills, and there a few dry plants struggle to maintain a miserable existence. South of Algeria, on the other side of the Erg, the country rises into the lofty plateau of Ahaggar (4000 feet), which fills all the middle parts of the Sahara. Its surface runs up into veritable mountains some 8000 feet high, which, incredible as it may seem, are covered with snow for three months in the year. On the south it apparently falls again towards the basins of the Niger and Lake Chad; nevertheless there are mountain-ranges along the eastern side reaching 11,200 feet in Emi Kussi, an extinct volcano, and 10,700 feet in Tusside, both in the Tibesti Mountains, and 9800 feet in Jebel Marra, in Darfur, and a mountain-knot in the oasis of Air (or Asben) reaches up to 6500 feet. Mountainous tracts occur also in the west, between Morocco and Timbuktu, but of inferior elevation (2000 feet). These mountainous parts embrace many deep valleys, most of them seamed with the dry beds of ancient rivers, as the Igharghar and the Mya, both going some hundreds of miles northwards towards the 'shats' (see below) of Algeria and Tunis. These valleys always yield an abundance of water, if not on the surface in the watercourses, then a short distance below it, and are mostly inhabited, and grazed by the cattle and sheep and camels of the natives. Another characteristic type of Saharan landscape is a low plateau strewn with rough blocks of granite and other rocks, and perfectly barren. These elevated stone-fields, called 'hammada'—the best known is the Hammada el-Homra, south-east of Ghadames and on the border of Tripoli—alternate with tracts of bare flat sand, with broad marshes, where water has stood and evaporated, leaving salt behind it, and with extensive tracts of small, polished, smoothly-rounded stones. In very many parts of the Sahara, especially in the valleys of the mountainous parts, in the recesses or bays at the foot of the hills, alongside the watercourses, and in the hollows of the sand-dunes, in all which localities water is wont to exist, there are oases—habitable, cultivable spots, islands of verdure in the midst of the ocean of desert. These oases occur in greatest number along the southern face of the Atlas and the Algerian moun-

tains, on the northern side of the Ahaggar plateau, and along certain definite lines, the chief of which extend between Murzuk in Fezzan and Lake Chad, the Igharghar and Sokoto by way of Air, the Igharghar and the bend of the Niger by way of Timissao, Morocco and Cairo by way of Tafilet, Tuat (Ainsalah), and Ghadames, and Morocco and Timbuktu by way of Tenduf and Taudeni. These lines of oases mark the great caravan-routes between the central Sudan and the Mediterranean.

A large portion of the Sahara, though not the whole, was undoubtedly under water at one time, probably in the Cretaceous period and earlier. Then the surface seems to have been in great part elevated, so that the water remained only in some lakes and in gulfs near the Mediterranean coast. The physical features that at present characterise the Sahara are undoubtedly due in their broad essentials to atmospheric, chemical, and even mechanical causes, and only in a very small degree to the action of water. Water has exercised scarcely any influence on a large scale here since the Tertiary period; and there can be no doubt that a process of desiccation, similar to that which is now going on in the Turkestan deserts, has been in operation throughout the whole of this region from the earliest historic time. The Romans had colonies or military posts a long way southwards, in what are now desert regions; and both Herodotus and Pliny tell us that the elephant, the rhinoceros, and the crocodile, all animals that only live near abundant supplies of water, were common throughout North Africa in their day. None of the Egyptian inscriptions or animal-sculptures represent the camel, nor do the Greek and Roman historians mention it either as being a denizen of North Africa. The camel is now the principal carrier across the Sahara, and must have been introduced since the beginning of the Christian era. The inference from these and other facts is that the process of desiccation has gone on more rapidly during the last 2000 years. The position of the sand-dunes is determined by the unchangeable configuration of the surface; the wind and chemical action do all the rest. The sand itself is simply the Saharan rocks (granite, gneiss, mica-schists, and cretaceous rocks) ground to dust. The great heat by day causes the rocks to expand; the great fall of the temperature at night, combined with the enormous evaporation that then takes place, makes them split and crack, and break into pieces; and the strong, often violent, winds use these fragments like files, or even sand-blasts, with which to grind to pieces other rocky fragments. The terrors of the desert sand-storm have been often described (see DESERT). Thick deposits of Saharan quartz sand-dust were discovered by the *Challenger* on the floor of the Atlantic a long way west of the African coast. The sand in the dunes is so dry that in several places the tread of a camel or a man will make the hill hum, or even thunder, as a vast quantity of it slips down to a lower level. The range of temperature is exceedingly great: often the thermometer falls from considerably more than 100° F. during the day to just below freezing-point at night. In the west of the Sahara the daily average is 85° in the shade in the month of May. Rain does fall in certain parts of the Sahara with more or less frequency; but in most districts on the average after intervals of two to five years. After a fall of rain it is not unusual to see the riverbeds in the mountainous regions filled with foaming torrents. But the atmosphere is so dry and clear that objects can be seen and sounds heard at a vast distance. The Mirage (q.v.) is no uncommon feature. Owing to this extreme dryness of the air, the Sahara, especially where it is reached by the prevailing west and north-west winds, is very healthy.

The plant-life is very rich in the oases, the date-palm, which has its home in these regions, being the principal ornament as well as the most valuable possession of these fertile spots. But fruit trees, as oranges, lemons, peaches, figs, pomegranates, &c., are also grown, with cereals, rice, durrha, millet, and such-like food crops. In the desert regions the plant-life is confined principally to tamarisks, prickly acacias and similar thorny shrubs and trees, salsolaceæ, and coarse grasses. The animals most commonly met with include the giraffe, two or three kinds of antelope, wild cattle, the wild ass, desert fox, jackal, hare, lion (only on the borders of the desert), ostrich, desert lark, crow, viper, python, locusts, flies. The people keep as domestic animals the camel, horse, ox, sheep, and goat. The Sahara separates the Ethiopian region from the Palæarctic. See GEOGRAPHICAL DISTRIBUTION.

Now a barrier, the Sahara was once a bridge. In Europe's Ice Age its climate was rainy. Before it became a desert it was a vast park-country, a high-road of migrations, human and other. Abundant traces of ancient human habitation have been found, some dating back to Neolithic times, others comparable in culture (whatever be their age) with the Palæolithic of Europe—Acheulean, Mousterian, Aurignacian, &c. Rock-sculptures are widespread of animals not now to be found in the Sahara. Their age and artists unknown. To-day the human inhabitants, who are estimated altogether at between 1,400,000 and 2,500,000, consist of Moors, Tuareg, Tibbu, Negroes, Arabs, and Jews. The Moors and Tuareg are both Berbers (q.v.); the former live between Morocco and Senegal, the latter in the middle, south of Algeria and Tunis. The Tuareg are great traders, and control the principal caravan-routes. The Tibbu, who number about 200,000, and are regarded as being ethnically intermediate between the Berbers and the Negroes, occupy the oases between Fezzan and Lake Chad. The Arabs of pure stock are very few; they have become mixed with the Berbers and the Negroes. With the exception of some tribes on the borderland of the Sudan, all the dwellers in the Sahara are Mohammedans. In 1890 Cardinal Lavigerie, Archbishop of Carthage (Tunis), founded a Christian missionary order, called the Armed Brothers of the Sahara.

Within the Sahara are included parts of Tripoli, Tunis, Algeria, Morocco, Mauritania, Senegal, and French Sudan. Politically France is easily the predominant power, her aim of uniting her possessions on the Senegal and on the Niger with Algeria and Tunis having been accomplished by the agreement of 1890 between Great Britain and France, and others by which it has been modified, whereby the whole of the Sahara, except parts of the west coast and the extreme east (the Libyan Desert and the Nile basin), was acknowledged to be within the French sphere of influence. On the west coast Río de Oro belongs to Spain, and in 1912 Ifni was recognised as Spanish. By the conquest of Tripoli in 1911-12 Italy gained a footing in the north-east.

The most valuable products of the Sahara are dates and salt, the latter collected on the salt pans, and made from the rock-salt of Taudeni in the west, and of Kawar (Bilma) in the east; the remaining products are horses, soda, and a little saltpetre. For many long years a very active trade was carried on by caravans, between the central Sudan and Niger countries and the Mediterranean states, the ivory, ostrich-feathers, gums, spices, musk, hides, gold dust, indigo, cotton, palm-oil, shea-butter, kola-nuts, ground-nuts, silver, dates, salt, and alum of the interior lands being exchanged for the manufactured wares (textiles, weapons, gunpowder, &c.) of European countries; but with the opening up of

means of communication to the Gulf of Guinea the flow of commerce has suffered grievous deflection from the arduous and venturesome trans-Saharan oasis routes. The opening up of the Sahara, however, by the construction of a trans-Saharan railway has long been a project of the French, and many schemes have been advanced. The possibility of a railroad from the Atlantic to the Red Sea has even been conceived, but generally it has been proposed to link the coast-lands of northern Africa, first with the central Sahara to the west of the Ahaggar Mountains, and then with central Africa in the direction of Lake Chad, and with western Africa in the direction of Timbuktu and the Niger. At present, from Philippeville to Tuggurt, and from Oran to Colomb Bechar, short lines capable of extension into trans-Saharan railways run into the desert from the Mediterranean coast. From the town of Tripoli to Gharian a line has been built by the Italians, part of a railway which it is proposed to construct as far as Murzuk. In the south-west Kayes, at the head of navigation on the Senegal, has been connected with the Niger.

The possibility of reclaiming the Sahara from the arid desolation to which such a vast proportion of its surface is now abandoned has been subject of much speculation. That no amelioration can be effected in the great bulk of its area is pretty well agreed; and if the desiccation is principally due, as has been maintained, to continental changes of elevation, it is pretty certain that nothing can be done. But the destruction of forests on the northern mountain-slopes is believed to be a co-operating cause. If so—for the fact is doubtful—this could be remedied. Two other methods of reclamation have, however, been proposed, the first that of flooding from the sea, the second that of irrigation by means of Artesian Wells (q.v.); effect has only been given to the second, but then with admirable success. (1) Westward from the Gulf of Gabes stretches for 250 miles a chain of salt lakes (*shats*) right along the south of Tunis and Algeria to the meridian of Biskra. Into these Captain Roudaire proposed (1874) to let the waters of the Gulf of Gabes by cutting through a ridge, 13 miles wide and 150 feet high, and so making an inland sea of some 3100 sq. m. in area with an average depth of close upon 80 feet. The scheme is, in point of engineering, practicable; but it is questionable whether it would accomplish the desired effect of modifying the climate and soil of the surrounding regions any more than the Sea of Aral or the Caspian does. At all events the proposal has been allowed to drop. In 1877 Donald Mackenzie propounded the idea of flooding the western Sahara, the district called El Juf, by letting in the waters of the Atlantic; but the German traveller Lenz ascertained that El Juf was not a vast depression, but only a small valley. (2) The method of reclaiming the desert by means of artesian wells was apparently known to the ancients. Since 1856 it has been prosecuted by the French with great energy. By 1890 they had made a string of these wells from the cultivated districts of Algeria as far as Tuggurt, on the edge of the desert, south of Biskra. Water is generally found at depths varying from 10 to 300 feet, and in great abundance. Wherever these wells have been bored the date-palm groves and the orchards have increased greatly in extent, and the population has become much denser.

See reports of French explorers in the Proceedings of the Paris Geographical Society; Zittel, *Die Sahara, ihre physische und geologische Beschaffenheit* (Kassel, 1884); Nachtigal, *Sahara und Sudan* (3 vols. 1879-89); Barth, *Travels in North and Central Africa* (5 vols. 1857-58); Lenz, *Timbuktu* (1884); Rohlf, *Quer durch Afrika* (1874), &c.; Téhichet, *The Deserts of Africa and Asia* (Brit. Assoc. Reports, 1882); Rolland, *Géologie du*

Sahara (1891); various scientific works by Foureau (1892-1905); Schrimmer, *Le Sahara* (1893); Vischer, *Across the Sahara from Tripoli to Bornu* (1910); *Documents scientifiques de la mission Tilho* (1910-11); Haywood, *Through Timbuctu and Across the Great Sahara* (1912); Cana in the *Geographical Journal* (November, 1915); Chudeau, 'L'hydrographie ancienne du Sahara' in *Revue Scientifique* (1921); French books of travel by Largeau (1882) and Augiéras (1919); Donald Mackenzie, *Flooding Sahara* (1877); and for the railway schemes, books by Courcelle-Seneuil (1904) and Leroy-Beaulieu (1904), and articles in *L'Afrique Française* (1913 and 1914) and in *La Géographie* (1914).

Saharanpur, a town of British India, United Provinces, is situated 125 miles by rail N. of Delhi. It has an old Rohilla fort, a handsome new mosque, St Thomas's Church (1858), numerous administrative offices, and government botanical gardens (1817). It was formerly notorious for its malaria, but has vastly improved in this respect since a marsh to the east of the town has been drained. Pop. (1872) 43,844; (1881) 59,194; (1901) 66,254; (1921) 62,261.—The district has an area of 2133 sq. m. and a pop. (1921) of 937,471.

Sahib (Arab., 'master,' 'lord'), the usual title in India and Persia of a respectable European, equivalent to Mr, Sir, &c. *Sahibah* is the correct feminine form, but the hybrids mem- and madam-sahib are used.

Saida. See SIDON.

Sa'id Pasha. See EGYPT.

Saiga. See ANTELOPES.

Saigon, capital of French Cochinchina, stands on the river Saigon, a branch of the delta of the Mekhong, about 60 miles from the sea by river. The present town has grown up under French influences since 1861, and with its fine streets and squares and boulevards, is one of the handsomest cities of the East. It has a magnificent government house, a governor's palace, a cathedral (1877), a fine town hall, a municipal theatre, barracks, military hospital, arsenal, institutions of higher learning, administrative offices, and a botanical and zoological garden. Its population, consisting principally of Chinese, Annamese, and French, amounts to 109,000. But the business suburb of Cholon, 4 miles south-west, has grown from a town of 27,600 in 1885 to one of some 234,000 inhabitants, over one-half Chinese. Saigon (properly *Gia-dinh*) has fine docking accommodation, being accessible to the largest vessels, and is the most important port between Singapore and Hong-kong. It exports enormous quantities of rice, chiefly to China, the Philippines, Japan, and the Straits Settlements. The remaining exports include fish, salt, cotton, wood, beans, and hides. Previous to the French occupation (1861) Saigon, although only a collection of common Siamese huts, was the capital of the province of Lower Cochinchina.

Sail, a sheet made of canvas or other suitable material, which is spread to the wind to cause a boat or ship to move through the water. Flax and cotton are the materials of which sail-cloth is generally made; and mixtures of these with other materials are also used. Amongst primitive peoples matting and tissues of various vegetable fibres are used. Sail canvas is woven in 'cloths' from 12 to 36 inches in width, each piece, called a 'bolt,' being 40 yards in length. There are many different qualities and weights. The sail is built up of these 'cloths' sewn together with a flat-lapped seam. Certain parts are doubled for strength, and the sail is bound round the edges with a bolt rope. Sails are spread by masts, yards, booms, gaffs, ropes, and combinations of these. They may be of various shapes and sizes, according to the carrying power of the vessel. A sail acts with the greatest power

when the wind is well aft of the beam. The action of the wind on a sail set at an angle to it is a good example of what is known in mechanics as 'the resolution of forces.' Let TD be a ship, PAS its sail, WA the direction of the wind, and let the length of WA represent the pressure of the wind on the sail. WA can be resolved into AB perpendicular to the sail, and BW parallel to it. The latter has no effect in pressing on the sail; AB is the effective pressure on the sail. Let BA be resolved into CA and BC, the former, CA, acting in the direction of the length of the vessel, and the latter perpendicular to it, or in the direction of the breadth. CA is the pressure that moves the vessel forward, the other, BC, tends to make it move sideways. From the form of the vessel, however, this force, BC, produces comparatively little lateral motion; any that it does is called *leeway*.

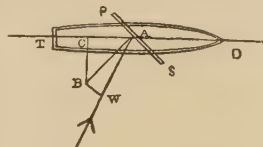


Fig. 1.

Sails, according as they are set parallel to the keel, or across the ship, are *fore-and-aft* sails, or *square* sails. But those which are set across the ship are not exactly square in shape; and many fore-and-aft sails are four-sided; *stay-sails* are triangular, and are suspended on the stays which support the masts upon the foreside—from the jib-

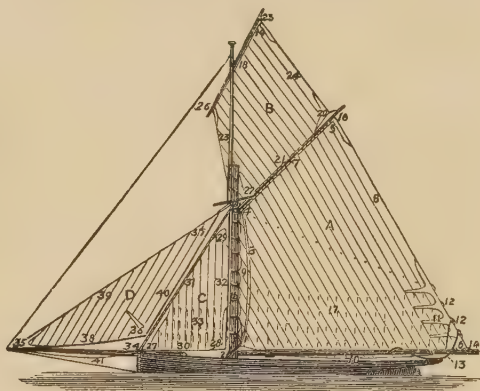


Fig. 2.—Sails of a Cutter, with the names of the different parts:

MAINSAIL, A.—1, main-tack; 2, main-tack tackle; 3, main-tack tricing-line; 4, throat; 5, peak; 6, clew; 7, head; 8, leach; 9, luff; 10, foot; 11, strengthening pieces; 12, cringles; 13, reef pennants rove; 14, main clew lashing; 15, mast hoops and seizings; 16, peak earing; 17, reef points.

GAFF-TOPSAIL, B.—18, head; 19, peak; 20, clew; 21, foot; 22, tack; 23, luff; 24, leach; 25, peak earing; 26, head earing.

FORESAIL, C.—27, fore-tack; 28, clew; 29, head; 30, foot; 31, luff; 32, leach; 33, reef points; 34, fore-tack tackle.

JIB, D.—35, tack, hooked on to the traveller; 36, clew; 37, head; 38, foot; 39, luff; 40, leach; 41, inhaul of the traveller.

boom, bowsprit, and deck in the case of the foremast, and from the deck in the case of the mainmast.

Large sailing-vessels are usually propelled by a combination of fore-and-aft and square sails; the names and positions of these are illustrated at the article *SHIPBUILDING*. The Schooner (q.v.) has fore-and-aft sails on both masts, though many schooners carry square topsails. The two-masted Brig (q.v.) is mainly square-rigged; and the Brigantine is a cross between brig and schooner. The Cutter (q.v.) is the typical fore-and-aft one-mast vessel, and the names of the several sails, and the technical terms for the parts of the sails, will be gathered from the accompanying illustration (fig. 2).

A Sloop is supposed to have a fixed bowsprit, with the jib set on a stay, whereas that of the cutter has a running one, with the jib set flying. A Yawl has a foremast rigged exactly like a cutter, but has a small mizzen-mast carrying a *spanker* or *driver*.

Some other types of small sails may be noted. The *lug-sail* is four-sided, hung from a yard fastened obliquely to the mast. Luggers may be



Fig. 3.—Lug-sail.

one, two, or three-masted, and vary much in size. The *shoulder-of-mutton sail* is triangular, set on the aft side of a boat's mast. The *sprit-sail* is quadrangular, stretched from the mast, not by a gaff along its top, but by a sprit extending from near the foot of the mast diagonally to the peak of the sail. The London barge has its heavy mainsail partly supported by a sprit, and there is a

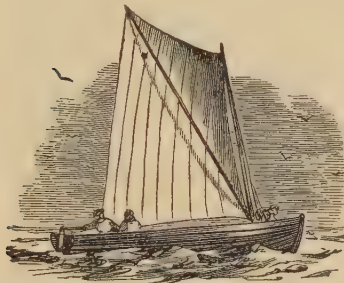


Fig. 4.—Sprit-sail.

spanker on a small mizzen-mast. The *spinnaker* is a large triangular racing sail carried by yachts when running before the wind, and extended by a boom on the side opposite the mainsail. The *lateen* sail, much used in the Mediterranean, is a triangular sail stretched from a long yard attached to a short mast, as shown in fig. 5. The *Felucca* is a two-masted



Fig. 5.—Dahabiyah.

lateen-sailed boat; the sails of the Egyptian Dahabiyah and of the Arab Dhow are of the same type. A Xebec has three masts, and carries a combination of lateen and square sails. The South

Sea Proa, the Chinese Junk, and other local rigs have many peculiarities in their sails. Naval rigs are illustrated at NAVY. See also SHIPBUILDING,

YACHT; and for Sailing or Navigation, see GREAT

CIRCLE SAILING, LATITUDE AND LONGITUDE, MERIDIAN, SEXTANT, STEERING, &c.

Saima, LAKE. See FINLAND.

Sainfoin (*Onobrychis sativa*), a plant of the family Leguminosæ, sub-family Papilionaceæ, of a genus nearly allied to *Hedysarum* (see FRENCH HONEYSUCKLE), but having one-seeded pods which are marked with wrinkles or pits, and are more or less prickly toothed at the margin. It is a spreading perennial, about two or three feet high, with leaves of nine to fifteen smooth acute leaflets, and spikes of beautiful flesh-coloured flowers, striated with rose-red, on long stalks. It is a native of the continent of Europe and of the south of England, and is much cultivated as a fodder-plant in dry, and particularly in calcareous soils, to which it is admirably adapted. Its cultivation was introduced into England in 1651; and before the introduction of turnip-husbandry the sheep-farmers of the chalk districts depended almost entirely upon it, as they still do to a large degree. It is, however, a very local crop, being scarcely cultivated on any but the most calcareous soils, where scarcely anything else is equal to it, although it has been found to succeed well on any soil sufficiently dry. There is no more nutritious fodder than sainfoin, whether for sheep, oxen, or horses. Even the dry stems of a crop which has produced seed are readily consumed by cattle, if cut into small pieces. Sainfoin is a deep-rooted plant and sometimes endures for ten, or even fifteen years on the same land—more generally only for four to seven years; and in the eastern counties of England it is often sown instead of clover on light and somewhat calcareous sands and sandy loams, and the ground is ploughed again in two or three years.—The name *sain-foin* probably means 'wholesome hay' (from Lat. *sanus*), and not, as is often assumed, a shortened form for *saint-foin* ('holy hay').



Sainfoin (*Onobrychis sativa*).
(Stebler and Schröter, Best Forage Plants.)

Saint, a name applied in the New Testament to the members of the Christian community generally, but restricted by ecclesiastical usage from very early times to those who have been specially remarkable for their personal virtues and their eminent services to the cause of religion. In the ages of persecution the quality which most of all challenged the admiration and reverence of the faithful was naturally constancy in the profession and the defence of the Christian faith; and the honours of the martyrs, even before the age of persecution had passed, were extended to confessors, and eventually to all who died in the odour of sanctity, and especially to those who also obtained the reputation of performing miracles. In general, however, the saints of the Catholic Church are distributed into several classes, chiefly in relation to the special character of the ecclesiastical offices

appropriated to their honour. Thus we find enumerated (1) Apostles and Evangelists; (2) Martyrs; (3) Confessors, a name applied primitively to those who had courageously undergone imprisonment or pains for the faith without gaining the final crown of martyrdom, but in later times understood of all who, not being martyrs, were eminent for sanctity of life; (4) Doctors or saints eminent for sacred learning; (5) Virgins; (6) Matrons and Widows. Anciently the title of Saint was bestowed upon an individual by the members of the particular Christian community to which he belonged, or to which his merits were most familiar. In the earliest times, however, the letters of St Cyprian show that caution was observed by the bishops to guard against the recognition of undeserving persons. It was not, however, till the 12th century that the pope reserved to himself the exclusive right to add to the roll of saints, or that a regular form of procedure was established in the Roman courts for the purpose of testing and of solemnly pronouncing upon the title of persons, who had died with a reputation for sanctity, to the public *cultus* of the church. A saint, according to the received interpretation, is one who has exercised the three theological virtues of faith, hope, and charity, and the cardinal virtues, prudence, justice, fortitude, *in a heroic degree*, and has persevered in this exercise until death. Sanctity may exist without miracles, as, according to the commonly alleged instance, there is no record of John the Baptist having wrought miracles; and, on the other hand, miracles may be performed by heretics or sinners. Nevertheless, by the existing discipline of the Roman Church, before a decree of Canonisation (q.v.) can be obtained, the rule requires evidence of such miracles as an expected fruit of heroic faith and as a confirmatory sign of sanctity after proof has been given of the heroic virtues.

It is difficult to estimate with anything approaching to exactness the number of saints who have received *cultus* as such in the various churches of Christendom from the earliest times. Of many almost all record has perished, except their names commemorated in some ancient calendar or preserved in the dedication of some church or sacred locality. The fullest list is that to be found in the index or general table in the sixty-first volume of the colossal work of the Bollandists (see ACTA SANCTORUM). From these tables it appears that by 1883 biographies or notices had been given of about 17,000 saints in the preceding sixty volumes—that is, up to the end of October; and further, that biographies or notices of some 3500 more remained to be given in the concluding volumes of the work then, as still, in process of completion. But the authority, however great, which is due to these researches is no more than the authority of learned men. The catalogue which possesses the highest ecclesiastical authority, and which has the character of a liturgical or church service-book, is that of the *Martyrologium Romanum*, revised by order of Gregory XIII. in 1586 by Baronius (q.v.), and frequently supplemented since. The breviary prescribes that the 'Martyrology' be read as part of the office of Prime wherever the office is solemnly sung in choir; and it is the custom, moreover, in religious communities to read the 'Martyrology' for the day publicly in the refectory. The 'Martyrology' is not, as its name might suggest, confined to the commemoration of martyrs only. It comprises the saints of every class to whom the Roman Church gives authentic recognition, and names some 2700 in all, including about twenty saints of the Old Testament, arranged as in a calendar according to the days of their celebration; while the recital for each day terminates with the clause, 'And in

other places of very many other holy martyrs, confessors, and holy virgins.' It is plain that of this multitude only a select few can have festivals assigned to them in the ecclesiastical year, or proper offices in the breviary or missal.

About two-thirds of every month in the Roman calendar is occupied with special saints' days, though, on some of these, minor saints are commemorated by a collect or prayer. But the Roman calendar is modified or supplemented in a greater or less measure in every national church, every diocese, and every religious order or community. Thus to the Roman breviary in England is added a supplement containing the offices of the English saints who sometimes displace or transfer to another day the saints of the Roman calendar. The fixed calendar of saints' days in use in various Catholic countries or communities thus varies considerably. At the end of the 1860 edition of Canon Hussenbeth's *The Emblems of Saints* will be found printed in parallel columns for purposes of convenient comparison eight such calendars—the Roman calendar, two old English calendars, the Scottish, the French, the Spanish, the German, and the Greek. It should further be noted that the actual calendar of saints' days in use in any given year can never quite correspond with the fixed calendar of this or that diocese or community. The great movable feasts determined by the annually varying date of Easter constantly disturb the order of the calendar, and lead to transferring the observance of a saint's day to some proximate *feria* or vacant day, and in some cases to extinguishing it altogether. The complicated rules which regulate these changes are based upon the different ranks accorded to the feasts—doubles of the first class, doubles of the second class, greater doubles, doubles, semi-doubles, and simples—in their relations to one another and to the Sundays and movable feasts which also have their various ranks.

Thus, to take an example of these variations at random, the 26th of May is the festival of St Philip Neri in the Roman calendar, but in England his place is taken by St Augustine of Canterbury, while St Philip is regularly transferred to the following day. On the other hand, in the churches of the Congregation of the Oratory the feast of their founder keeps his own day even in England, and St Augustine is postponed to 6th September. Again, the 26th of May is specially liable to be invaded by the occurrence of movable festivals. Thus, in 1877 the English churches had to transfer St Augustine to the 30th of the month, and St Philip Neri to the 23d of June. The result is that a special local 'ordo' is annually printed for the use of the clergy, and beyond the fixed calendar there is the ecclesiastical calendar corresponding to the clerical 'ordo' for the year.

In Christian art representations of the saints are often marked by the nimbus, aureole, or glory (see NIMBUS), and many of the saints are pictured as accompanied by emblems, by which they could readily be recognised. Apart from symbols which only typified the person indicated (as a shepherd for Christ, a gourd or a whale for Jonah), the figure of the saint is given with an added emblem. Thus the four evangelists were symbolised by four rivers, the four rivers of paradise. The adoption of the four living creatures (Rev. iv. 6) for the same purpose does not appear to have taken place till the 5th century; but soon it became a constant practice to represent St Matthew by or with the man, Mark with the lion, Luke with the ox, John with the eagle. The twelve apostles are depicted as twelve men, twelve sheep, or twelve doves. St Peter, for obvious reasons, is represented with the keys or with a fish; many of the saints with

the instruments by which they were martyred—St Paul with a sword; St Andrew with a Cross (q.v.); St Simon with a saw; St James the Less with a club; St Matthew with a lance; St Catharine with a wheel; St Lawrence with a gridiron; others with objects connected with their history or in some other way—St George with a dragon; St Matthew with a purse. St James the Elder is figured as a pilgrim. Between 4000 and 5000 such emblems are given in Maurice and Wilfred Drake's *Saints and their Emblems* (1916). A martyr who had a special interest in a place was called its patron (See PATRON) as early as the 4th century; the possession of a relic was enough to constitute the saint a patron of its possessors. His being born in a place or having died there was a good reason for choosing the patron saint. The angels Michael, Gabriel, and Raphael were chosen patrons of churches as early as the 6th century. Trades and professions had their patrons, and every disease a saint gifted for its cure. The patron saint defended his votary, heard his prayer, helped him in difficulty, and even protected him at the day of judgment from the consequences of his sin. Husenbeth's work, already mentioned, gives a list of patron saints of trades, professions, countries, and cities. Among well-known patron saints were St George of England, St Andrew of Scotland, St Patrick of Ireland, St David of Wales, St Denis of France, St James of Spain, St Nicholas of Russia, St Stephen of Hungary, St Mark of Venice. There are curious instances, especially in the 15th century, of armorial bearings assigned to certain English and other saints. The Catholic doctrine of invocation of the saints is treated at PRAYER; at RELICS the honour paid to relics of saints and martyrs is dealt with. See also ROMAN CATHOLIC CHURCH, and SYMBOL.

Besides the *Acta Sanctorum* of the Bollandists and *Analecta Bollandiana* (1882, et seq.) their annual review, see Anna Jameson's *Sacred and Legendary Art* (1848, new ed. 1896); Alban Butler, *Lives of the Fathers, Martyrs, and other Saints* (1756-59), and later editions, including the corrected and amplified edition begun in 1926 by H. Thurston, S.J.; Baring-Gould, *Lives of the Saints* (15 vols. 1872-77, and later enlarged editions), and with Fisher, *Lives of the British [Celtic] Saints* (4 vols. 1907-13); *Lives of the English Saints* (1844-45), edited by Cardinal Newman; C. A. Jones, *Saints of the Prayer-book* (1885); R. Owen, *Sanctorale Catholicum* (1880); R. M. Stanton, *A Menology of England and Wales* (1888), which includes the English martyrs of the 16th and 17th centuries beatified by Pope Leo XIII.; for Irish saints, O'Hanlon (1877) and Whitley Stokes (1888); for Scottish, Forbes (1872) and Pinkerton (1789, new ed. 1889, translated from the Latin by W. M. Metcalfe, 1895); for Welsh, Rees (1853).

St Affrique, a town of the French department of Aveyron, 56 miles NW. of Montpellier, stands in a beautiful valley in the midst of meadows, orchards, and vineyards. There is a considerable trade in wool and in the celebrated Roquefort cheese (see ROQUEFORT). Pop. 6000.

St Albans, a city of Hertfordshire, 20 miles NNW. of London, on the top and northern slope of an eminence washed by the Ver, one of the chief feeders of the Colne, across which stood Verulamium. That important Roman station is perhaps identical with the fortress of Cassivellaunus, destroyed in 54 B.C. by Cæsar, and was taken by Boadicea in 61 A.D. In honour of the protomartyr Alban, said to have been beheaded here about 303 for sheltering the Christian priest Amphibalus, Offa, king of Mercia, in 793 founded a great Benedictine abbey, which from Pope Adrian IV. (q.v., born in the neighbourhood) obtained precedence over all other abbeys in England. Rebuilt after 1077 with flat Roman tiles from Verulam by Abbot Paul of Caen, and dedicated in 1115 in the presence of

Henry I., the abbey church, in spite of successive alterations (Early English, Decorated, Perpendicular), is still 'the vastest and sternest' of early Norman structures, its exterior length (548 feet) being second only to Winchester's, whilst the transepts measure 189 feet across, and the massive central tower is 144 feet high. It was made the cathedral of a new diocese in 1877, and in 1871-85 was very thoroughly (much too thoroughly, many think) 'restored' by Sir Gilbert Scott and Lord Grimthorpe (then Sir Edmund Beckett). Special features of interest are the substructure of the shrine of St Alban (its 2000 shattered fragments pieced together), the tombs of Duke Humphrey of Gloucester and 'Sir John Mandeville', the superb presbytery reredos, and Abbot Ramryge's chantry. Of the forty abbots down to the Dissolution in 1539 the greatest was Cardinal Wolsey; Richard of Wallingford, called the 'father of trigonometry in England,' was abbot in 1326-35; and among the monks were Matthew Paris, Roger Wendover, Rishanger, and the other compilers of the *Chronica Monasterii S. Albani*, which, like the *Treatise of Dame Juliana Berners* (q.v.), was printed here during Abbot Wallingford's abbacy, and which has been edited for the Rolls series (25 vols. 1863-91). The third printing-press in England was established here in 1480 by an unknown printer called 'The Schoolmaster Printer.' The abbey gatehouse was in 1869 converted from a gaol to the purposes of King Edward VI.'s grammar-school, which till then had occupied the Lady Chapel; else, nothing remains of the monastic buildings. In St Michael's Church is Francis Bacon's monument; the 15th-century clock-tower was restored in 1864; and a drinking-fountain marks the site of an Eleanor cross, demolished in 1702. There are almshouses founded by the famous Duchess of Marlborough, a town-hall (1832), a cattle market (new premises 1926), and a public library (1880). The industries include straw-plaiting, brewing, boot and brush making, printing, and silk-manufacture. St Albans, which was disfranchised for bribery in 1852, was incorporated by Edward VI. in 1553, and had its municipal boundary extended in 1879 and again in 1913. It was the scene of two battles in the Wars of the Roses (q.v.)—the first, on 22d May 1455, a victory for the Yorkists; the second, on 17th February 1461, for the Lancastrians. Pop. (1851) 7000; (1901) 16,019; (1921) 25,593. Area of city, 2695 acres.

See Ashdown, *St Albans, Historical and Picturesque* (1894); Page, *St Albans* ('Story of the English towns') (1920); and works on the cathedral by Newcome (1793), Comyns Carr (1877), Neale (1878), Perkins (1903), Galbraith (1911), Williams (1917).

St Amand-les-Eaux, a town of France, dept. Nord, 8 miles NW. of Valenciennes, with hot sulphur-springs and a ruined abbey. Iron-founding, porcelain, and hosiery are the industries. Pop. 14,000.

St Amand Mont Rond, a town of France, dept. Cher, on the river Cher, 25 miles SSE. of Bourges. Important fairs are held here. Pop. 9000.

St Andrews, one of the smaller towns of Scotland, but no mean city in age, importance, or historical interest, stands on a rocky plateau at the edge of St Andrews Bay, Fife, and is 31 miles NNE. of Edinburgh. From the number and nature of the remains of ancient burial found in and around the city there can be no doubt that there was a settlement here in early prehistoric times. The monkish legend, long discredited, assigned its ecclesiastical origin to St Regulus (q.v.) or Rule, who, warned in a dream, brought certain bones of St Andrew from Patras in the 4th century, and was

wrecked at Muckros, afterwards called Kilrimont, now St Andrews. There is, however, reason for believing not only that those relics were brought in the 8th century, but that, before the end of the 6th, Cainnech or Kenneth, the patron saint of Kilkenney, had founded a monastery at Rig-Monadh, the Royal Mount, and that thus arose the name of Kilrimont. Early in the 10th century it seemingly became the seat of the 'Ardepscop Albain,' the high bishop of Alban; and in Malcolm Canmore's time he was known as 'the Bishop of the Scots,' a title which was retained until at least 1309. By a bull of Sixtus IV., St Andrews was erected into an archiepiscopal and metropolitan see in 1472. The Augustinian Priory, founded in 1144, was the richest and greatest of all the religious houses of Scotland. The Cathedral, founded in or about 1160 in presence of Malcolm IV., and consecrated in 1318 in presence of Robert the Bruce, was stripped of its images and ornaments in 1559, and afterwards fell into ruin. The extreme length inside is 355 feet, but at one time it had been several bays longer. The Bishop's Palace or Castle, first built in 1200, was frequently demolished and rebuilt, and is now a ruin. George Wishart and other martyrs were confined in its 'bottle-dungeon,' and Cardinal Beaton was slain within its massive walls. None of the ruins is less imposing but few are more interesting than the foundations on the Kirkhill—the site of the Celtic Church. St Rule's Tower has probably occasioned more discussion and perplexed more archaeologists than any other building in Scotland. Its arches, as well as that of its roofless chapel, approach the horseshoe in form. Most competent judges now assign it to the second quarter of the 12th century. The Parish Church, which was almost entirely rebuilt in 1798, and beautifully restored 1907–1909, was founded in 1412. Its predecessor, which stood near the cathedral, was built three centuries earlier. Of the Black Friars Monastery a portion of the church remains; but of the Grey Friars nothing save the well and part of the enclosing wall. The schools of St Andrews were noted in 1120; but the University, the first in Scotland, only dates from 1411. St Salvador's College was founded in 1455, St Leonard's in 1512, and St Mary's in 1537. St Salvador's and St Leonard's were united in 1747. The College of Dundee was affiliated in 1897. The average attendance of students, including those at Dundee, is about 680, and of these many are women, who have been admitted since 1892. The library contains over 150,000 volumes, and there is a good museum. The Parish Church of St Leonard's was deserted in 1760, and the congregation, after worshipping in St Salvador's Chapel until 1904, occupied their new church at the West End. Of Celtic stones the largest local collection in Scotland is housed in the Cathedral Museum, which was opened in 1909. The Madras College, founded and endowed by Dr Bell, has been remodelled, and in 1888 was placed under a new governing body. The town was erected into a free burgh between 1144 and 1153. In those days the inhabitants were described as Scottish, French, Flemish, and English. In 1526 it was reckoned one of the six 'principale townis of merchandice of this realm'; but it has now almost no trade. The small harbour is little used. For a number of years the fishers were increasing rapidly, but the steam-trawlers have proved too much for them. The manufacture of golf-clubs and balls is naturally a thriving industry, St Andrews being known all over the world as the headquarters of golf. There are four long courses and six short ones. It is a popular watering-place and summer-resort. The St Andrews group of burghs is now merged in East Fife. Pop. (1801) 3263; (1891) 6853; (1921) 9336.

See, besides the *Liber Cartarum Prioratus Sancti Andree* (Bann. Club, 1841), the *Register of the Kirk Session* (Scot. Hist. Soc., 1889–90); Hay Fleming's *Martyrs and Confessors of St Andrews* (1887) and *Cathedral Museum* (1927); Maitland Anderson's *Historical Sketch of the University* (1878), *Matriculation Roll of the University: 1747–1897* (1905), and *Early Records of the University* (Scot. Hist. Soc., 1926); Herkless and Hannay's *College of St Leonard* (1905) and *The Archbishops of St Andrews* (5 vols. 1907–15); works by Martine (*Reliquie*, 1797), Grierson (1807), Lyon (1843), Roger (1849), A. Lang (1894), and Eric S. Robertson (1923).

Saint Arnaud, JACQUES LEROY DE, a French marshal, was born at Bordeaux, 20th August 1796, and became a soldier. He fought for the Greeks in 1822–26, but made his reputation in Algeria. In 1847 he was made a general of brigade; and in the early part of 1851 he carried on a bloody but successful warfare with the Kabyles. Louis Napoleon, plotting the overthrow of the republic, was at this time on the lookout for resolute and unscrupulous accomplices; and he recalled General Saint Arnaud and appointed him to the command of the second division of the city forces. On 26th October Saint Arnaud became war minister, and took an active part in the arrangements for the *coup d'état* of 2d December, and in the subsequent massacres at the barricades. For these services he was rewarded with the marshal's baton. On the breaking out of the Crimean war in 1854 he was entrusted with the command of the French forces, and co-operated with Lord Raglan in the battle of the Alma, 20th September. But nine days afterwards he died on board ship, on his way home to France. See his *Lettres* (ed. by his brother, 2 vols. 1864).

St Asaph, a little cathedral city of Flintshire, North Wales, on an eminence between the rivers Elwy and Clwyd, 6 miles SSE. of Rhyl. The cathedral, rebuilt after 1284, is a plain, cruciform, red sandstone structure, mainly decorated in style, 182 feet long, with a massive central tower 93 feet high, and fine oak stalls. It has a collection of early Bibles and Prayer-books, and was restored by Scott in 1867–75. St Kentigern (q.v.) is said to have founded about 560 a bishopric at Llanelwly, renamed St Asaph after his favourite disciple. Among bishops have been Reginald Pecock; W. Morgan, the first translator of the Bible into Welsh; Isaac Barrow the elder, on whose monument is a request for prayers for his soul; W. Lloyd, one of the Seven Bishops; Thomas Tanner; and S. Horsley. In 1920 Dr Edwards, Bishop of St Asaph, was enthroned as the first archbishop of the newly constituted Church in Wales. St Asaph has a grammar-school, founded about 1600, and rebuilt in 1882. Pop. 1800.

St Augustine, an ancient Spanish town on the east coast of Florida, now the capital of St John's county, stands on Matanzas Sound, 2 miles from the Atlantic and 37 miles by rail SSE. of Jacksonville. It was founded in 1565, and is the oldest town in the United States. Its mild and equable climate renders it a favourite winter-resort for invalids. It is a Roman Catholic bishop's see. Pop. 6000.

St Austell, a town of Cornwall, 14 miles NE. of Truro and 1½ NW. of the head of St Austell Bay. It is the centre of the kaolin or china-clay industry, and has a church (13th to 16th century), restored in 1870. Pop. 3000.

St Bartholomew, or ST BARTHÉLEMY, a French West Indian island, 190 miles E. of Porto Rico. Area, 8 sq. m.; pop. 3000. The treeless surface rises to 1003 feet; the climate is very dry. French from 1648 till 1784, the island then was Swedish till 1877, when it was bought back by France for £16,000.

St Bees, a coast village of Cumberland, 4½ miles S. of Whitehaven by rail and 3 SE. of St Bees Head (300 feet). A nunnery founded about 656 A.D. by an Irish princess, St Begha, appears to have been destroyed by the Danes, and to have been reconstituted as a Benedictine priory in the reign of Henry I. St Bees Theological College, established in 1816 by Dr Law, then Bishop of Chester, was closed in 1896. Near the church is a grammar-school founded by Archbishop Grindal in 1587, and reconstituted in 1881.

St Benoit, a town on the east coast of the island of Réunion; pop. 11,000.

St Bernard, the name of two mountain-passes in the Alps. (1) **GREAT ST BERNARD** is on the road between Aosta in Piedmont and Martigny in the Swiss canton of Valais, and is 8120 feet above sea-level. The pass was used by the Celts and Romans, and in the Middle Ages was much frequented by pilgrims and clerics journeying to Rome. In 1800 Napoleon entered Italy with 40,000 troops by the St Bernard. Almost on the crest of the pass stands the celebrated hospice founded in the 10th century by St Bernard de Menthon for the benefit of pilgrims. The hospice is connected with a station in the valley below, from which the Augustinian monks above are warned by telephone when travellers are on their way up the mountain. The monks are assisted by lay-brothers; their work is, with the aid of large dogs, to rescue travellers who are in danger of perishing from the snow and cold. The dogs used are the short-coated variety of the 'St Bernard dog' (see next article). The rigorous cold and the difficulty of breathing the rarefied air frequently do permanent injury to the health of the monks in charge. (2) **LITTLE ST BERNARD**, SW. of the above in the Graian Alps, connects the valley of Aosta with that of Tarentaise in Savoy. By this pass Hannibal is thought by some to have led his forces into Italy. (See ALPS.) It too has a hospice, 7143 feet above the sea.

St Bernard, a breed of dogs which derives its name from the hospice of St Bernard, where it was first introduced for the purpose of finding the pass across the mountain in snow. Every morning during the winter two dogs, one old and one young, accompanied by one or more of the monks or attendants, started from the monastery for the shelter at the foot of the mountain on the Italian side; a similar party of men and dogs also descended to the shelter at the Swiss end of the pass. If any travellers were found there they were helped on their way to the hospice, the dogs going on before to show the road. Possibly, on rare occasions, the dogs were allowed to go down to the valley by themselves, but as a rule they only acted as guides to the monks. Pictures and stories of the dogs laden with food and clothes, and sometimes actually carrying a benumbed traveller, are plainly due to the exaggeration of their admirers.

The St Bernard, according to the traditions of the monastery, is the result of a cross between a Danish bull-bitch and a mastiff, a native hill dog, though at what time effected it is impossible to say. After the breed was once established it was kept pure until 1812, when owing to the severity of the winter the monks were obliged, contrary to their usual custom, to send out the brood-bitches as well as the dogs, with the result that all the females succumbed to the cold, and the monks found themselves without the means of continuing the true breed. In this extremity a cross with the Newfoundland was tried, but at first failed, owing to the excessive coat of the Newfoundland, which hampered the dogs in snow; however, by breeding back to their own short-coated dogs, the monks

obtained the desired shortness of coat, though occasional specimens were born with rough coats. These rough-coated specimens were sold or given away to the inhabitants of the surrounding valleys, who continued to breed them, so that St Bernard dogs soon became general in Switzerland. About 1860 these dogs first attracted the attention of English travellers, who imported them to Britain, where they were exhibited and at once excited much notice on account of their size and beauty. Others were introduced, and the St Bernard was soon established as the most popular big dog. The St Bernard, as bred to modern English ideas, is an immense red or orange coloured dog, marked with white on muzzle, neck, chest, feet, and tip of tail. The head should be massive and imposing, with a strong square muzzle, a point of great importance. Legs should be straight, with large feet, and double or, at least, single dew claws. Hind-feet should turn out, though not sufficiently to hinder the dog's movements. The coat of the rough variety is of medium length; it should not be too curly. In the smooth variety the coat should be short and wiry. Many of the finest St Bernards measure over 30 inches high at the shoulder, and weigh over 150 lb. On account of his great size and weight the St Bernard often moves in an awkward manner, a defect which should be avoided. St Bernards, as a rule, are good tempered, though many are not to be trusted.

St Brieuc, a town of Brittany, the capital of the department of Côtes du Nord, on the Gouet, 2 miles from its mouth in the English Channel, and 93 E. of Brest. It has a port, Le Légué, at the river's mouth; a cathedral, dating from the 13th century; and a quaint old quarter with picturesque houses. In 1689 James II. assembled his French forces here for the invasion of Ireland, and in 1840 it was the birthplace of Villiers de l'Isle Adam. There is a trade in coal, bricks, iron-work, and agricultural produce. Pop. 25,000.

St Catherine's, a city of Ontario, chief town of Lincoln county, on the Welland Canal by rail 32 miles E. by S. of Hamilton and 5 S. of Port Dalhousie on Lake Ontario. It has large manufactures of machinery and agricultural implements, with saw-mills and weaving. Its mineral springs are noted. Pop. 20,000.

St Chamond, a town of France, dept. Loire, 7 miles NE. of St Étienne by rail, has manufactures of ribbons, silk, and iron, with naval and military workshops, and important dyeing industries. Pop. 16,000.

St Charles, capital of St Charles county, Missouri, on the high north bank of the Missouri River, 23 miles by rail (44 by river) NW. of St Louis. It has steel-die works and a railroad-car factory. Pop. 8000.

St Christopher, popularly **St Kitts**, one of the Leeward group, British West Indies, lies 45 miles NW. of Guadeloupe. It is long (22 miles) and narrow (6 miles), and is traversed by a chain of rugged mountains (Mount Misery, 3700 feet); area, 65 sq. m. The capital is Basseterre (q.v.), with a population of about 7700. Sugar culture is the chief industry; sugar, rum, and syrups are exported. Cotton-growing has developed rapidly, and other products are tobacco, salt, and coconuts. Administratively St Kitts forms a presidency along with Nevis (q.v.) and Anguilla (q.v.). The government rests with an administrator, a nominated executive council, and a legislative council of seven official and seven nominated unofficial members. Pop. (1921) 38,214, about five-eighths in St Kitts. This island, whose native Carib name meant the 'fertile island,' was discovered in 1493

by Christopher Columbus, who named it from a fanciful resemblance of its outline to statues of his patron saint, St Christopher. Colonised by French and British settlers simultaneously in 1625, it passed wholly into the possession of Britain in 1713. The French both before and after that date held it for short periods. A terrible hurricane swept the island in 1899. See Mrs Burdon's *Handbook of St Kitts-Nevis*.

St Clair, a navigable river of North America, in the line of the Great Lakes, and carrying (225,000 cubic feet per second) into Lake St Clair the waters of Lake Huron. It is over 40 miles long, and half a mile broad. In 1891 a railway tunnel under its bed was completed between Port Huron, Michigan, and Sarnia, Ontario, 20 feet in diameter, and 6026 (including excavated approaches, 11,553) feet long. Lake St Clair is 26 miles long and 25 wide, has an area of 410 sq. m., and from its south-west end passes the volume of water it has received into Lake Erie by means of the Detroit.

St Claude, a town in a valley surrounded by hills, in the French department of Jura, with a pop. of 13,000, largely occupied with turner's work (briar pipes, chess-men, yard measures, &c.), gem-cutting, and cabinet-making. The monastery dates from 430 A.D.

St Cloud, a town of France, dept. Seine-et-Oise, situated on an eminence on the left bank of the Seine, in the western outskirts of Paris. Henry III. was assassinated here in 1589. St Cloud was long famous on account of its magnificent château, built by Louis XIV.'s brother, the Duke of Orleans. Napoleon planned and carried out here the *coup* of 18th Brumaire, and after he became emperor made this château his favourite place of residence. It was destroyed, and its magnificent park (in which stands the Sèvres porcelain-factory) greatly injured, during the siege of Paris in 1870. Pop. 12,000.

St Croix, an American river, called also the Passamaquoddy and the Schoodic, which, flowing out of Grand Lake, on the eastern border of Maine, runs south-east 75 miles to Passamaquoddy Bay, and forms a portion of the boundary between the United States and New Brunswick.

St Cyr, a village of France, dept. Seine-et-Oise, about 2 miles by rail W. of Versailles. It owes its origin to an educational institution for poor girls of good birth, founded by Louis XIV., at the suggestion of Madame de Maintenon. It was for its 250 pupils that Racine wrote his tragedies of *Esther* and *Athalie*. Madame de Maintenon died here, and was buried in the choir of the church. The institution was suppressed at the Revolution; and in 1806 the buildings were converted by Napoleon into a military school, which still exists. Pop. 6000.

St Davids, a 'city' of Pembrokeshire, South Wales, in the westernmost corner of the Principality, on the rivulet Alan, within 1½ mile of St Brides Bay and 16 miles WNW. of Haverfordwest station. The ancient *Menevia*, it is now a mere village; but in the middle ages its cathedral, with the shrine of its founder, St David (q.v.), the patron saint of Wales, attracted many pilgrims, among them the Conqueror, Henry II., and Edward I. and Queen Eleanor. Rebuilt between 1180 and 1522, that cathedral still is mainly Transition Norman in character, a cruciform pile, measuring 298 feet by 131 across the transepts, with a central tower 125 feet high. It is the largest, finest, and most interesting church in Wales. Special features are the reddish-hued stone, the richly ornamented nave with oak ceiling, the rood screen (c. 1338), the lantern, the base of St David's shrine, the tomb of Edmund Tudor, Henry VII.'s father, the mosaics by

Salviati, and Bishop Vaughan's chapel. The west front was rebuilt by Nash in 1793; and the whole was restored by Scott in 1862-78. Little is known of the British bishops after St David's death in 601; of bishops since 1115 may be mentioned Gower, Houghton, Chichele, Ferrar the Marian martyr, Davies, Archbishop Laud, Bull, Horsley, and Thirlwall. North of the cathedral is the ruined college of St Mary (1377), with a slender tower 70 feet high; and across the Alan are the magnificent remains of Bishop Gower's palace (1342). A restored cross, the shattered Close wall, and the imposing Tower Gate deserve notice, and also St Davids Head, rising 100 feet above the sea.

St Denis, a town in the French department of Seine, 4 miles N. of Paris, has manufactures of printed calicoes, flour, chemicals, machinery, white-lead, and other commodities. A famous sheep and parchment fair, founded in the 7th century, was held up to 1552. The town is supposed to date from the foundation of a chapel raised above the tomb of St Denis (q.v.). This chapel was replaced in the 7th century by an abbey, built by Dagobert I., who was buried in its church, which thereafter became the mausoleum of the kings of France. The existing abbey church was begun by Abbot Suger in 1137, more or less finished during the next century, much damaged at the French Revolution, and skilfully restored by Viollet-le-Duc from 1848 onwards, though it suffered again in the bombardment of the town by the Germans in 1871. Monuments were erected above each of the royal tombs by St Louis, and the series was continued in after ages, but there are no tombs later than Henry II., the Bourbon coffins being placed in the crypt without monument in the church, which contains a magnificent stone altar. The most magnificent of these memorials are the tombs of Louis XII. and his queen, Anne of Brittany, of Francis I. and Claude, and of Henry II. and Catharine de' Medici. The abbey was plundered by the English in 1430. Napoleon converted it into a school for the daughters of officers of the legion of honour. During the Revolution, in 1793, the royal tombs were rifled and demolished, and the bodies cast indiscriminately into ditches prepared for them. Pop. (1872) 31,850; (1920) 76,358.

St Denis, the capital of Réunion (q.v.).

St-Dié, a town of the French department of Vosges, stands on the Meurthe, 50 miles by rail SE. of Nancy, possesses a Romanesque-Gothic cathedral, a large seminary, and a museum, and carries on energetically the weaving of cottons, woollens, and silks, embroidery, dyeing, the making of lace, machinery, and metal goods. It is a convenient starting-point for excursions into the Vosges. Pop. 20,000.

St Dizier, a town of France (dept. Haute-Marne), 38 miles by rail SE. of Châlons, is situated on the Marne, which here begins to be navigable. In 1544 it resisted for some weeks the army of Charles V., and in 1814 the French twice defeated and were twice defeated by the invading allies. There are iron forges and foundries, engineering yards, and copper and bronze works. Pop. 16,000.

St Domingo. See HAYTI, SAN DOMINGO.—St Domingo Bark is one of the names for Caribbean Bark (q.v.).

Ste Anne de Beaupré, a Canadian village at the junction of the river Ste Anne with the St Lawrence, 22 miles NE. of Quebec. From the 17th century it has been celebrated as a Catholic place of pilgrimage, and miraculous cures are still alleged. The basilica was burned down in 1922. Pop. 1600.

Sainte-Beuve, CHARLES-AUGUSTIN, critic, was born at Boulogne-sur-Mer in 1804. His father, commissioner of taxes in the town, a man of literary tastes, died three months before the birth of his son, but it was from him that Sainte-Beuve deduced the leading bent of his own character and talent. His mother was the daughter of an Englishwoman who had married a Boulogne sailor. She was a woman of character and practical sense, but with so little regard for any ideal interests of life that she was never reconciled to her son's choice of a literary career till his election as a member of the Academy in his forty-first year. Her husband had left her in straitened circumstances, and it was only by considerable sacrifice on her part that her son received the advantage of a liberal education.

Till his fourteenth year Sainte-Beuve attended the school of a M. Blériot in Boulogne, where he received a thorough grounding in Latin, and where he gave unmistakable proofs of unusual gifts. By his own desire he was then sent to Paris, where, boarding with a freethinking professor, M. Landry, he attended the Collège Charlemagne. At this school also he gave further promise of future distinction. Though he had thus shown such special aptitudes in the direction of literature, for the next three years (1824-27) he followed a course of medical study, and for another year even walked the hospitals—apparently out of deference to his mother's wishes.

It was in 1824, when Sainte-Beuve was in his twentieth year, and while he was still a medical student, that he began that career as a man of letters which he was to follow with such assiduity and devotion to the end. In that year M. Dubois, who had been one of his teachers at the Collège Charlemagne, founded a literary and political paper called the *Globe*. Supported by such writers as Jouffroy, Rémusat, Ampère, and Mérimée, the *Globe* became one of the leading organs of the day, and was hailed by Goethe as heralding a new departure in the intellectual life of France. On the invitation of Dubois, who had recognised the promise of his pupil, Sainte-Beuve took his place on the regular staff of contributors. For three years he wrote short articles on various subjects, which were collected after his death, and published under the title of *Premiers Lundis*. With the doctrinaire attitude of the chief contributors of the *Globe* Sainte-Beuve was never in complete sympathy, and in 1827 he came under a new influence, which forms one of the turning-points in his life. In that year he wrote a eulogistic review of the *Odes et Ballades* of Victor Hugo, which led to the closest relations between the poet and his critic. Under the influence of Hugo, Sainte-Beuve became for a time the zealous advocate of that romantic movement of which Hugo was the acknowledged leader, and of which Sainte-Beuve himself was eventually the most judicious critic. As a member of the romantic *cénacle* which counted in its number Hugo, Lamartine, De Musset, and Alfred de Vigny, Sainte-Beuve embodied his new ideals and his new experiences both in poetry and prose. In 1828 he published his *Tableau de la Poésie Française au Seizième Siècle*, with the double object of justifying the romantic movement and of directing attention to what was of real value in the French poetry of the 16th century. In 1829 and 1830 successively appeared *Vie et Poésies de Joseph Delorme* and *Les Consolations*, poems which, while they show intellectual subtlety and ingenious fancy, are fraught with morbid feeling strangely dissonant from the buoyancy and serenity of the writer's later years. In 1829, also, in the pages of the *Revue de Paris*, the predecessor of the *Revue des Deux Mondes*, he began the first of those longer critical articles on French literature which, under

the name of *Causeries*, he was afterwards to carry to such perfection.

The revolution of July 1830 brought Sainte-Beuve under a new set of influences. The *Globe* now passed into the hands of the Saint-Simoniens, and for a year he became one of its contributors under the new direction. All his life Sainte-Beuve had a keen interest in questions relating to the well-being of the people; but his new colleagues soon passed the limits of his sympathy, and we find him for the next three years on the staff of the *National*, then edited by Armand Carrel. An article by Sainte-Beuve in that journal, which was the organ of extreme republicanism, led to a rupture with the editor, and he discontinued his contributions. It was during this period (1830-36), also, that Sainte-Beuve became a sympathetic listener of one of the most interesting men of the century, the famous Lamennais. In his later years Sainte-Beuve insisted that the foundation of his intellectual life was the French materialism of the 18th century; yet both his relations with Lamennais and his private correspondence prove that at this period of his life, at least, religious questions seriously engaged his attention. With the extreme democratic opinions of Lamennais after his breach with Rome Sainte-Beuve could have no sympathy, and by 1836 their intimate relations ceased. Later in life he expressed himself very frankly regarding Lamennais' career, but his final judgment is virtually that of all judicious critics. His solitary novel, *Volupté* (1834), also belongs to this period of his life, a period apparently of mental and spiritual unrest. In 1837 he proceeded to Lausanne, where he delivered a series of lectures on the history of Port-Royal. Subsequently, as the result of the intermittent labour of twenty years, these lectures took the shape of a book of five volumes, which contain some of Sainte-Beuve's finest work. Whereas in the first two volumes, however, he is to a certain extent in sympathy with Jansenism, in the last three his point of view is that of the purely disinterested critic. At Lausanne Sainte-Beuve was deeply impressed by the character and views of Alexandre Vinet, and, though he eventually diverged far from Vinet's teaching, he treasured his memory as one of the noblest hearts and minds it had been his fortune to know. During his stay at Lausanne Sainte-Beuve produced his last volume of poetry, *Pensées d'Août*.

From 1840, according to Sainte-Beuve himself, dates a new departure in his criticism. Thenceforward he claims to have been master of himself, and in his own words to be the disinterested 'naturalist of minds.' In that year he was again in Paris, where an appointment as keeper of the Mazarin Library brought him a modest competence, which saved him from the necessity of hasty production. During the next eight years he wrote mainly for the *Revue des Deux Mondes*, to which he had been an intermittent contributor since its foundation in 1831. As one of the most distinguished literary workers of the day, he was in 1844 elected member of the French Academy, his eulogium being pronounced by Victor Hugo. The political confusions of 1848 led Sainte-Beuve to accept the professorship of French literature at Liège, where he delivered a course of lectures afterwards published under the title of *Chateaubriand et son Groupe Littéraire sous l'Empire*. In 1849 he returned to Paris, when he entered on an engagement which was to afford him the precise sphere he needed for the adequate display of his powers and attainments as a literary critic. This was to write for the *Constitutionnel* an article on some literary subject to appear on the Monday of every week. For the next twenty years Sainte-Beuve,

with little intermission, carried on this task. On Monday he settled down to his task, and on five successive days worked for twelve hours at the preparation of his materials and the composition of his article. Saturday he devoted to a careful revision of proofs, and on Sunday he allowed himself a holiday. In 1861 these *Causeries du Lundi*, as they were called, were transferred to the *Moniteur*, an official organ of Napoleon III.; in 1867 back to the *Constitutionnel*, and finally in 1869 to the *Temps*. The papers thus written make up in all twenty-eight volumes, of which the first fifteen are entitled *Causeries du Lundi*, and the succeeding volumes *Nouveaux Lundis*.

By his acceptance of the government of Napoleon III. Sainte-Beuve gave offence to many of his former friends; but his justification was that forms of government were indifferent to him provided he might pursue his own objects in peace. In 1854, on the occasion of his appointment as professor of Latin Poetry at the Collège de France, the students refused to listen to his lectures, and he was forced to demit both the office and its emoluments. The lectures he intended to deliver, a critical estimate of Virgil, were subsequently published as a separate volume. Nominated a senator in 1865, he regained popularity by his spirited speeches in favour of that liberty of thought which the government was doing its utmost to suppress. In his last years Sainte-Beuve lived the life of a hermit in his modest house in the Rue Montparnasse though he counted among his friends and admirers the first men of letters in France. He died on 13th October 1869 of a malady from which he had long suffered. It was his special instruction that he should be buried without religious ceremony and without the customary eulogium. His funeral, however, was attended by a multitude estimated at ten thousand, but the only words pronounced at his grave were—'Adieu, Sainte-Beuve; adieu, our friend.'

It is by the amount and variety of his work, and the range of qualities it displays, that Sainte-Beuve holds the first place among literary critics. Others have equalled or surpassed him in individual effects; where he is unapproachable is in his faculty of educing the interest and significance of the most various types of human character, and the most various forms of creative effort. To his marvellous insight, range of sympathy, and knowledge of detail he added an experience of men and things exceptionally rich and varied for one whose main function was literary criticism. But, besides their value as criticism, the works of Sainte-Beuve are an inexhaustible mine of facts and reflections bearing on every interest of human life. Regarded in its totality, his work is in its essential tendency identical with that of Montaigne. In both we have the point of view of the uncommitted observer, the same many-sided presentment of life, the same inconclusive philosophy; and in both a personal character equally void of every heroic element. Supreme as he is in his own department, however, Sainte-Beuve is not a European man of letters like Erasmus, or Voltaire, or Renan. The subjects he treated were not of universal interest, and his literary methods are as far as possible from the simplicity and directness which are the crowning qualities of these three writers. Nevertheless, the work of Sainte-Beuve marks an epoch in the intellectual history of Europe. By its delicacy, subtlety, and precision it extended the limits of the study of human character and of the products of human intelligence.

The chief authorities for the life of Sainte-Beuve are the Lives by Levallois (1872) and D'Haussonville (1875). See also Sainte-Beuve's own 'Ma Biographie' in *Nouveaux*

Lundis, vol. xiii.; the *Souvenirs* by Troubat (Sainte-Beuve's last secretary; 1890); and studies by Vattier (1892), Faguet (1900), Spoelberch de Lovenjoul (1901), and Michaut (1905). The works of Sainte-Beuve are: *Tableau Historique et Critique de la Poésie Française et du Théâtre Français au XVI^e Siècle*; *Poésies Complètes* (2 vols.); *Volupté*; *Port-Royal* (7 vols. 1860); *Chateaubriand et son Groupe Littéraire sous l'Empire* (2 vols. 1860); *Critiques et Portraits Littéraires* (5 vols.); *Portraits Contemporains* (5 vols.); *Portraits de Femmes*; *Causeries du Lundi* (15 vols.); *Nouveaux Lundis* (13 vols.); *Souvenirs et Indiscrétions*; *Premiers Lundis* (3 vols.); *Les Cahiers de M. Sainte-Beuve*; *Chroniques Parisiennes*; *Lettres à la Princesse*; *Étude sur Virgile*; *Le Général Jomini*; *Monsieur de Talleyrand*; *P. J. Proudhon, sa Vie et sa Correspondance*; *Correspondance de C. A. Sainte-Beuve* (2 vols.).

Sainte-Claire Deville, HENRI ÉTIENNE, French chemist, was born on 11th March 1818, in St Thomas, West Indies, and was educated in Paris. In 1844 he was commissioned to organise the Faculty of Sciences at Besançon, and in 1851 obtained the chair of Chemistry in the Normal School at Paris, and shortly afterwards the similar chair to the Sorbonne. He died in Paris on 1st July 1881. He began his work as a chemical investigator by inquiring into the composition of certain resins, but soon transferred his energies to the investigation of metallurgic substances. It was Sainte-Claire Deville who first produced aluminium (1855) and platinum in commercial quantities, and demonstrated the general theory of the dissociation of chemical compounds at a high temperature. Amongst other results that were due to his skill and ingenuity, he discovered (1849) anhydrous nitric acid; examined the forms of boron and silicon; devised methods for fusing platinum, iridium, cobalt, &c.; determined the density of metallic vapours at exceedingly high temperatures; produced artificially sapphire, aluminium, and similar substances; and invented a way of getting crystallised oxides. His labours for producing globules of aluminium, which he exhibited at the Paris Exhibition of 1855, were in continuation of Wöhler's, dating from 1827. The platinum metals he studied along with Debray. His papers were published in *Comptes Rendus* of the Academy of Sciences, and in *Annales de Chimie*. He also published *De l'Aluminium* (Paris, 1859), and *Métallurgie du Platine* (2 vols. 1863).

Sainte Croix. See SANTA CRUZ.

St Elias, MOUNT, a great volcanic mountain close to the border between Canada and Alaska, 18,024 feet high. Long believed to be the highest mountain in North America, it is exceeded by Mount Logan, inside the Canadian line, 19,539 feet, and by Mount McKinley in Alaska (400 miles to the NW.), 20,464 feet. Mount St Elias is clothed almost from base to summit with eternal snow. There are huge glaciers and utterly impassable precipices and yawning chasms; but in 1897 the ascent to the summit was successfully made by Prince Luigi of Savoy, and the feat has been repeated more than once since. The forest covering the greater part of the lowlands near the Malaspina glacier at the base of St Elias extends over the moraine, and thence for four or five miles over the surface of the glacier.

Sainte Marie-aux-Mines. See MARKIRCH.

Saintes, an old town of France, dept. Charente-Inférieure, on the left bank of the Charente, 28 miles by rail SE. of Rochefort, has manufactures of earthenware, pottery, bricks, and tiles. In ancient times this town, under the name of *Mediolanum*, was the capital of the Santones, from whom the subsequent province derived the name of Saintonge (see ROLAND). Its interesting Roman remains include a triumphal arch and the

ruins of an amphitheatre. It was a bishop's seat down to 1790; the cathedral still stands. Palissy's home was at Saintes during the first fifty years or so of his life. Pop. 19,000.

St Étienne, one of the most important industrial towns in France, capital of the department of Loire, stands on the Furens, a tributary of the Loire, 36 miles by rail SW. of Lyons and 312 SSE. of Paris. It is built in the midst of the second largest coalfield of France. The town, which looks thoroughly grimy, has few buildings of interest; but a school of mines (1816), a national small-arms factory (1764), a gallery of art, an artillery and a commercial museum may be mentioned. The chief industries are in iron and steel and in ribbons. Its workshops turn out steel and iron plates, gun-armour, dynamos, bicycles, iron masts, large castings for machinery, firearms, locks, cutlery, files, nails, tools, &c. Large numbers of craftsmen, mostly hand-workers in their own homes, or operatives in small factories with looms driven by electricity, are engaged in the town and its vicinity in making ribbons, laces, fringes, and similar ornamental work. Besides these branches of industry pottery and glass are manufactured. Pop. (1800) 16,000; (1851) 53,741; (1891) 133,443; (1921) 167,967. The coal-mines were worked in the 14th century, but extensively only in the end of the 18th. The town was twice captured by the Huguenots, in 1563 and 1570, and between this last date and 1629 it suffered terribly on three occasions from the plague. The first railways in France were built from St Étienne, one in 1828 to Andrézieu, the other in 1831 to Lyons.

St Eustatius (commonly called *Statia*), a Dutch West Indian island, 10 miles NW. of St Christopher. Area, 8 sq. m.; pop. 1300. See CURAÇAO.

Saint-Évremond, CHARLES MARGUETEL DE SAINT-DENIS, SEIGNEUR DE, a famous French writer and wit, was born at St Denis near Coutances in Normandy, 1st April 1613. He was educated by the Jesuits at the Collège de Clermont, at Caen, and at the Collège d'Harcourt, next entered the service, and fought with distinction at Rocroi, Freiburg, and Nördlingen. He gave steady support to the throne throughout the Fronde, but in 1661 had to flee first to Holland, finally to England, on the discovery of his witty and sarcastic Letter to Créquien on the Peace of the Pyrenees. He was warmly received by Charles II., and here he spent the rest of his days, delighting the world with his wit, a fast friend of the beautiful Hortense, Duchesse de Mazarin, whose strange death sorely troubled his old age. Here he died, 29th September 1703, and was buried in Westminster. His writings were famous long before they were made public, and in his own day he enjoyed an equal reputation on either side of the Channel for polished satire, Attic irony, and brilliant style. Distinctively a man of fashion, a complete Epicurean in philosophy and life, a brilliant conversationalist in an age when conversation ranked among the fine arts, he has written his name high amongst the masters of French prose, although he lacked enthusiasm, ambition, motive, to produce anything adequate to his gifts. Still, it is a sovereign distinction to have created a style so delicate, yet so effective and so individual. His one mannerism is antithesis, yet the art is so exquisite as never to offend. His satire, *La Comédie des Académistes* (1644), is a masterpiece in its kind, and his dissertation on Racine's *Alexandre* reveals the true critic's insight. But so little was his curiosity that though he lived nearly forty years in England he never learned English and never knew Shakespeare. The letters betwixt him

and his dear friend Ninon de Lenclos are charming. His writings, including essays, comedies, &c., were first collected by Des Maizeaux with a Life (Lond. 1705). There are good volumes of selections by C. Giraud (1865) and Lescure (1881).

See the studies by Gilbert and Gidel (1866), Merlet (1870), Pastorello (Trieste, 1875), Macé (1894); also Sainte-Beuve's *Nouveaux Lundis*, vol. xiii., and *Causeries du Lundi*, vol. iv.

St Flour, a town in the French department of Cantal, finely situated on a steep basaltic plateau (3000 feet) 50 miles S. of Clermont-Ferrand, has a cathedral (Gothic; 1375-1466), and manufactures gloves and cloth. Pop. 5000.

St Gall. See SANKT GALLEN.

Saint-Gaudens, AUGUSTUS (1848-1907), American sculptor, was born in Dublin of French and Irish stock, but was carried to New York in infancy with his family, and trained a cameo-cutter. In 1867-73 he studied sculpture in Paris and Rome, being the first American sculptor who had enjoyed a complete artistic training in European schools. His monuments to Farragut and Sherman at New York, to Lincoln and General Logan at Chicago, to Colonel Shaw at Boston, to R. L. Stevenson at Edinburgh are famous; as also his 'Puritan,' 'The Peace of God,' and his 'Diana.' See his *Reminiscences* (1913), books on him by Cortissoz (1907) and Hind (1908), and works on American sculpture by Caffin (1903) and Taft (1904).

St Germain-des-Prés, named from Germanus (q.v.), was a famous Benedictine monastery near Paris (see MAURISTS). Its church (1001-1163) ranks as the oldest in Paris.

St-Germain-en-Laye (in English books often ST GERMAINS), dept. Seine-et-Oise, stands on an eminence above the Seine, with a royal forest (10,000 acres) behind it, the river before it, and Paris 13 miles to the E. Above the river runs the famous terrace (2625 yards long by 115 feet wide), made by Lenôtre in 1672. The historic associations cluster round the old royal castle, which, until Louis XIV. removed the court to Versailles, was the favourite residence of the kings of France. Here were born Henry II., Charles IX., Louis XIII., and Louis XIV., and here died Louis XIII. King James II. of England lived in this castle from 1689 to his death in 1701. After that it was turned into barracks, then into a military prison, and finally by Napoleon III. into a museum of Gallo-Roman antiquities. Peace was signed within its walls between Charles IX. and the Huguenots in 1570, between France and Brandenburg in 1679, and between Austria and the Allied Powers in 1919. The Fête des Loges, one of the most popular of popular festivals, is held annually at a chapel in the forest. The people (20,000 in all) manufacture woollens and cottons.

St Germans, formerly the seat of the ancient diocese of Cornwall, now a small village, stands on the slope of a hill, on a branch of the river Lynher, 9½ miles W. by N. of Plymouth. Its fine parish church has an excellent Norman west front.

St Gilles, a town of France, dept. Gard, is situated on the Canal de Beaucaire, 12 miles SSE. of Nîmes. Its abbey church, the west front of which is a masterpiece of Romanesque architecture, and is covered with the richest decoration, dates from 1116. Pope Clement IV. was born here. Pop. 6000.

St Gotthard, a mountain-knot of the Alps, that has its feet planted in the Swiss cantons of Uri, Grisons, Ticino, and Valais, and lifts its head, 9850 feet high, to the eternal snows. In its arms it holds the sources of the rivers Rhine and Rhone, Ticino and Reuss, and so sends the water from its melted snows to the German Ocean, the Mediter-

ranean, and the Adriatic. On its shoulder it bears one of the most celebrated of the Alpine passes from Switzerland to Italy. The road that crosses this pass (6936 feet) leads from the shores of Lake Lucerne to the shores of Lago Maggiore. This route was first used by the Longobardi in the 6th century. The name is taken from St Gotthard, bishop of Hildesheim (d. 1038). In the days of Charlemagne the path was made practicable for pack-animals; but down to 1820 it was not wider than 13 feet. In 1820-30 it was widened to 18 feet and smoothed for carriages. Near the summit of the pass stand two hotels and a hospice, the latter for poor wayfarers, of whom some 12,000 used to travel this way every year. Since 1882, however, a railway has climbed up the lower slopes of the St Gotthard, and then burrowed through it in a tunnel. The making of this tunnel was begun in 1872 and finished in 1880; it extends from Göschenen (at a height of 3639 feet) in Uri to Airolo (3757 feet) in Ticino, measures 9½ miles in length, is 26 feet wide and 21 high, rises with a gradient that reaches on an average 26 in 100 feet. A mountain railway crosses the pass at right angles, running from Chur (Coire) to Brigue by way of the Oberalp and Furka passes and the Rhone valley.

St Helena (pronounced St Elëna), a lonely British island in the Atlantic, 1200 miles from the west coast of Africa, 1700 NW. of Capetown, measures 10 miles by 8, and has an area of 47 sq. m. It is part of an old volcano, and reaches 2823 feet in High Hill. Its shores face the ocean as perpendicular cliffs 600 to 2000 feet high, and are in many places cleft by deep, narrow valleys. The climate is pretty constant and generally healthy. Previous to the cutting of the Suez Canal St Helena was a favourite port of call for vessels bound to and from India by the Cape of Good Hope, and the inhabitants did a large trade in furnishing these vessels with supplies. But the Suez route greatly lessened its importance. The internment of Boer prisoners (1899-1902) gave a temporary fillip to trade, and in 1908, as a relief measure, the New Zealand flax industry was established by government and took root. A lace-making industry has also been started. The exports consist almost entirely of fibre and tow. Cattle-rearing is carried on, and there is a certain amount of fish-curing. St Helena is an important cable station, is a naval coaling station with a detachment of marine artillery, and has a noted observatory. Pop. (1921) 3747. The capital and port of the island is Jamestown (pop. 1400). St Helena was discovered by the Portuguese in 1502, and taken possession of by the British East India Company in 1651, who remained masters of the island down to 1834; since that time it has been administered by a governor and an executive council. The island was the place of Napoleon's imprisonment from 1815 to his death in 1821, at Longwood, three miles inland from Jamestown; and near Longwood he was first buried.

St Helens, (1) a town of Lancashire, on the Sankey brook, flowing to the Mersey, 12 miles ENE. of Liverpool and 21 W. by S. of Manchester. With good railway and canal facilities, and situated in the immediate neighbourhood of coal, it has become one of the chief centres of the glass industry of the world, being especially noted for its plate-glass, and also possesses extensive glass-bottle, copper-smelting, and chemical works. It was constituted a municipal borough in 1868; a parliamentary borough, returning one member, in 1885; and a county borough by the Local Government Act, 1888. Pop. (1871) 45,134; (1901) 84,410; (1921) 102,640.—(2) A small town in the Isle of Wight, 4 miles SE. of Ryde; pop. 6000.

St Helier, ST HÉLIER, or ST HELIER's, the

capital of Jersey, is on the south coast on the east side of St Aubin's Bay. It is defended by Elizabeth Castle (1551-86), on a rocky island off the shore, approached by a causeway at low-water. Royal Square, the scene of the battle of Jersey in 1781 (the last attempt of the French to regain possession of the islands), contains the Salle des États, the meeting place of the local parliament, the public library (1736), and the court-house (1647). Victoria College (1852) is finely situated, and the parish church dates from the 11th to the 14th century. Pop. (1851) 29,153; (1871) 30,756; (1921) 27,866. See JERSEY, and CHANNEL ISLANDS.

St-Hilaire. See BARTHÉLEMY, GEOFFROY.

St Ignatius' Bean. See IGNATIUS' BEANS.

St Ives, (1) a fishing-town of Cornwall, beautifully situated on the west shore of St Ives Bay, 8 miles NNE. of Penzance. It has a 15th-century granite church, with an ancient cross, in the picturesque old parts of the town. St Ives is the chief seat of the Pilchard (q.v.) fishery, and from its mild climate and good bathing is a favourite resort. It is said to take name from St Ia, an Irish princess, martyred here in 450 A.D. Incorporated by Charles I. in 1639, it returned two members till 1832, and then one till 1885. Pop. 7000.—(2) A picturesque old monastic town of Huntingdonshire, on the left bank of the Ouse, 5 miles E. of Huntingdon. Almost destroyed by fire (1689), and inundated by the river (1823), it has a 15th-century parish church and a six-arch stone bridge of singular beauty, built by the abbots of Ramsey, with an old chapel or lighthouse in the middle. Cromwell lived at Sleppe Hall, now built over, in 1631-36, and T. Watts-Dunton was born here. This place is said to be named after Ivo, a Persian bishop, who died here about 590, and it became in 1017 the seat of a Benedictine priory. A large weekly cattle-market was chartered in 1290, and the town was incorporated in 1874. Pop. 3000.

St James's Palace, a large inelegant brick structure in London, fronting towards Pall Mall. Originally a hospital dedicated to St James, it was reconstructed and made a manor by Henry VIII. The Chapel Royal, much altered since the time of Henry VIII., has been the scene of several royal marriages. Here Queen Mary died (1558); Charles I. slept here the night before his execution; and here Charles II., the Old Pretender, and George IV. were born. When Whitehall was burned in 1697, St James's became the London residence of the British sovereigns till Queen Victoria's time.—*The Court of St James's* is a designation of the British Court.—St James's Park, southward from the Palace, extends over 58 acres.

St Jean, chief town of the St Jean and Iberville district of Quebec, on the Richelieu, opposite the town of Iberville, with which it is connected, 22 miles SE. of Montreal. There are miscellaneous manufactures and a trade in lumber and agricultural produce. The railroad name is St John. Pop. 8000.

St Jean d'Acre. See ACRE.

St John, the largest river of New Brunswick, rises in the highlands in the north of Maine, flows north-east and then south-east 450 miles (the last 225 in British territory), and falls into the Bay of Fundy by an estuary 5 miles in width. It is navigable for about half its course. Its middle course separates Maine from Canada. At its mouth are the famous 'reversing falls' occasioned by the great range and rapidity of tidal ebb and flow in the Bay of Fundy.

St John, (1) commercial capital and largest city of New Brunswick, and principal Atlantic winter port of Canada, stands on the north bank

of the estuary of the St John River, by rail 277 miles NW. of Halifax and 481 from Montreal. It is an important railway town, being the terminus of the Canadian Pacific and Canadian National systems. The harbour is exceptionally fine, and accessible to the largest vessels at all seasons of the year. The timber-trade and fishing are great industries, and the manufactures include lumber, cotton, flour, engines, nails, wooden ware, &c. It has a custom-house, post-office, city building, insane asylum, hospital, public library, Y.M.C.A. building, and numerous churches and banks. Pop. (1881) 26,127; (1921) 47,166. The Micmac Indian settlement here was first entered by Champlain in 1604, and a permanent French settlement was established in 1635, and was recognised as British in 1713. In 1783 10,000 United Empire Loyalists settled here, and gave the place its importance. Its charter of incorporation (1835) is the oldest in Canada. In 1877 the place was mostly destroyed by fire. Portland, an adjoining town, was absorbed in 1889.—(2) A town in Quebec. See ST JEAN.

St John, HENRY. See BOLINGBROKE.

St John, KNIGHTS OF. See HOSPITALLERS.

St John's, (1) the capital of Newfoundland, stands on the extreme east coast of the island, on Avalon Peninsula, 1076 miles ENE. of Montreal and 1730 W. by S. of Cork in Ireland. It is thus the nearest port in America to Europe; and it possesses a small but excellent harbour, landlocked but accessible to ships of largest tonnage. It is the seat of Government House, Parliament Buildings, Anglican and R.C. cathedrals, and a public museum. The industries include fishing, oil-refineries, iron-foundries, machine shops, engine works, breweries, tanneries, and manufactures of shoes and furniture. Pop. 37,000.—(2) Capital of Porto Rico, see SAN JUAN.

St John's Bread. See CAROB.

St Johnstoun. See PERTH.

St John's Wort (*Hypericum*), the typical genus of plants of the family Hypericaceae. It is a numerous genus of herbs and shrubs widely distributed both in the New and the Old World, particularly abundant in western Asia, southern Europe, and in North America; it occurs also within the tropics. The leaves are opposite entire, without stipules, often marked with glandular dots of two kinds, pellucid ones which are very apparent when the leaves are held against the light, and black ones which are usually on the under side of the leaves round the edge, or sometimes on the flowers. The flowers are regular, with five sepals, and five petals, usually yellow. They abound



Large-flowered St John's Wort
(*Hypericum calycinum*).

in a yellow resinous juice which is more or less purgative and anthelmintic. The common St John's Wort, an abundant native of Britain,

even when slightly bruised yields copiously a yellow resinous juice, which, when rubbed between the fingers, emits a scent like lemons, and stains the skin dark purple. The plant has long been credited with powerful medicinal properties, but finds no place in the pharmacopœias, nor is it recognised by regular practitioners. In France and Germany the plant is ceremoniously gathered on St John's Day as a charm against evil spirits, storms, and thunder; in North Wales a similar custom still exists, and in Scotland it was formerly worn as a charm on the person against all malignant influences. The leaves of *H. Androsæmum* are called by the French *toute saïne*, hence the English name *Tutsan*; in both countries they were formerly used to dress fresh wounds. Other species of *Hypericum* have similar properties. There are several species, such as *H. calycinum* (also called Aaron's Beard), frequently cultivated in British gardens.

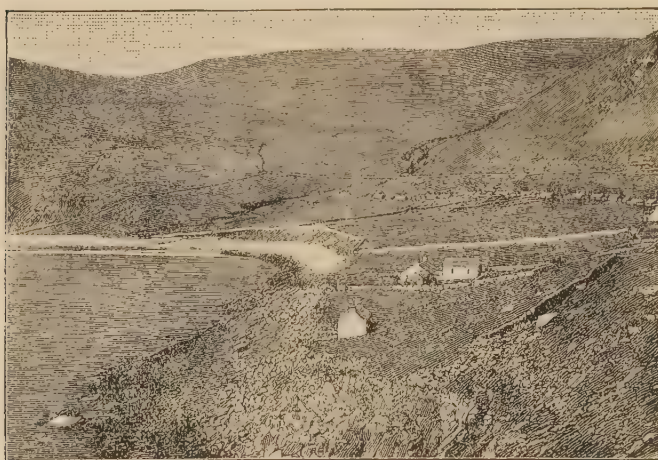
St Joseph, a city of Missouri, capital of Buchanan county, is on the left bank of the Missouri River, 110 miles (68 by rail) above Kansas City. It is an important railway centre, and a busy commercial town. Here are the state asylum for the insane and St Joseph College and other Roman Catholic institutions; the city was formerly a bishop's see. St Joseph has large packing establishments and manufactories of ornamental and other ironwork, clothing, furniture, machinery, marble, confectionery, &c. It is also the centre of a great fruit and grain district. The first settler, an Indian trader, laid out the town in 1843, and by 1851, when incorporated as a city, it was famous as the starting-point for the long journey in wagons across the plains. It suffered from a great fire in 1893. Pop. (1870) 19,565; (1890) 52,324; (1920) 77,939.

Saint-Just, LOUIS ANTOINE LÉON FLORELLE DE, French Revolutionist, was born at Decize near Nevers, 25th August 1767, and was educated by the Oratorians at Soissons. He began the study of law at Reims, but early gave himself to letters, and found his gospel in the writings of Rousseau. At nineteen he set off for Paris, perhaps to avoid taking orders, with some of his mother's plate and other valuables, and was, at her request, imprisoned for six months for selling these. Like most young men of his age he was fired by the revolutionary fever, which, added to the native enthusiasm of his temperament, was yet to carry him far. He published in 1789 a poor poem, *L'Organt*, a mere boyish imitation of Voltaire's *Pucelle*, and in 1791 an essay of a different promise, *L'Esprit de la Révolution*. Next year he was returned fifth deputy for Aisne to the Convention. He first attracted notice by his fierce tirades against the king, and he opened the memorable debate on the verdict in his trial. 'Royalty,' said he, 'is in itself a crime. Every king is a rebel and a usurper. We must judge Louis, not as a citizen, but as an enemy; that is to say, put him to death without forms of process.' He soon became a devoted follower of Robespierre, and by his influence was sent on missions to the armies of the Rhine and the Moselle, which his energy and enthusiasm, as well as administrative ability, urged on to victory. He made bombastic rhetorical speeches before the Convention, but his slight youthful figure, mild voice, large blue eyes, long black hair, and singular beauty gave no promise of the intensity and relentlessness of the fire that burned within him. 'He carries his head like a Saint Sacrament,' said Camille Desmoulins. 'And I,' retorted Saint-Just, 'will make him carry his like a Saint Denis'—a ferocious prophecy soon to be fulfilled. Saint-Just began the attacks on Hébert which

sent him to his doom, quickly followed by the fall of Danton and his friends. Early in 1794 he laid before the Convention a comprehensive report on the police, and soon after proposed Robespierre's famous civil institutions—a ludicrous scheme for a new organisation of society. Boys were to be taken from their parents at seven and brought up for the state, not the family; marriages were not to be proclaimed till after the birth of the first child; friendship was to be no longer a domestic tie, but a public obligation, every citizen being required on reaching twenty-one to declare in the temple who were his friends, he that had none to be banished. Until the citizens were sufficiently educated for this splendid programme a strong dictatorship was necessary, and the faithful follower and his chief alike saw the one man in Robespierre. Saint-Just fell with Robespierre, but unlike him carried his head high on the tumbril, and died without a word, 28th July 1794.

See S. Fleury, *Saint-Just et la Terreur* (1851), and the Life by Ernest Hamel (1859), the latter as eulogistic as the former is the opposite; vol. ii. of Aulard's work, *Les Orateurs de la Législative et de la Convention*; also, the *Œuvres Complètes*, with introduction by Vellay (1908).

St Kilda, a lonely island in the Atlantic, belonging to Harris in Inverness-shire, and 40 miles W. of North Uist. With an extreme length and breadth of $3\frac{1}{4}$ and $1\frac{1}{4}$ miles, it is only 1.9 sq. m.



The Town and Bay, St Kilda.

in area; has lofty precipitous cliffs almost everywhere except at the south-eastern landing-place; and attains a maximum altitude of 1220 feet. The rocks are igneous, incumbent on sandstone; the climate is mild; and the soil is black loam, with very fine pasture, but little arable land. The livestock includes some sheep (which graze also on four neighbouring islets) and Highland cattle, and some mongrel collies; but a principal source of wealth is the sea-birds—fulmar petrels, gannets, puffins, &c.—which supply feathers, oil, and meat. The fisheries, though productive, are neglected. The crofters are practical communists; but their advantages are well-nigh counterbalanced by the destructive tempests and consequent famines, by the practical inaccessibility of the island for eight months of the year, by poverty, and by an absolute lack of amusements. Crime is unknown. The native name of the island is Hirta, and the name St Kilda is probably of Columban origin. The island, which had been in the hands of the Macleods from time immemorial, was sold in 1779,

but was repurchased in 1871. Events in its history have been the reduction of the population by small-pox to four adults and twenty-six children (1724); the imprisonment of Lady Grange by her husband (1734-42); the emigration of thirty-six islanders to Australia (1856); the drowning of six (1864); and the founding of a regular school (1884); the establishment of wireless communication with the mainland (1913); a submarine attack (1918). There are less than 100 inhabitants.

See works by Dean Munro of the Isles (1585); Martin (1698-1703), Kenneth Macaulay (1764), L. MacLean (1838), J. Sands (1877), G. Seton (1878), R. Connell (1887), and N. Heathcote (1900).

St Kilda, a coast suburb of Melbourne (q.v.), on the east side of Hobson's Bay.

St Kitts. See ST CHRISTOPHER.

St Lawrence, a great river of North America, which, issuing from Lake Ontario, flows north-east for some 750 miles—part of the way forming the boundary between Canada and the United States—and falls into the Gulf of St Lawrence by a broad estuary. But in its widest acceptation the name includes the whole system of the Great Lakes and their connecting streams, with a total length from source to mouth of 2200 miles, and a drainage basin of 297,600 sq. m. (These lakes, which are of comparatively modern date, are nothing more than a great system of river-valleys, whose old outlets

have been blocked, but many of whose former channels have been traced.) The area of water-surface in the five lakes alone is 94,650 sq. m., and their aggregate basin 259,950 sq. m. The St Lawrence system, or that of which the great river is the outlet, thus constitutes by far the largest body of fresh water in the world. This mighty artery of North-east America rises, under the name of the St Louis, on the spacious plateau which sends forth also the Mississippi towards the Gulf of Mexico, and the Red River of the North towards Hudson Bay. Lake Superior (602 feet above sea-level), the next link in the chain, finds its way to Lake Huron through St Mary's River, whose rapids have a fall of 20½ feet. Below Lake Huron, which receives Lake Michigan from the south, St Clair River, Lake St Clair, Detroit River, and Lake Erie maintain pretty nearly the same level (there

is a fall of some 8 feet, however, in Detroit River) till the river Niagara descends 326 feet to Lake Ontario, which is itself still 247 feet above the sea-level. The St Lawrence proper, with a number of lake-like expansions (such as the Lake of the Thousand Isles, of St Francis, St Peter, &c.), presents the character first of a river, and then of an estuary, down to the gulf. Prior to 1858 only vessels drawing not more than 11 feet of water could pass up the river above Quebec; but now vast extensions have been made, and the channel has been cleared for transatlantic steamers as far as Montreal, which has become Canada's principal maritime port. There is, further, an important lake, river, and coast traffic, which is increasing every year. Between Lake Ontario and Montreal there are several rapids, which, however, may be all avoided by means of canals that have been constructed at a very great expense. The 'Great Lakes Waterway Scheme' proposes the deepening of the channel of the upper St Lawrence, the enlargement of the Welland Canal, and the construction of new

canals, whereby Chicago, Toronto, and the other lake ports should be brought into direct communication with the Atlantic without transshipment at Montreal. A joint engineering board for Canada and the United States took up the problem in 1924. At about two-thirds of the distance from Lake Ontario to the city of Montreal the intersection of the parallel of 45° determines the point where the St Lawrence, after having been an international boundary from the head, or nearly so, of Lake Superior, becomes exclusively Canadian. Immediately above the island of Montreal the St Lawrence is joined by its principal auxiliary, the Ottawa (800 miles), from the north-west; and a little more than half-way between this confluence and Three Rivers, the highest point of tidal influence, the Richelieu from the south brings in the tribute of Lake Champlain. Other principal tributaries are the St Maurice (400 miles), the Saguenay (100), and the Batiscan (50). The width of the St Lawrence varies from less than 1 to 4 miles; the estuary at its mouth is above 100 miles across. During winter the river is frozen over and navigation closed. For map, see CANADA.

The GULF OF ST LAWRENCE, a western inlet of the North Atlantic, washes Newfoundland, Quebec, New Brunswick, and Nova Scotia. It has three communications with the ocean—the Strait of Belle Isle, between Newfoundland and Labrador; the Gut of Canso, between the island of Cape Breton and the peninsula of Nova Scotia; and a far wider passage than either, with the island of St Paul in the middle, between Cape Breton and Newfoundland: while in the opposite direction it narrows, at the west end of Anticosti, into the estuary of the St Lawrence River. Besides the islands of Anticosti, St Paul's, and Prince Edward, this arm of the sea contains very many clusters of islands, which are rendered more dangerous to shipping by the thickness of the fogs and the uncertainty of the currents. Both the Gulf and River of St Lawrence are celebrated for the productiveness of their fisheries. See QUEBEC.

St Leger, one of the five classic races of Horse-racing (q.v.) in England. It is named after Colonel St Leger, who instituted the race in 1776, and is run on the round course at Doncaster in September; the distance is 1 mile, 6 furlongs, 132 yards.

St Leger, SIR ANTHONY, born about 1496, became a courtier of Henry VIII., and in 1540 was appointed lord deputy of Ireland. He filled the office under Edward VI. and again under Mary, and throughout distinguished himself for moderate yet firm treatment of the fractious Irish clans. He was, however, accused of fraud, and died 16th March 1559.

St Leonards. See HASTINGS.

St Lô, a town of Normandy, dept. Manche, is built on a rocky elevation on the right bank of the Vire, 60 miles by rail SE. of Cherbourg. A St Lô, Bishop of Coutances, built a church here in the 6th century; but the place was destroyed by the Normans in 888, and, having been rebuilt, taken by the English in 1346 and 1417. The Gothic church of Notre-Dame is very handsome. St Lô is an important agricultural centre, and horse-breeding is carried on in the country round. The astronomer Leverrier was born here in 1811, and the novelist Feuillet in 1812. Pop. 10,000.

St Louis, ranking as sixth city of the United States in respect of population, is the commercial metropolis of the Mississippi valley and principal city of the state of Missouri. Situated on the west bank of the Mississippi River, 21 miles S. of the mouth of the Missouri, it is by rail 1108 miles WSW. of New York, 2434 E. of San Francisco,

and 1170 N. of New Orleans. In 1764 Pierre Liguette Laclède, head of the Louisiana Fur Company, established a trading-post on the present site of St Louis, giving it the name which it still bears in honour of Louis IX. of France. In 1768 the Spaniards took formal possession of Upper Louisiana, but the settlement was governed by a French captain, St Ange de Bellerive, until 1770, when Don Pedro Piaras was made lieutenant-governor and military commandant, with headquarters at St Louis. In 1801 the village again became a part of the French possessions, and in 1803 passed into the hands of the United States. The population of the settlement in 1799 was 795; in 1810, one year after the town was incorporated, it had increased to 1400, in 1820 to 4928, and in 1840 to 16,469. Then began a rapid growth. In 1844 the population was 34,140; in 1850, 74,439; in 1870, 310,864; in 1900, 575,238; and in 1920, 772,897.

St Louis is built upon three gently sloping terraces, the summit of the third being 200 feet above and 4 miles W. of the river; beyond this point for miles the country is almost perfectly level. The city has a river frontage of nearly 20 miles; its greatest width is 7 miles, and its area nearly 65 sq. m. The streets in the old part of the city are narrow, but all those west of Third Street, three blocks from the river, are broad and straight. The water-supply is taken from the Mississippi River at Bissel's Point, north of the city, and is virtually inexhaustible. The fearful cyclone of 27th May 1896 caused some three hundred deaths, damaged property extensively, and wrenched off the east end of the Eads Bridge.

The largest of about a score of parks—amongst the finest in the United States—is Forest Park, in the western part of the city. Tower Grove Park was, with the botanical garden, given to the city by the philanthropist Henry Shaw. The principal public buildings are the Four Courts, court-house, city hospital, insane asylum, and women's hospital, the custom-house and post-office (which cost over \$5,000,000), the Merchants' Exchange, the Cotton Exchange, the Crow Museum of Fine Arts, city hall (1891-95), the Mercantile Library, and the Public Library.

The city has a well-developed system of education. There are two universities, the Washington (non-sectarian), with over 2000 students, and the St Louis (Roman Catholic), with over 3000 students, and a Lutheran Theological Seminary, with 350 students; but there are numerous academies and colleges of lower grade, besides two law schools, several medical colleges, a school for nurses, a school of midwifery, and a college of pharmacy. St Louis contains over 300 churches, representing almost every Christian denomination. Several of the newspapers are wholly in German.

At the annual Fall Festivities in October there are, besides a popular fair, an exposition and a great 'Procession of the Veiled Prophet,' somewhat like the Mardi Gras celebration at New Orleans. The exhibition of 1904, a world's fair on a great scale, was timed to commemorate the Louisiana Purchase, by which the United States acquired from France—President Jefferson and Napoleon being representatives—1,000,000 square miles of the Mississippi basin (see UNITED STATES).

Some twenty railroads enter St Louis, the terminus of all being the new Union Dépôt (1874-92). The Mississippi at St Louis is spanned by three bridges. The oldest of these, the Eads, was opened for traffic 4th July 1874. It consists of three spans, the central being 520 feet in the clear; and the two side spans 502 feet each. It is a railroad, foot, and wagon bridge, and connects with the Union Dépôt by a tunnel one mile long under the city. There are in addition the Merchants' steel railroad bridge

(1890), 2420 feet long, and the McKinley Bridge (1907) for electric railways.

In 1875 St Louis was separated from the county of St Louis and given an independent government of its own. The mayor and municipal assembly constitute the governing power. The position of the city in the midst of the Mississippi valley gives it a commanding place as a trading centre, with an immense distributing and manufacturing business. Amongst its staples are cotton, bread-stuffs, packed meats and foods, tobacco, live-stock, timber, furniture, machinery, grain, wool, and furs; and in respect of manufactures St Louis holds the fourth place amongst American cities. It is the chief tobacco-manufacturing place in the world, and its annual product of flour, boots and shoes, enamel ware, hardware, railway cars, stoves, bricks, wooden wares, drugs, is enormous. It has a fur-market, and a large commerce in grain, live-stock, &c.

St Louis, the capital of the French colony of Senegal in West Africa, is situated on a small low island near the mouth of the Senegal River. Bridges connect it with N'dar Toute, a summer watering-place, on the right bank, and with the suburb of Bouetville, the terminus of the railway, on the left bank. The mouth of the river is rendered dangerous by a shifting bar of sand. The great ocean steamers land goods and passengers at Dakar, on Cape Verde, 100 miles to the south-west, and thence they are conveyed by rail. Nevertheless, the place has a trade of considerable importance, gums and earthnuts being exported. The climate is not healthy; water is supplied by an aqueduct $7\frac{1}{2}$ miles long. There are a cathedral, governor's palace, &c., and a public garden. Pop. 18,000.

St Louis, a town of the French island of Réunion (q.v.), 28 miles from St Denis; pop. 15,000.

St Louis. See MAURITIUS.

St Lucia, the largest of the Windward Islands, in the West Indies, 42 miles long and 15 to 20 wide, with an area of 233 sq. m. Pop. (1924) 54,304. The chief products are sugar, cocoa, logwood, lime-juice, honey, rum, and coconuts. Sugar and cocoa are the principal exports. Much of the island is high and rocky land, covered with well-nigh impenetrable forest, and it contains extensive deposits of sulphur. The climate is in the main healthy, a fresh trade-wind blowing almost continually. The island, discovered in 1502, was colonised by the French in 1563; up to 1803, when it definitively became a British possession, it frequently changed hands between France and Britain. The capital is Castries (pop. 6000), a coaling and shipping centre. St Lucia suffered severely from the great hurricane, with deluge of rain, of 1898.

St Lucia Bay, a lagoon at the mouth of the Umfulosi River in Zululand, surrounded by uninhabitable swamps. Cape St Lucia is a promontory to the south of the channel which connects the lagoon with the sea.

St Malo, a fortified seaport of Brittany, dept. Ille-et-Vilaine, stands 51 miles NNW. of Rennes, by rail, on the estuary of the Rance. The old town clusters all over a rocky islet that is surrounded with walls and connected with the mainland by a single narrow causeway (*Sillon*). Forts and batteries crown several rocks lying off the town, and the defences are completed by an old castle next the causeway. The harbour is safe, but difficult of approach; the tides sometimes rise 50 feet, and storms dash over the top of the battlements. About the end of the 17th century the people of St Malo reaped large fortunes by privateering in the English Channel, and the port was the headquarters of the French East India Company. The harbour, which lies between St Malo and St

Servan, is common to both places. The trade is mainly with Britain. Regular services connect Southampton and the Channel Islands with St Malo, which exports potatoes, vegetables, dairy produce, chestnuts, apples, slate, and imports wood, coal, iron, &c. The people, 12,000 in number, are engaged in fisheries, the coasting-trade, shipbuilding (launches and small craft), and tanneries. The former cathedral, now the Church of St Vincent, has a gloomy nave and a beautiful choir dating from the 12th and 14th centuries respectively. The see was established in the 12th century, but suppressed in 1790. Among eminent natives of St Malo are Chateaubriand, Maupertuis, Lamennais, and the sailors Cartier and Labourdonnais. The English bombarded the town in 1693 and 1695, and in 1758 an expedition led by the third Duke of Marlborough burned numerous vessels lying in the harbour. Suburbs connect St Malo with Paramé and St Servan, while Dinard, across the Rance, is a fashionable watering-place.

Saint-Marc Girardin. See GIRARDIN.

St Martin, one of the Lesser Antilles, in the West Indies, has since 1648 been divided between France and the Netherlands. It exports sugar, cotton, tobacco, maize, &c., and large quantities of salt. The French portion, a dependency of Guadeloupe, has an area of 20 sq. m. and a pop. of 4000. The Dutch portion, a dependency of Curaçao, has an area of 18 sq. m. and a pop. of 2000.

Saint-Martin, LOUIS CLAUDE (1743-1803), a French philosopher ('le Philosophe inconnu'), was born at Amboise, and died at Aurai near Châtillon. Influenced by Böhme and Mystras, he was a vigorous opponent of sensationalism and materialism. Of his numerous works among the best known are *Des Erreurs et de la Vérité* (1775); *De l'Esprit des Choses* (1800); and *L'Homme de Désir* (1790). See the *Essai* on him by Caro (1852), and the Life by Waite (1901).

St Mary Church, now part of Torquay (q.v.).

St Marylebone. See MARYLEBONE.

St Marys, a city of Ohio, on the St Mary's River. Natural gas and oil are abundant in the district, while the town has woollen, paper, and flour mills, &c. Pop. 5700.

St Mary's Loch, a Scottish freshwater lake in the west of Selkirkshire, 16 miles WSW. of Selkirk, 10 S. of Peebles, is picturesquely situated like a mirror among the hills, and is aptly described by Scott as 'lone St Mary's silent lake.' Lying 814 feet above sea-level, it is crescentic in shape; its length is 3 miles, its maximum breadth 1 mile, and maximum depth 153 feet. The river Yarrow issues from its north-eastern end, while at the other extreme it is connected with the smaller Loch of the Lowes; Meggat Water is the chief of the tributary streams. To the north are traces of the ancient St Mary's Kirk, whence comes the name of the loch. The district has many associations with James Hogg (q.v.), the 'Ettrick Shepherd.' His cottage at Altrive stands some distance to the east; a monument erected to his memory in 1860 stands on the south-west, as does also the inn of Tibbie Shiel (d. 1878), a former servant of Hogg's father. At this famous inn Hogg, Aytoun, and many other worthies used to forgather.

St Mary's River, the strait connecting Lakes Huron and Superior, with a 'sault' of 20½ feet.

St Maur. See MAURISTS.

St Mawes, a village of Cornwall, on an offshoot of Falmouth Harbour, 3 miles E. of Falmouth. It has a castle (1542), and from 1562 to 1832 returned two members.

St Michael's, or SÃO MIGUEL. See AZORES.

St Michael's Mount, a conical and isolated granite rock in Mount's Bay, Cornwall, 3 miles E. of Penzance. It communicates with the shore by a causeway 560 yards long, which, however, is covered with water eight hours out of the twelve, and sometimes is impassable for two or three days together. The Mount is 267 feet high, and is crowned by an old and picturesque castle—now used as a manorial residence—surmounted by a tower, on one angle of which there is a projecting stone lantern, popularly called 'St Michael's Chair.' At the base of the north or landward side of the Mount is a fishing-village. The 'guarded mount' is said to have received its name from an apparition of St Michael to some hermits; and Edward the Confessor founded upon it a Benedictine priory, which in 1088 was annexed to the abbey of Mont St Michel in Normandy.

St Michel, MONT, an extraordinary rocky islet of the Norman department of Manche, in the bay of St Michel, 18 miles WSW. of Avranches. It is a solitary cone of granite, a thousand yards in circumference and 260 feet high. It rises sheer out of a level expanse of sand, and, though its elevation is not great, the perfectly flat environment and its pointed crest render it a most striking feature in the landscape. Till 1880–81 it was only accessible by crossing the sands at low-water, there being a firm track across them, with quicksands to right and left; but a good road was then formed along a causeway a mile in length. A Druid stronghold once, the islet, as the scene of an apparition of St Michael in 708, became in 966 the seat of a great Benedictine monastery, which, 'half church of God, half fortress,' has memories of Henry I., II., and V. of England, resisting the last successfully in two sieges. The Revolution transformed this celebrated place of pilgrimage into a prison, and such it remained until 1863; in 1874 it was declared a 'monument historique,' and large sums were spent on its restoration by Viollet-le-Duc and his successor. The buildings include the church (c. 1020–1521), with Norman nave and Flamboyant choir; the exquisite cloisters (1228); the Halle des Chevaliers (1220), where Louis XI. in 1469 founded the order of St Michel; 'La Merveille,' the monastery proper, so called from its huge north wall of the 13th century, 246 feet long and 108 high; and numerous crypts dating variously from the 10th to the 12th centuries. Beneath is a little fortified town with 200 inhabitants.

St Mihiel, a fortified town on the right bank of the Meuse, in Meuse department, France, 20 miles SE. of Verdun. There are iron-works and manufactures of hosiery and of paper. The Benedictine abbey, founded in 709, is famous. During the Great War St Mihiel was the apex of an important salient in the lines held by the Germans attacking Verdun, and was the scene of a famous American victory in September 1918. Pop. 10,000.

St Moritz, a favourite watering-place in the upper Engadine (q.v.), with chalybeate, sulphurous and other mineral waters, and a pop. of 1600.

St Nazaire, a seaport of France, dept. Loire-Inférieure, is situated on the north side of the estuary of the Loire, 40 miles by rail W. by N. of Nantes. During the 19th century large sums were spent on harbour improvements, and extensive docks were built to accommodate the larger vessels that were unable to get up the Loire to Nantes (q.v.). The shipping increased rapidly, and St Nazaire became one of the leading ports of France, served by numerous lines of passenger steamers. It has busy metallurgical works and great shipbuilding yards, where battleships and large mail and cargo steamers are constructed.

The most important of the imports are timber, coffee, sugar, rice, and of the exports, agricultural produce, cloth, wine, spirits. Pop. (1851) 2400; (1891) 26,461; (1921) 41,631.

St Neots, a market-town of Huntingdonshire, on the Ouse, 8 miles SSW. of Huntingdon. It takes name from the ninth-century hermit St Neot, whose relics were translated from St Neot (close to Liskeard) in Cornwall to a Benedictine monastery founded at Eynesbury, close by, in 974; and it has a fine parish church, Perpendicular in style. Pop. 4000.

St Nicolas, a town of Belgium, in East Flanders, 12 miles by rail W. by S. of Antwerp, stands in the midst of the district of Waes, a densely-peopled and productive agricultural region. It has a large flax-market, and manufactures cotton and woollen stuffs, lace, needles, bricks, and pottery. A flourishing trade is carried on in linens, flax, corn, &c. Pop. 35,000.

St Omer, a town of France (till 1892 a second-class fortress) dept. Pas-de-Calais, stands in a marshy site, on the Aa, 26 miles SE. of Calais by rail. The chief objects of interest are the Gothic cathedral (13th–15th century), with remarkable sculptures, the ruined tower and arches of the Benedictine abbey church of St Bertin, an arsenal, a museum, and a library. A college for the education of English and Irish Catholics was opened at St Omer in 1592. It was closed during the Revolution, but still exists as a seminary. Alban Butler was a president, and O'Connell a student. The people carry on active manufactures of tobacco-pipes, linen, shoes, sugar, with brewing, distilling, and tanning. Pop. 19,000.

Saintonge, a former French maritime province, now forming mainly the department of Charente-Inférieure. The capital was Saintes (q.v.).

St Paul, capital of the state of Minnesota, occupies a commanding situation on both banks of the Mississippi, near the mouth of the Minnesota River, one of its great tributaries. With Minneapolis it ranks as one of the 'twin cities of Minnesota.' It is the outgrowth of a small hamlet of voyageurs, chiefly Canadian, employed in the fur trade and in selling whisky to the soldiers at Fort Snelling in the vicinity. The first log-huts were erected on the site of the city in 1840, and in 1841, at the suggestion of a Roman Catholic priest who made occasional visits, a small log-chapel was erected and dedicated to St Paul, which has given the name to the city. In 1842 the first family of American ancestry arrived, and in 1846 the hamlet had become of sufficient importance to have a post-office. In the act of the United States congress passed in 1849 authorising the organisation of Minnesota Territory, St Paul was designated as the capital, and from that time has occupied an important position. At that period the town did not contain a brick or stone building, and the number of inhabitants was about 500. Upon the lower plateau of limestone rock are the capitol, post-office, city hall, and large stores; the best private residences are on the upper plateau, overlooking the Mississippi. The Summit Avenue is noted for its width and the beauty and costliness of the houses. The sanitation of the city is excellent, and there are some thirty public parks. Ample provision is made for education. There are several colleges, not under the control of the city or state; Macalester College, the oldest of these was chartered in 1853, and that year opened its preparatory department, known as the Baldwin School; Hamline University, chartered in 1854, is under the control of the Methodist Church; and St Paul's College and Seminary are Roman Catholic. There are also the Agricul-

tural College of the State University, the State Historical Library, and an Academy of Natural Sciences. There are churches of all denominations. All parts of the city are reached by electric street-railways. St Paul is a great railway centre, is the centre of the wholesale grocery and dry goods business in Minnesota, and has the largest manufactures in the west of boots and shoes and of clothing. It has also large railroad and machine shops, and manufactories of agricultural implements. Pop. (1860) 10,701; (1880) 41,473; (1890) 133,156; (1920) 234,698.

St Paul, a bare volcanic islet, 860 feet high, in the Indian Ocean, midway between Africa and Australia, in 38° 42' S. lat. and 77° 32' E. long.; area, 3 sq. m. Both it and the densely vegetated New Amsterdam (26 sq. m.), 50 miles to the north, were taken possession of by France in 1843.

St Paul's Rocks, a group of small islets 1° N. of the equator and 540 miles from the South American Atlantic coast.

St Paul's School was founded in 1509-12 by John Colet (q.v.), dean of St Paul's, for 153 children 'of every nation, country, and class,' with William Lilye as the first headmaster. The original schoolhouse in St Paul's Churchyard was burned in the Great Fire of 1666; the second by Wren (1674) gave place in 1824 to a third; and a fourth, at West Kensington, near Addison Road station, was opened in 1884. The boys' school is now one of the largest secondary day-schools in England, with some 600 boys. Famous Paulines have been Camden, Milton, Halley, Pepys, the Duke of Marlborough, Sir P. Francis, Judge Jeffreys, Major André, and Jowett. St Paul's School for Girls, a modern development of Colet's foundation, is near.

St Peter Port, the town of Guernsey (q.v.).

St Petersburg, now LENINGRAD, from 1713 to 1918 the capital of Russia, stands at the head of the Gulf of Finland, in 59° 56' N. lat. and 39° 19' E. long., at the mouth of the Neva. The flat and low marshy ground upon which the city is built only recently emerged from the sea, and even in historical times the hills of Pulkova and Duderhof, which are now at a distance of 9 miles from the shore, stood close by the sea. Before entering the sea the mighty Neva, which flows 36 miles from Lake Ladoga, divides into many branches, thus giving origin to no less than 100 islands of various sizes, the surfaces of which rapidly increase. The average area added in this way to St Petersburg in a century and a half was 4 acres in a year. When a strong wind is blowing from the sea its level rises by several feet, and the poorer parts of the city are inundated every year; but when the overflow exceeds 10 feet nearly the whole is inundated. Such was the case in 1777 and 1824, when the Neva rose 13·8 feet above its average level. In August 1891 it rose again for a few hours full 10 feet above the average. The country round St Petersburg being covered with morainic deposits, peat bog, and marshes, is so thinly peopled that the government of St Petersburg (without the city) has only 90 inhabitants per square mile. The almost uninhabited wildernesses of Karelia, Olonetz, and Vologda, beginning at the very gates of Leningrad, stretch towards the north and east, while the lake-depression (see RUSSIA) and the very thinly peopled tracts of the Valdai plateau separate from the Russian cities of Tver, Yaroslav, and Moscow (400 miles). Within a radius of 120 miles there is not one single town worth naming, the towns nearest to the former Russian capital being the now decaying Novgorod, the Finnish cities of Viborg and Helsingfors (263 miles), and the Estonian and Lettish cities of Reval and Riga (449 miles). Nevertheless the

mouth of the Neva was from an early period coveted by the Novgorod merchants. In the 15th century they already had their factories at the head of the delta of the Neva; so that Peter I. only followed the tradition of the Novgorodians when he took possession of the Swedish forts at the head and at the mouth of the Neva, laid the first foundations of his capital (in 1702) on one of the islands of the delta, and dreamed to make of it a new Amsterdam. His dream was realised to some extent, but St Petersburg still remains somewhat isolated from the rest of Russia. Connection was established through the Neva, which, connected by canals with the upper Volga, became the virtual mouth of the immense basin of the chief river of Russia and its numberless tributaries. Owing to this connection St Petersburg became, and has remained almost since its founding, the chief port of Russia for the export of raw produce and the import of manufactured goods. Foreign trade and the centralisation of all administration in the residence of the emperor made of St Petersburg a populous city with more than a million inhabitants and covering 42 sq. m., on the banks of the Neva and the islands formed by its branches—the Great Neva, the Little Neva, the Great Nevka, the Little Nevka, and scores of others. The removal of the government to Moscow, with civil war, blockade, and other troubles, reduced the population from 1,907,708 in 1910 to 1,071,103 in 1920. On the other hand, Leningrad (including Cronstadt) is now Russia's only port on the Baltic.

The Great Neva, the chief branch, which has within the city itself a width of from 400 to 700 yards, and carries every second 1,750,000 cubic feet of very pure water, is a most beautiful river. It is so deep that large ships can lie alongside its granite embankments. But it is rather shallow at the mouth, with a narrow and sinuous channel across the bar, so that Cronstadt, built on an island 16 miles to the west of St Petersburg, was not only its fortress but also its port, till 1885, when a ship-canal, 20 miles long and 22 feet (now 28) deep, was constructed to admit ships to the Galernaya Harbour in the south-west corner of St Petersburg. A shallower channel admits lighter ships. The main body of the city, containing all the chief streets, stands on the mainland, on the left bank of the Neva; and a beautiful granite quay, with a long series of palaces and mansions, stretches for 2½ miles from the timber-yards in the east to the New Admiralty in the west. Three permanent bridges cross the Neva; another, built on boats, is removed in autumn and spring, as well as when the ice of Lake Ladoga comes down the Neva in the beginning of May. Vasilievsky Island, between the Great and Little Nevas, has at its head the Stock Exchange, surrounded by spacious storehouses, and a row of scientific institutions, all facing the Neva—the Academy of Sciences, the University, the Philological Institute, the Academy of Arts, and various schools and colleges. On Peterburgskiy Island, between the Little Neva and the Great Nevka, stands the old fortress of St Peter and St Paul, facing the Winter Palace, and containing the Mint and the cathedral wherein the members of the imperial family are buried. Farther up the mainland on the right bank of the Neva is covered by the poorer parts of the city, but contains some public buildings and a great number of factories. Numerous islands, separated from each other by the small branches into which both Nevkas subdivide, and connected together by a great number of wooden bridges, are covered with beautiful parks and summer-houses. The main part of Leningrad has for its centre the Old Admiralty; its lofty gilded spire and the gilded dome of St Isaac's

Cathedral are among the first sights caught on approaching by sea. Three streets radiate from it, east-south-east, south-east, and south; the first of them the famous Nevskiy Prospekt; while four canals describe irregular half-circles which intersect these three streets at right angles. The street architecture, with its huge brick houses covered with stucco and mostly painted gray, is rigid and military in aspect. But the canals and the bridges which span them, the width of the chief streets, and an occasional glimpse of the Neva or of some broad square break the monotony.

A spacious square, planted with trees, encloses the Old Admiralty on three sides. To the east of it rise the huge and magnificent mass of the Winter Palace, the Hermitage Gallery of Art, and the semicircular buildings of the general staff, which surround a square facing the palace, and adorned by the Alexandra column, a shaft of red granite 84 feet high. To the west of the Admiralty is the Petrovskiy Square, where prances the well-known statue of Peter I.—the work of Falconet—on an immense block of granite brought from Finland. The cathedral of St Isaac of Dalmatia, in the south of it, is an almost cubic building (330 feet long, 290 broad, and 310 high), surmounted by one large and lofty and four small gilded domes. This church, erected by Nicholas I., is devoid of architectural beauty, but its peristyles of immense red granite monoliths give it a character of rude majesty. Its interior decorations are very rich, and it contains pictures painted by the best representatives of Russian art of its period. A somewhat stiff monument to Nicholas I. by Baron Clodt stands on a large square to the south of the cathedral.

The Nevskiy Prospekt is one of the finest streets of the world, not so much for its houses—they are of a very mixed and mostly vulgar architecture—as for its immense width and length, the crowds which overflow its broad *trottoirs*, and the vehicles which glide over its wooden pavement. It runs for 3200 yards, with a width of 130 feet, from the Admiralty to the Moscow railway station, and thence with a slow bend towards the south for another 1650 yards, to reach again the Neva near the Smolnyi convent. About midway in its first part it passes by the Kazan cathedral, the Gostinoy Dvor—a two-storied building containing numerous shops—the public library, the square of Catharine II. adorned with a gorgeous but tasteless statue of the empress, and the Anitchkoff Palace. It crosses the Fontanka on a broad bridge adorned by four groups in bronze of wild horses with their tamers.

The climate is less severe than might be expected, but it is unhealthy and very changeable on the whole. The average temperatures are 15.4° F. in January, 64° in July, and 38.6° for the year. Still, the Neva remains frozen for an average of 147 days every year. A short but hot summer is followed by a damp autumn and very changeable winter, severe frosts being followed by rainy days in the midst of winter, and returning in April and May after the first warm days of the spring.

As a manufacturing centre, Leningrad has not the importance of Moscow. Its factories produce cottons and other textiles, metals, machinery, leather, sugar, guns, porcelain goods, &c. There are many large factories in the surrounding country, but the industrial establishments of the town itself are chiefly small.

The great number and variety of scientific, literary, artistic, and technical institutions, and of institutions for higher education, as well as the development of the press, rendered life at St Petersburg especially attractive, the more so as the provincial towns of Russia decidedly suffered from a lack of such. Even Moscow, which down to

1848 was the intellectual centre of Russia, had largely fallen from that position. Leningrad has a university, and numerous academies, medical, technological, engineering, naval, military, &c. The scientific societies are very numerous: the Academy of Sciences and its branches are well known in Europe, while the scientific museums enjoy a high repute. The Botanic Garden is famous. Great facilities for work in all branches of art are afforded by the Academy of Arts; and Leningrad is on the whole a very musical city, with an excellent conservatoire. The public libraries are numerous. Besides the Public (formerly Imperial) Library (see LIBRARY) there are the libraries of the Academy of Sciences, the University, the Council of State, as well as those of the scientific societies, some of which are very rich in their special branches. There are besides rich art collections in the Hermitage and Winter Palace (Flenish, Russian, and early Italian schools well represented, and priceless collections of Greek and Scythian antiquities). Many pictures from private collections confiscated at the Revolution have gone to the Winter Palace, as well as those which belonged to the Academy. Other private collections remain where they were, the old palaces of the nobility being retained as museums. It is noteworthy that there was little looting or destruction in the historic houses of Leningrad, even where there was actual fighting. On the other hand, depopulation and dearth of fuel have led to the demolition of many wooden buildings of no particular interest. Leningrad is the chief seat of the Russian publishing trade.

St Petersburg, a town of Florida, is situated on Pinellas Peninsula on the west coast, 20 miles SW. of Tampa. Much fruit is grown in the neighbourhood, and there are cigar and furniture factories. In 1924 a concrete bridge, some 6 miles long, across the Gulf of Tampa was completed, to provide direct communication between St Petersburg and Tampa, both of which are popular winter and summer resorts. The terrific hurricane which devastated Miami in 1926 also did some damage to St Petersburg. Pop. 27,000.

St Pierre, was the largest town, though not the capital, of the island of Martinique (q.v.) in the West Indies, with a good harbour (defended by a fort), a cathedral, a college, a botanical garden, and 30,000 inhabitants. Founded in 1665, it was the birthplace of Josephine, consort of Napoleon I. It was utterly destroyed in a few minutes on the 8th May 1902 by an appalling eruption of Mount Pelée, a volcano long supposed to be extinct.

St Pierre. See RÉUNION, and MIQUELON.

Saint-Pierre, JACQUES-HENRI BERNARDIN DE, the author of *Paul and Virginia*, was born at Havre, 19th January 1737. His parents were amiable but foolish people with absurd pretensions to family, and the education of the abnormally imaginative boy was ill regulated from the beginning. He found his ideals in the Lives of the Saints and *Robinson Crusoe*, made a voyage to Martinique in one of his uncle's ships, and returned to pursue irregular studies at Caen and Rouen. He dreamed of a missionary's life, but was sent to Paris to become an engineer, and found himself at twenty-three on his father's second marriage compelled to shift for himself. He served some time in the Engineers, but quarrelled with his chiefs and was dismissed, and next year was sent to Malta only to suffer the same experience. His head was turned by the writings of Rousseau, and he made public employment impossible for him by the innumerable utopian memoirs and criticisms on matters of administration with which he deluged the bureaux of the ministers. Buoyed up by

dreams of a new state to be founded on the shores of the Sea of Aral, he travelled on nothing to Russia, and returned in dejection to Warsaw, where in his three months' stay occurred the romance which grew into that legend of the love of a princess which he ended by believing in himself. Next followed further wanderings to Vienna, Dresden, and Berlin, and a government expedition to Madagascar, which he abandoned at the Île de France, to spend there almost three years of melancholy and observation. In June 1771 he returned to Paris, his head full of ideas, yet he hesitated awhile before he recognised his true vocation. His *Voyage à l'Île de France* appeared early in 1773, and at first attracted little attention. Yet it gave a distinctly new element to literature in that close portraiture of nature—that apprehension of the mysterious correspondence between the spectacle and the spectator, which nowadays adds the personal accent to descriptions of landscape. As he himself said of the contemporary descriptions, 'la physionomie n'y est pas,' and indeed even Rousseau's *Confessions* and *Rêveries* (both later) give us sensations rather than images.

A close friend of Rousseau in his last years, Saint-Pierre became misanthropic and half-crazy through poverty and lack of sympathy, and wearied out his few friends with his importunities. His *Études de la Nature* (3 vols. 1784) showed the strong influence of Rousseau in its sentimentalism, its inspired folly, and the ridiculous length to which it carries the use of final causes. He proves the existence of God from poetic reasons; everything in nature points to Him, for God made nature for man, and man for Himself. Nature makes men good; society corrupts them—'plus la société est policée, plus les maux y sont multipliés et cruels.' Hence the value of ignorance—the mother of all mystery—especially to women. In his Elysium are no capitalists nor nobles, but monuments to the inventors of useful arts, and such especial benefactors of the race as Nicot, who introduced tobacco into Europe. Not to speak of more essential faults, the book contains much wild physical science, as his theories of the tides and elongation of the poles. The new work was received with immense applause, and a fourth volume followed in 1788, containing the immortal *Paul et Virginie*, its author's one work of genius. Humboldt owns the wonderful truth with which it realises the splendours of tropical vegetation, but it is as an exquisite idyll of love growing up unconsciously in two natural hearts that the book possesses a perennial charm even for such critics as Sainte-Beuve and Gautier. *Daphnis and Chloe* suggested the idea of the change from friendship into love, but individual genius alone wrought the peculiar spell which carried *Paul and Virginia* quickly across Europe in English, Italian, Dutch, Russian, Polish, and Spanish translations, and which made Napoleon take it with him in his Italian campaign, and re-read it at St Helena. Yet the story has many faults besides its overstrained sentimentality—it is sadly marred by its didactic passages, and indeed the whole is but an object-lesson to the *Études*. His next works were *Vaux d'un Solitaire* (1789) and the weaker novel, *La Charmière Indienne* (1791).

At fifty-five Saint-Pierre married the daughter of his printer, a girl of twenty, and at sixty-three he married another young girl, who after his death became the wife of Aimé Martin, his enthusiastic biographer and editor. A member of the Institute from its foundation in 1795, he was admitted to the Academy on its revival in 1803, but he made himself ridiculous by childish quarrels with his fellow-members. Napoleon heaped favours upon him, and he lived comfortably amid his flowers till

his death in his country-house at Eragny, near Pontoise, 21st January 1814.

Saint-Pierre wrote down to the last, yet did not succeed in destroying his reputation. His *Harmonies de la Nature* (3 vols. 1796) was but a pale repetition of the *Études*. Besides these the *Le Café de Surate* and the *Essai sur J.-J. Rousseau* alone deserve to be named. His name survives only in his one masterpiece, but his influence remains entire in the greater Chateaubriand and Lamartine.

His *Œuvres Complètes* by Aimé Martin fill 12 volumes (1813-20); the *Correspondance*, 4 volumes (1826). His great Biography by the same editor appeared in 1820; its extravagances may be corrected by Arvède Barine's clever study (1891) in *Les Grands Écrivains Français*. See also Mornet, *Le sentiment de la nature en France de Rousseau à Saint-Pierre* (1907).

St Pol de Léon, a decayed town in the Breton department of Finistère, near the English Channel, 13 miles NNW. of Morlaix. It has a beautiful cathedral (13th to 15th century), dedicated to St Pol, who came hither from Cornwall in the 6th century, and also the Kreizker church, with a famous open-work spire 283 feet high. Pop. 7000.

St Quentin, a town in the French department of Aisne, stands on the Somme, by rail 95 miles NE. of Paris and 33 S. of Cambrai. The church of St Quentin is a remarkably fine Gothic structure (damaged during the Great War), dating from the 12th to the 15th century, and containing a much more ancient crypt. The town-hall (15th and 16th centuries) is also a fine specimen of Gothic. The town suffered considerably during the Great War, but its trade soon recovered. The chief industries are manufactures of cotton and wool, embroideries, machinery, and commerce in grain. Pop. (1911) 55,571; (1921) 37,345. St Quentin and its vicinity have been the scene of many memorable battles. The Spaniards under the Duke of Savoy and Ferdinand Gonzaga, assisted by an English contingent under the Earl of Pembroke and Egmont in command of the Flemings, inflicted a crushing defeat upon the French under Constable Montmorency, on 10th August 1557 (St Lawrence's Day), a victory which Philip II. commemorated in the Escorial (q.v.). Shortly afterwards the town, after a brilliant defence by Coligny, capitulated to the Spanish army. On 19th January 1871 the Germans under von Goeben defeated the army of Faidherbe, capturing nearly 10,000 prisoners. The Germans occupied St Quentin from August 1914 to 1st October 1918, and for many months this front was the point of junction of the French and British armies. The battle of St Quentin (or second battle of the Somme) in March 1918 ended in the retreat of the British fifth army against overwhelming odds.

St Raphael, a popular health resort near Fréjus (q.v.).

Saint-Réal, CÉSAR VICHARD, ABBÉ DE, who has been, and not undeservedly, styled the French Sallust, was born in 1631 at Chambéry, and died there also in 1692. He went early to Paris, visited London and there lived awhile under the shelter of St Evremond and the Duchesse de Mazarin, but in 1679 settled at Chambéry as historiographer to the Duke of Savoy. He had been long a student of history when in 1674 he covered himself with distinction by his brilliant *Histoire de la Conjuración que les Espagnols formèrent en 1618 contre la République de Venise*, which to this day is counted among French classics. His style is vivid and vigorous, simple and pure, yet picturesque; and the story is unfolded with a skilful mastery of dramatic sense. It has been objected that the facts are not always reliable, the conclusions frequently unsound, but it should be remembered that Saint-Réal wrote history before the modern

conception of history awoke, and that his aim was to produce a good literary narrative, not a chronicle. A work of art should be estimated according as it corresponds to the ideal of the writer, rather than to the prepossessions of the individual reader, and, this test applied, the *Conjuration contre Venise* remains an exquisite masterpiece of historical painting in miniature.

Saints. See SAINT.

Saint Saëns, CHARLES CAMILLE, French composer, pianist and critic, was born in Paris 1835, and died on a visit to Algiers in 1921. At the age, it is said, of two and a half years he was taught the pianoforte by his great-aunt, and at seven he had further instruction from Stamaty, and subsequently learned harmony under Maleden. In 1847 he studied the organ under Benoist, and at the age of sixteen wrote his first symphony. He became organist, first of the church of St Méry, and in 1858 of the Madeleine, where he continued till 1877. One of the greatest executants of his time on the pianoforte and organ, he displayed remarkable powers of improvisation. He repeatedly made professional tours abroad in all the principal countries of Europe, including Great Britain, also visiting Africa, the United States twice, and South America once. Of his thirteen operas, by far the most successful has been *Samson et Dalila*, first produced at Weimar in 1877, and sometimes given as a cantata; but *Henri VIII.* (1883) and *Ascanio* (1890) had some popularity. His four symphonic poems (in which he follows the lead of Liszt), *Le Rouet d'Omphale*, *Phaëton*, *Danse Macabre*, *La Jeunesse d'Hercule*, are also well known. His other works include five symphonies; five piano, three violin, and two 'cello concertos; besides a large amount of chamber music, organ music, songs, &c. Saint Saëns laid stress on form as the essential part of music, advocating 'art for art's sake' and putting reason before sentiment. Though his very numerous compositions reveal an excellent technique and are distinguished for their clarity and vivacity, yet they always seem to be superficial, and to be lacking in depth of feeling and in a sense of realities. The same precise, clear-cut style is to be found in his literary productions (on a variety of subjects)—*Harmonie et Mélodie* (1885), *Problèmes et Mystères* (1894), *Portraits et Souvenirs* (1899), *Au Courant de la Vie* (1914), &c.

See studies by Nietzel (1899), Baumann (1905), and Hervey (1921).

Saintsbury, GEORGE EDWARD BATEMAN, was born at Southampton, 23d October 1845, and was educated at King's College School, London, and Merton College, Oxford. From 1868 till 1876 he filled scholastic appointments at Manchester, Guernsey, and Elgin, but soon after established himself firmly in the literary world of London as one of the most active and influential critics of the day. From 1895 to 1915 he occupied the chair of English Literature in Edinburgh University. All his work is characterised by clearness of thought, fullness of knowledge, and force, if not always grace of style; and he has been invaluable to his generation as a guide to French literature old and new. He has been an active contributor to the greater magazines (of *Macmillan's* he was for some time editor) and to encyclopædias, including the present work. Among his books are a *Primer* (1880) and a *Short History* (1882) of French literature; *Dryden in 'English Men of Letters'* (1881), and *Marlborough in 'English Worthies'* (1885); *Minor Poets of the Caroline Period* (3 vols. 1905–21); a *History of Elizabethan Literature* (1887); *Essays in English Literature, 1780–1860* (1891); *Essays on French Novelists* (1891), *Miscellaneous Essays* (1892 and 1895); *English Literature in the*

19th Century (1896); *The Flourishing of Romance and Rise of Allegory* (1897), a book on Scott (1897), a *Short History of English Literature* (1898), *Matthew Arnold* (1899), a great *History of Criticism* (1900–4), *The Earlier Renaissance* (1901), *Specimens of English Prose Style* (1885), the standard *History of English Prosody* (3 vols. 1906–10), *A History of English Prose Rhythm* (1912), books on the English (1912) and the French (1917–19) novel, *Notes on a Cellar-book* (1920), and a succession of *Scrap Books*.

St Servan, a French seaport, department Ille-et-Vilaine, on the Rance estuary, now practically a suburb of St Malo (q.v.), with fishing and ship-building; pop. 12,500.

Saint-Simon, CLAUDE HENRI, COMTE DE, founder of French socialism, was born at Paris, 17th October 1760, and belonged to the same stock as the ducal author of the memoirs. When D'Alembert was his tutor, he ordered his valet to rouse him every morning with the words, 'Rise, *Monsieur le Comte*, you have great things to do.' Like other French nobles, he showed his youthful enthusiasm for liberty by serving as a volunteer in the American war of independence against England. He did not, however, take any prominent part in the Revolution in his own country; his birth as an aristocrat brought him into suspicion with the extreme party, and he was imprisoned for a time. But he made a little fortune by speculating in confiscated lands; not from love of money, as we are assured, but that he might have leisure to promote the grand projects which he was now contemplating.

His ancestor Charlemagne had appeared to him in a dream, and encouraged him to devote his life to philosophy, by promising that his successes as philosopher would equal those of the emperor as warrior and statesman. Accordingly Saint-Simon now went through a long course of study and experiment to fit himself for his new career. Pleasure and science were alike welcome to him, provided they enlarged the circle of his knowledge and experience. One of his experiments was matrimony (1801); it proved a failure, and was soon terminated by a divorce. The lavish expenditure incurred during his experiments also reduced him to utter poverty, in which he passed the rest of his life. It was at this time that he made his characteristic proposal of marriage to Madame de Staël: 'Madame, vous êtes la femme la plus extraordinaire du monde, comme j'en suis l'homme le plus extraordinaire; à nous deux nous aurions, sans doute, un enfant plus extraordinaire encore.' Madame de Staël, however, declined to humour the philosopher, and Saint-Simon, now beginning to be in straits, published his first work, *Lettres d'un Habitant de Genève à ses Contemporains* (1803). His early writings were scientific and speculative. The first distinct approach to an enunciation of socialism occurred in a work *L'Industrie*, which appeared in 1817, and similar views were set forth in *L'Organisateur* (1819), *Du Système Industriel* (1821), *Catéchisme des Industriels* (1823). The last, and by far the most important, work of Saint-Simon was the *Nouveau Christianisme*, published in 1825. While writing these works the philosopher lived in utter penury, being often destitute of decent food and clothing, and hardly able to scrape together the means of publishing them. But for the kindness of friends and a small pension allowed him by his family in 1812 he would have died of starvation. In 1823 he had so exhausted his funds that he tried to shoot himself with a pistol, and lost an eye in the attempt. He died May 19, 1825.

It will be seen that the most prominent feature

of Saint-Simon's life was the originality with which he ordered it for himself. The heroic fortitude which he showed in enduring extreme poverty and neglect cannot be too highly commended. That his originality degenerated into eccentricity and vanity is evident enough. The like qualities and defects are found in his works. They are wanting in sober-mindedness, judgment, and system; they are loose, diffuse, and full of repetitions. Yet there must have been a great charm both in the personality and in the theories that attracted so many of the brightest and ablest young men of France, including Comte and Augustine Thierry. Notwithstanding all his vagaries and eccentricities, the man who originated Comtism and French socialism must be regarded as a seminal thinker of high rank. He sowed the seed which afterwards grew into important systems. In opposition to the destructive spirit of the Revolution, he sought after a positive reorganisation of society. He desired that the feudal and military system should be superseded by an industrial order controlled by industrial chiefs, and that the spiritual direction of society should pass from the church to the men of science. In the *Nouveau Christianisme* the cause of the poor is laid down as the groundwork of religion. Proceeding from the grand precept, 'Love one another,' Saint-Simon thus enunciated the fundamental principle of the new Christianity: 'The whole of society ought to strive towards the amelioration of the moral and physical existence of the poorest class; society ought to organise itself in the way best adapted for attaining this end.' According to Saint-Simon, the essence of religion and the transforming principle of the new society are alike contained in these words.

After his death the vague ideas of Saint-Simon were developed by his disciples into an elaborate system of socialism. During the excitement produced by the revolution of 1830 the school attracted great attention both in France and Europe. The *Globe* became its organ, and many of the most promising youth of France joined it. An association living out of a common purse was established. But dissensions connected with the marriage question arose between the two leaders, Bazard and Enfantin. Bazard, with many important members, seceded, and Enfantin, who had advocated lax ideas on the relations of the sexes, led the association into the lower depths of extravagance and absurdity till the courts of law interfered, and the society was broken up in 1832. Many members of the school afterwards played a leading part in various departments of French life. The first systematic presentation of socialism may be regarded as due to the Saint-Simon school, and it will be most convenient to give an account of their views under the article SOCIALISM.

An admirable edition of the works of Saint-Simon and Enfantin was issued by survivors of the school (47 vols. Paris, 1865-78). See the study by Booth in English (1871); the study by Janet (1878); two books by G. Weill (1894, 1896); and the monograph on Saint-Simon and Comte by G. Dumas (1905), all in French.

Saint-Simon, LOUIS DE ROUVROY, DUC DE, a great French writer, was born at Paris, 16th January 1675. His father, who was sixty-eight at his birth, had been a page and favourite of Louis XIII., and had risen rapidly at court, becoming First Equerry in 1627, and finally duke and peer in 1636, but soon after fell into disgrace, and passed much of his time thereafter at the castle of Blaye on the Gironde, which as governor he kept for the crown throughout the Fronde. The boy was given the title of Vidame of Chartres, as those of marquis and count had become too common. He received a careful education at home and at the academy of Rochefort, entered the service in the king's

household troops in 1691, and behaved with spirit at Neerwinden (1693) under the eye of Luxembourg. He succeeded his father in the title, as well as in all his appointments, in 1693, married in 1695, and served in the army of the Rhine under his father-in-law, the Marshal de Lorges, from 1694 till the peace of Ryswick, having offended Luxembourg by championing the action of the dukes in Parlement against his claim in a question of privilege. Dissatisfied with his promotion, he left the service in 1702, and repaired to Versailles, where he studied the 'insects of the court,' and conformed to all the tedious etiquette of Louis XIV., without for some years enjoying any measure of the royal favour. He embroiled himself in an endless series of disputes with members of the peerage about points of precedence and privilege, made a bitter enemy of the powerful Marquis d'Antin, as well as of the Duc de Maine, the eldest of the king's bastards by Madame de Montespan, who had been, to his great displeasure, given in 1694 a special rank below the princes but above the other peers; and he was disliked by the Dauphin and the whole 'cabal of Meudon' which surrounded him. Indeed, he left Versailles for a time, and passed most of the year 1709 in the country at La Ferté. But he recovered the king's favour by his efforts to bring his friend Orléans to a more reputable life, and by his successful intriguing in the project to marry the Dauphin's favourite son, the Duc de Berry, to the daughter of Orléans. The marriage took place in July 1710, and the Duchesse de Saint-Simon was, to his great regret, made lady-in-waiting to the young Duchesse de Berry, and passed nine uncomfortable years of attendance upon her half-maniac mistress. The death of the Dauphin (April 1711) relieved him of all anxiety for the future, for his son, the Duke of Burgundy, Fénelon's pupil, was his warm friend. But his joy was short-lived, for the virtuous young Dauphin and Dauphiness were both carried off by fever in February 1712. Another mortification was the elevation of the two bastards in 1714 to be princes of the blood. The king's death on 1st September 1714 opened up a bitter struggle between Orléans and Maine, in which Saint-Simon supported his friend with equal warmth and boldness. It ended in the complete triumph of Orléans; but though Saint-Simon had a seat on the council of the regency, he found Orléans indifferent to his schemes of financial reform, and the restoration to the peers of a paramount position in the work of government, but he had at least the gratification of seeing 'the bastards' degraded from the princely rank. His influence decreased as that of Dubois rose; but he was sent to Spain in 1721 on a splendid special embassy to demand the hand of the Infanta for the young king, Louis XV. The death of Orléans in December 1723 closed his public career, and he spent the next thirty years in calm retirement at his château of La Ferté Vidame near Chartres, 77 miles distant from Paris. Saint-Simon died in his house at Paris, 2d March 1755. He had struggled all his days with colossal debts, and he sank at last into sheer insolvency.

Saint-Simon amused himself, between the years 1734 and 1738, in making notes in an interleaved copy of Dangeau's dry and servile *Journal* (written 1684-1720); but he seems to have begun his own journal before 1699. Finally, about 1739, he began to prepare the *Mémoires* in their final form, and this task he completed about 1752. This precious MS. was claimed by his cousin, the Bishop of Metz, but it was finally impounded in 1761 by the Duc de Choiseul for the Foreign Office. It was read to furnish amusement for Madame de Pompadour; Madame du Deffand speaks of it in a letter to

Horace Walpole; and it had undoubtedly been seen by Duclos, Marmontel, and Voltaire. A volume of garbled extracts appeared at Brussels in 1780, but it was not till 1830 that the first authentic edition appeared, the MS. having been given to General de Saint-Simon by Louis XVIII.

Saint-Simon's Memorials on Precedent and Privilege are not interesting, nor yet his Letters, but his *Mémoires* remains a consummate masterpiece of literary art, in its kind absolutely alone. His knowledge of military affairs was inadequate; his fondness for a striking story was a standing snare to him; and other inaccuracies are plentiful enough; while his narrative is constantly marred by defective information and by prejudice, but never by deliberate falsehood. He was an honest hater—'all my life,' he says, 'I have known only too well how to love and how to hate'—but if he heaps his hatred upon Vendôme, Villars, Madame de Maintenon, Maine, Noailles, and Dubois, he has no less intense a love for Beauvilliers, for his spiritual adviser, the Abbot Rancé of La Trappe, and for his young hero the Duke of Burgundy. His life was pure in an impure age; he had an un-French dislike to all such frivolities as cards and frequenting playhouses; there is but one instance even of his taking part in a hunt. He describes with pity the horrors of hunger among the peasantry during the winter of 1709; and his heart was hot within him at the inhuman persecutions of the Jansenists and the Huguenots, which he ascribes directly to Madame de Maintenon, herself 'the dupe of her own hypocrisy'—a mere tool in the hands of the Jesuits. He loved the old Gallicanism of the French Church, and abhorred the infamy of the Revocation; he describes the military disasters and humiliation of the king's later years with a remorseless truth, but does ample justice to the dignity and kingly deportment of Louis, who 'never considered that any one but himself had been king of France.' He was an admirable observer, and he has left us an inimitable gallery of the portraits of a whole court, all distinct and individual, vivid and real. His aim was to make his reader think 'not that he is reading a history or memoirs, but rather that he is himself in the secret of all that is represented to him, and spectator of all that is related,' and in his aim he succeeded as no other has done before or since. Yet his style is unstudied, slap-dash, full of confusions of construction—'il écrit à la diable pour l'immortalité,' said Chateaubriand. Sainte-Beuve with these words sums up his judgment: 'Thanks to him—un Tacite au naturel et à bride abattue—we have nothing to envy in the earlier writer. And what is more, the vein of comedy, which he has so boldly scattered through his Memoirs, has given us in him truly a Tacitus à la Shakespeare.'

Editions of Saint-Simon's Memoirs were published in 1840 (40 vols.), 1856 (20 vols., ed. by Bédollière), and in 1873-86 (20 vols., ed. by Chénel), but the final complete edition of the *Mémoires*, with the additions to Dangeau's *Journal*, is that of Boislisle (30 vols., 1879 et seq.). Faugère published the *Œuvres Inédites* in 1880-92 (8 vols.). The *Projets de Gouvernement du Duc de Bourgogne* were published in 1860 and the *Lettres et Dépêches* of the Spanish Embassy in 1880. Volumes of extracts from the Memoirs appeared (in French) in 1891 and 1911 (ed. by Lanneau), while abridged English translations were made by Wormeley (4 vols., 1899) and Arkwright (6 vols., 1915-18). See Sainte-Beuve, *Causeries du Lundi* (vols. iii. and xv.) and *Nouveaux Lundis* (vol. x.); Taine, in *Essais de Critique et d'Histoire*; Chénel, *Saint-Simon considéré comme Historien de Louis XIV.* (1865); studies by Collins (1880), Cannan (1885), and Boissier (1892); books by Pilastre (1905, 1909); Meyrac, *Louis XIV., sa cour, ses maîtresses d'après Saint-Simon* (1911); and Domic, *Saint-Simon et la France de Louis XIV* (1919).

St Stephen's. See WESTMINSTER.

St Sulpice, the famous diocesan seminary for priests in Paris, close by the large and wealthy church of St Sulpice, on the south side of the Seine, near the Luxembourg.

St Thomas. See SÃO THOMÉ.

St Thomas, one of the Virgin Islands in the West Indies, sold in 1916, together with Santa Cruz (q.v.) and the less important St John, by Denmark to the United States, lies 36 miles E. of Puerto Rico. Area, 28 sq. m.; pop. 10,000, mostly negroes. English is the language of the educated classes. The surface is hilly (1555 feet) and the soil poor. The port, Charlotte Amalie or St Thomas (pop. 8000), was formerly a busy emporium for the European trade and the principal port of call in the West Indies. Geographically it is favourably situated, and the Panamá Canal may restore some of its old importance. Much imported coal is sold to passing steamers. The harbour is landlocked. Before the abolition of slavery St Thomas was covered with prosperous sugar-plantations. The island is often visited by earthquakes. It was first colonised by the Dutch in 1657, and became Danish in 1666. The British held it in 1667-71, 1801, 1807-15.

St Thomas, a town of Ontario, 15 miles S. of London by rail, with sawmills, foundries, railway works, and various factories. It is an important railway centre. Pop. 16,000.

St Thomas's, one of the great London hospitals, founded as a hospice in the 13th century, was moved from Southwark in 1868, and is now housed in seven four-storied red-brick pavilions, a spacious but ugly building standing opposite the Houses of Parliament, on the south side of the Thames. The revenue of the hospital is about £70,000. It has over 630 beds, and treats annually 8000 in-patients and over 60,000 out-patients.

St Victor, HUGO OF, a mediæval theologian, a Fleming, born near Ypres in 1097, died in 1141 as prior of the Augustinian monastery of St Victor at Paris, was a man of the school of Bernard of Clairvaux, and a mystic, his favourite teaching being that the intellect or its exercise, reasoning, will never enable man to discover the 'uncorrupted truth of things.' His writings were very popular in the monastic schools and in pietistic circles during the middle ages. His pupil, RICHARD OF ST VICTOR, prior of his monastery from 1162 to 1173, and a Scot by birth, went even further than Hugo in that he proclaimed mystic contemplation to be above reason.

Saint-Victor, PAUL DE, a superfine French writer, was born at Paris in 1827, the son of a poet who translated Anacreon and became a fine connoisseur in painting. He had his education at Freiburg in Switzerland and at the Collegio Romano at Rome, and made his début in 1851 as a dramatic critic in the *Pays*, under the protection of Lamartine, whom he had already served as secretary. In 1855 he carried his pen to the *Presse*, later to *La Liberté*, and last to the *Moniteur Universel*. He quickly made himself famous by his knowledge and insight, and by a brilliant style, marred only by its affectedness and over-elaboration. Sense of colour, imagination, a quick eye for the picturesque in everything, and the sovereign gift of the artist—the intuition of individuality—made him a word-painter of the first rank, while his severity of taste and his sense of form saved him from extravagance. Yet his style is splendid, Oriental or at least Italian rather than French—even in his appearance he was a Venetian who had stepped out of his canvas. 'When I read Saint-Victor, I put on blue spectacles,' said Lamartine, and Victor

Hugo wrote to him, after reading his review of the *Travailleurs de la Mer*, 'One would write a book merely to make you write a page.' His first book was *Hommes et Dieux* (1867), a series of historico-æsthetic studies on the Venus of Milo, Diana, Ceres, Helen, Nero, Marcus Aurelius, Cæsar Borgia, and Henry III. Later books were *Les Deux Masques, tragédie-comédie* (3 vols. 1879-83); *Anciens et Modernes* (1886); *Les Femmes de Goethe* (1869); *Victor Hugo* (1885); and *Barbares et Bandits*. Saint-Victor was reserved in temperament, and indeed, to speak truly, was something of a coxcomb. He lived an uneventful life, was for some years General Inspector of Fine Arts, and died at Paris, 9th July 1881. See the study by Alidor Delzant (1886), which reveals to us the strangely mechanical method in which he wrote. He first selected certain words, spread them about his page like colours on a palette, next grouped round them other euphonious terms, and lastly strung the whole together in a proposition.

St Vincent, one of the British islands in the West Indies, Windward Group, 105 miles W. of Barbados. Area, 150 sq. m.; pop. 46,744. The chief town is Kingstown (pop. 4000), at the head of a bay on the south-west coast. The island is traversed from north to south by a chain of volcanic mountains, which rise in the volcano called the Soufrière (in eruption in 1812 and 1902) to 3000 feet. Many of the valleys are fertile, and the shores are rich and productive. One-fourth of the area is under cultivation, a peasant proprietary being established under government auspices. The climate is healthy. Sugar, rum, cocoa, spices, and arrowroot are products; the sugar industry has steadily declined, and the total trade of the island fell in twenty years to about half, but cotton since 1903 has largely restored prosperity. The island has an administrator and a legislative council, since 1926 partly elected. St Vincent was discovered by Columbus in 1498, and was then inhabited by Caribs. These people were left in possession down to 1783, although Charles I. gave the island to the Earl of Carlisle in 1627. In 1797 the Caribs, rebelling with French aid, were transferred to the island of Rattian in the Bay of Honduras. St Vincent, with the other Windward Islands, suffered greatly from a hurricane of almost unparalleled violence in 1898; and in 1902, almost at the same time with the eruption of Mont Pelée on Martinique, the Soufrière burst into activity, vomiting lava and ashes, and causing 1600 deaths.

St Vincent, CAPE, a commanding promontory forming the south-western corner of Portugal. On June 16, 1693, Admiral Rooke was here attacked by a superior French fleet, and defeated with the loss of twelve men-of-war and eighty merchantmen which were sailing under his convoy; on January 16, 1780, Admiral Rodney destroyed here several Spanish ships of Langara's fleet; on February 14, 1797, the great battle of Cape St Vincent (see following article) resulted in the total defeat of the Spaniards and capture of some of their largest ships. This victory frustrated the formidable Spanish-French scheme of invading England. The fourth naval fight off Cape St Vincent took place between the fleet of Queen Maria of Portugal, commanded by Sir Charles Napier (q.v.), and that of Dom Miguel, in which a portion of the latter was destroyed and the rest captured, 5th July 1833.

St Vincent, EARL, Admiral. John Jervis was born at Meaford Hall, Staffordshire, January 9, 1735. Running away to sea as a boy, he rose to be a naval lieutenant in 1755, and so distinguished himself in the Quebec expedition in 1759 as to receive the rank of commander. As captain of the *Foudroyant* in 1778 he fought in the action off Brest, and in

1782 captured the *Pégase* of 74 guns, whereupon he was made K.C.B. In 1793 he commanded the naval part of the successful expedition against the French West India Islands. In 1795, now a full admiral, he received the command of the Mediterranean fleet. On the 14th February 1797, with only fifteen sail of the line and seven frigates, he fell in, off Cape St Vincent, with the Spanish fleet of twenty-seven sail. Jervis determined to engage the enemy, and the battle of St Vincent was fought; but it should be remembered that the genius of Nelson contributed greatly to the success of the day (see NELSON). For this victory the king created Jervis Earl St Vincent, and parliament settled upon him a pension of £3000 a year. After having, by great firmness, repressed a mutiny off Cádiz, which threatened the loss of the whole fleet, he was compelled by ill-health to return home. He was soon applied to by government to subdue the spirit of sedition which had openly manifested itself in the Channel fleet; and his endeavours were eminently successful. He held the appointment of First Lord of the Admiralty for the three years 1801-4, and reformed innumerable crying abuses; and having for a second time commanded the Channel fleet, he retired. He died 13th March 1823, and was buried at Stone, Staffordshire, with a monument in St Paul's Cathedral.

See his *Life and Correspondence*, by Captain Brenton (prejudiced; 1838); the standard *Memoirs of the Earl of St Vincent*, by J. S. Tucker (1844); the *Life*, by Anson (1913, based on Tucker); and the naval histories.

St Vitus' Dance. See CHOREA.

Sais, an ancient Egyptian city, called in the hieroglyphs *Sa*, was situated on the right bank of the Canopic branch of the Nile. It gave its name to two Egyptian dynasties, the 24th and 26th, founded by natives of the city. Sais was important as a religious capital, and had a famous temple of the goddess Neith and a tomb of Osiris. Towards the decline of the monarchy it rose to great splendour. The 26th dynasty transferred thither the capital of the kingdom. It was also a renowned seat of learning, and was frequently visited by the sages of Greece. The legend of the mysterious veiled statue in the temple at Sais (which formed the subject of Schiller's ballad and of Novalis's romance) is the issue of Greek invention.

Saith. See COAL-FISH.

Saivas is the name of one of the three great divisions of Hindu sects. See INDIA, Vol. VI. p. 106. The word designates the votaries of Śiva, and comprises different special sects, which varied in number at different periods of mediæval Hinduism. See ŚIVA.

Sakai, a town of Japan, situated on the south-west of the island of Nippon, 7 miles S. of Osaka. Before the rise of that town Sakai was the chief commercial port of Japan; its trade is now absorbed in that of Osaka. Pop. 85,000.

Sakai, a dwarfish jungle people of the south of the Malay Peninsula, with dark skin, black wavy hair, and broadish nose. They are classed as pre-Dravidian.

Sakhalin, or SAGHALIEN (Japanese *Karafuto*), is a long and narrow island (670 by 20 to 150 miles), running north and south, and lying close off the east coast of Siberia. The northern portion is Russian, and the southern Japanese, the parallel 50° N. lat. being the dividing line. The Strait (or Gulf) of Mamia Rinso (or Tartary) separates it from the mainland; the Strait of La Pérouse parts its southern extremity from Hokkaido (Yezo); and the misty, chilly sea of Okhotsk washes its eastern and northern shores. Owing to the vicinity of this sea, to the presence of ice-floes off the east coast, and to the dense forests, chiefly of coniferous trees, which clothe the

mountains (5000 feet) that run from end to end of the island, the rainfall is heavy and mists very prevalent, so that the climate is on the whole extremely raw and cold. Large areas, however, are fit for agriculture and pasturage, which the Japanese have been developing. The rivers are navigable for very short distances; but they, as well as the adjoining seas, teem with fish, the rivers especially with salmon; and herring, sturgeon, and salmon fisheries are very important. Coal is mined, and the rich petroleum supplies of the north-east were exploited after the Russo-Japanese war. The people are Gilyaks in the north, Ainu in the south. Soon after the Russians became masters of the whole island (1875) they made an attempt to colonise it by means of convicts, but the scheme proved a failure. Bears, sables, wild reindeer, tigers, and other wild animals occur. The vegetation is chiefly Siberian in character. Sakhalin, inhabited since the stone age, belonged to China until the beginning of the 19th century. The Japanese then held the southern part down to 1875, when they ceded it to Russia, certain of the Kurile Islands being granted in return. But after the war in 1904-5 the Japanese demanded the restitution of the whole island; ultimately, by the treaty, the Russians, who long refused to make any concession, restored the southern part (with its fisheries) to Japan. After the Russian Revolution the Japanese occupied Northern Sakhalin till 1922. Of the Japanese portion, the area is about 13,926 sq. m., and the population 105,900; of the Russian portion, the area is about 42,610 sq. m., and the population 52,600. See a French work by Labbé (1903), and *The Uttermost East* by C. Hawes (1903).

Saki (*Pithecia*), a genus of long-tailed American monkeys of the family Cebidæ. Some species (e.g. *P. hirsuta*) are covered with long hair, and are sometimes called Fur-tailed Monkeys. The Black Saki (*P. satanas*), from the Amazons, is the best-known species.

Saki, a kind of beer which the Japanese make from rice. It is the common alcoholic liquor of Japan. It is clear, and has a peculiar taste, which Europeans generally reckon unpleasant. The Japanese usually heat it before drinking, and pour it into flat cups or saucers of lacquered wood. It produces a very speedy and transient intoxication.

Sakjeguuzi, a site 62 miles WNW. of Carmelish, excavated by Professor J. Garstang, has yielded important Syro-Hittite and Aramæan sculptures.

Sakkara, a village 10 miles S. of Cairo, near the ruins of Memphis (q.v.), and famous for its eleven Pyramids (q.v.).

Śaktas is the name of one of the great divisions of Hindu sects. See INDIA, Vol. VI. p. 106.

Śakuntalā is one of the most pleasing female characters of Hindu mythology. She is mentioned as a water-nymph in the *Yagurveda* (see VEDA); she is the subject of an interesting episode of the *Mahābhārata* (q.v.), and is spoken of in the *Purāṇas*; but her name has become especially familiar in Europe through the celebrated drama of Kālidāsa (q.v.), which, introduced to us by Sir William Jones in 1789, became the starting-point of Sanskrit philology in Europe, and excited the warm admiration of Goethe.

Sakurashima, an island volcano in the Bay of Kagoshima, did much injury to the town of Kagoshima in 1914.

Śakyamuni, or the 'Saint Śākya,' is a name of the founder of the Buddhist religion. See BUDDHISM, Vol. II. p. 526.

Sāl (*Shorea robusta*), a tree of Northern India, whose wood—hard, dark brown, rather coarse

grained, but very durable—is next in value to teak. It is carefully cherished by government. See SHOREA, DAMMAR, DIPTEROCARPACEÆ.

Sala, GEORGE AUGUSTUS HENRY (1828-95), journalist and novelist, and a man of much out-of-the-way learning, was born in London, the son of an Italian and an Englishwoman, and, forsaking art for literature, became a contributor to *Household Words*, the *Welcome Guest*, *Temple Bar* (which he founded and edited), the *Illustrated London News* (to which from 1860 to 1864 he contributed the 'Echoes of the Week'), and *Cornhill*. As special correspondent of the *Daily Telegraph* he was in the United States during the civil war, in France during the war of 1870-71, in Russia in 1876, and in Australia in 1885. *Twice Round the Clock* was published in 1859. Among his best-known novels are *The Baddington Peerage* (1860), *Captain Dangerous* (1863), *Quite Alone* (1864). *Wat Tyler, M.P.* is a burlesque; and among the popular books of travel are *A Journey due North* (1859), *Dutch Pictures* (1861), *A Trip to Barbary* (1865), *From Waterloo to the Peninsula* (1866), *Rome and Venice* (1869), *Under the Sun* (1872), *Paris Herself Again* (1881), *America Revisited* (1882), *A Journey due South* (1885), *Things I have Seen* (1894), and his autobiographical *Life and Adventures* (1895). His last book was on cookery.

Salaam (*Selām*, Arab. = Heb. *Shalom*, 'peace'), the general term of salutation among the Mohammedans; 'Es-selāmu aleikum' ('Peace be with you') (addressed only to the faithful) being answered by 'With you be peace, and the mercy of God, and his blessings!'

Salad, a preparation of raw herbs for food, derives its name from the fact that salt is one of the chief ingredients used in dressing it. The principal salad herbs are lettuce, endive, chicory, celery, mustard and cress, water-cress, onions, radishes, tomatoes, chervil, and a few savoury herbs used to give flavour. They are usually cut up, and mixed with salt, vinegar, oil, and other condiments, according to taste, often with sugar. The great value of salads is in the fact that they are uncooked, and consequently contain more mineral matter, such as potash, soda, &c., than if boiled. Potato salad is made with boiled potatoes. Salads are often prepared with animal food, such as lobsters, crabs, eggs, &c. See MAYONNAISE.

Sal'adin, the name given by western writers to SALAH-ED-DIN YUSUF IBN AYUB, the sultan of Egypt and Syria, and the founder of the Ayubite dynasty in those countries. He lives in the works of historians as the Moslem hero of the third crusade and the paragon of Moslem chivalry. He was born in 1137 at the castle of Tekrit, on the Tigris, of which his father Ayub, a Kurd, was governor under the Seljuks. Following the example of his father and uncle, he entered the service of Nur ed-din (q.v.), emir of Syria, and accompanied his uncle Shirkoḥ in his expeditions to Egypt (1167-68) in command of Nur ed-din's army. On the death of Shirkoḥ, Saladin succeeded as vizier of the Fatimite khalif, and in 1171 he deposed him and became virtual king of Egypt, though nominally subject to Nur ed-din. But on Nur ed-din's death (1174) Saladin proclaimed himself sultan of Egypt and Syria, and the title was confirmed to him by the khalif of Bagdad. He next reduced Mesopotamia to his rule, and received the homage of the Seljuk princes of Asia Minor. The remaining years of his life were occupied in wars with the Christians and in the consolidation of his extensive dominions. On 4th July 1187 the Christian army suffered a terrible defeat near Tiberias; the king of Jerusalem, the two grand-masters, and many other warriors of high rank were taken captive; then

Jerusalem was stormed (3d October), and almost every fortified place on the Syrian coast (Acre, Saida, Beyrout, &c., though not Tyre) was taken by the victorious Saladin. The news of this great success being brought to western Europe aroused the religious enthusiasm of the Christians to its highest pitch, and a powerful army of crusaders, headed by the kings of France and England, eventually made their appearance on the scene of strife. They captured Acre in 1191, and Richard Cœur-de-Lion defeated Saladin in the battle of Arsuf, 7th September, took Caesarea and Jaffa, and finally obtained a treaty for three years (2d September 1192), by which the coast from Jaffa to Tyre was yielded to the Christians. In the following year Saladin died at Damascus on 3d March. Saladin was not a mere soldier; his wise administration left traces which endured for centuries, in the citadel of Cairo, and in forts, canals, dikes, and roads. His opponents frankly attribute to him the noble qualities of chivalry, invincible courage, inviolable fidelity to treaties, greatness of soul, piety, justice, and moderation. The chivalrous side of his character has been well caught by Scott in *The Talisman*. The Ayubite dynasty ruled over Syria till 1259, when it was dispossessed by the Perso-Mongols, and over Egypt till the rise of the first Mameluke kingdom in 1250. See S. Lane-Poole, *Life of Saladin* (1899, re-issue 1926).

Salamanca, a city of Spain, stands on and between four low hills beside the river Tormes, 110 miles NW. of Madrid. From the middle of the 13th to the close of the 17th century it was the seat of one of the most celebrated universities in Europe. Founded in 1243, this great school won renown at first for the teaching of civil and canon law; later theology became an important faculty. In the 16th century there were here from 6000 to 8000 students, amongst them the members of an Irish College. The university buildings date chiefly from the 15th century, and are Gothic in style. In Salamanca's palmy days her population reached 50,000, and the university counted more than a score of colleges. The library was founded in 1254. The city is still surrounded with walls, pierced by ten gates, and preserves very much of its mediæval appearance, its houses, convents, and churches, its streets and squares having altered but little since the university began to decline. The river is crossed by a bridge of twenty-seven arches, in part of Roman construction. The great square is the largest perhaps in Spain; it is surrounded by an arcade, and has on one side the municipal buildings. It was used for bull-fights, and can hold 20,000 spectators. The city possesses two cathedrals; the old cathedral, cruciform in shape, late Romanesque in style, and dating from the 12th century, is richly decorated with paintings and monuments; the new cathedral (1513-1734) is a florid Gothic pile, also richly decorated. Amongst the remaining noteworthy buildings are the Jesuit College (1614), Renaissance in style; the Old College, now the governor's palace; the convents of the Dominicans and the Augustinians, the churches of which are both elaborately ornamented. In the middle ages Salamanca was famous for its leather-work; at the present day it has not much industry, save a little manufacture of cloth, linen, leather, and pottery. Population, 32,000. The town was captured by Hannibal in 222 B.C. The Moors were expelled from its walls in 1055. During the Peninsular war it was taken by the French (1812), who committed great destruction in one of its quarters, and in the vicinity Wellington defeated Marmont on 22d July 1812.—The *province*, which produces a good deal of wool, has an area of 4830 sq. m. and a population of 320,000.

Salamander (*Salamandra*), a genus of tailed Amphibians, nearly related to the newts (Molge, &c.). The Salamanders are born in the water, but in adult life mostly live on land. In early life they breathe by gills, but these disappear, the adults breathing entirely by lungs. They feed on worms, slugs, snails, insects, and other small animals. In habit they are somewhat sluggish, shy, and stupid. The Spotted or Fire Salamander (*S. maculosa*) is common in Europe and extends to Algiers and through Asia Minor to Syria. It is usually 5-6 inches in length, but giants of eight inches are recorded. The colour is conspicuous, bright yellow patches on a blackish background. The very glandular skin exudes a milky poisonous secretion. The Black Salamander (*S. atra*) is restricted to the Alps of Europe. It is viviparous with only two young ones at a time. There are no British species. The four genera included



The Spotted Salamander (*Salamandra maculosa*).

in the family Salamandridæ—of which the salamander is type—are confined to the Old World. Though the salamanders are quite harmless, they have long had, and still retain, a popular reputation of extreme venomousness, and are therefore much dreaded. Strange fables have been current concerning them from remote ages, particularly concerning the icy cold (a reference perhaps to the moist secretion) which envelops their body, and enables them not only to endure fire without burning, but to extinguish fire. Pliny refers to this belief, but very dubiously (*Nat. Hist.* x. 86 and xxix. 23); and so recently as 1716 the *Philosophical Transactions* recorded how a salamander, being cast 'into the fire, thereupon swelled presently, and then vomited store of thick slimy matter, which did put out the neighbouring coals.' Cellini relates that as a boy he was beaten by his father to make him remember he had seen a salamander in the fire. See SYLPHS.

Sal'amis, or KOLURI, an irregularly-shaped, mountainous island of Greece, forming with Attica the Bay of Eleusis. Close to the southern promontory lies the long narrow island of Psyttalia. Its area is about 35 sq. m., the chief town being the port of Salamis (pop. 12,000), on the west coast. In ancient times its two principal towns, Old and New Salamis, lay, the former on the south, the latter on the north-east coast. Salamis was an independent state till about 620 B.C., when it fell, first to Megara, next to Athens through the policy of Solon. Its name is ever memorable from the great naval battle between the Greeks and Persians, fought (480 B.C.) a few days after the battle of Thermopylæ, in the narrow strait between the east coast of Salamis and the west coast of Attica. The Greek fleet of 366 triremes was drawn up at the entrance of the bay forming the harbour of New Salamis, the Athenian contingent under Themistocles, the Corinthian under Adimantus, while the Spartan Eurybiades commanded the whole. Great dissensions prevailed among the Greek leaders, which would probably have led to a general break-up had not Themistocles by a stratagem induced Xerxes, king of the Persians, to bring up his fleet, and give immediate battle to the Greeks. Xerxes drew up his ships, numbering

1200 triremes and 3000 smaller vessels, during the night previous to the battle, opposite the Greek fleet, along the coast of Attica, almost completely blocking up both entrances to the straits; and confident of victory he took his seat on a throne erected on a lofty height on the Attic coast, almost opposite New Salamis. Both Greeks and Persians fought with great bravery, but the latter were entirely defeated, their unwieldy fleet losing all advantage of numbers in the narrow space. Both the order and incidents of the battle are obscure, but the issue is clear enough. The loss of the Greeks is said to have been 40, and that of the Persians 200 ships, exclusive of those which were captured. See Kromayer and Veith, *Antike Schlachtfelder* (vol. iv. 1924).

Sal Ammoniac, known also as Ammonium Chloride, and sometimes as Hydrochlorate of Ammonia, is used in medicine and in chemistry to a considerable extent. It is obtained from the ammoniacal liquor of the gas-works by adding hydrochloric acid and then subliming it in iron pots; on a small scale it may be made by adding hydrochloric acid to solution of ammonia. It occurs in colourless, odourless, translucent fibrous masses, with an acrid saline taste, and soluble in water. It is used as an expectorant in chronic bronchitis, in catarrhal conditions of the gastrointestinal tract, and in various hepatic diseases. While being dissolved in water it greatly lowers the temperature, and hence in solution can be used as a refrigerant. The dose is 3 to 12 decigrams given in solution. In chemistry it is largely used as a test. See AMMONIA.

Salangane, the Swiftlet that builds edible nests. See NESTS.

Salaria Via, one of the oldest of the Roman roads, left the city at the Porta Salaria, and ran *via* Reate, Asculum Picenum, to Castrum Truentinum and Ancona on the Adriatic. A traffic in salt from the salt-marshes of the Tiber was carried on by the Sabines along this highway. The ancient Porta Salaria has not survived.

Salband, name given by miners to the band of altered rock or other material which often separates the contents of a mineral vein or lode from the rock-mass which the vein traverses. *Salvage* and *Flucan* are terms used in the same sense.

Saldanha Bay. See CAPE OF GOOD HOPE.

Saldanha Oliveira e Daun, JOÃO CARLOS, DUKE OF, Portuguese statesman and marshal, was born on 17th November 1790, a grandson of the 'Great Marquis,' Pombal, and great-grandson of the Austrian Marshal Daun. He was educated at Lisbon and entered the army. When the French invaded Portugal he took the patriotic side, and fought with distinction at Busaco, San Sebastián, Nive, &c. From 1817 to 1822 he was in South America, and took a leading part in the struggle between Brazil and Montevideo, after the capture of which last town he was nominated viceroy of the province. When, however, Brazil declared herself independent of Portugal, Saldanha returned to Lisbon, and in 1825 was appointed governor of Oporto. A moderate constitutionalist, he took the part of Dom Pedro against Dom Miguel (see PORTUGAL), helping to defend Oporto in 1833, beating off repeated attacks upon Lisbon (for which he was created marshal), gaining the victories of Pernes and Almoester, taking Leiria and Santarem, and finally forcing Miguel to sign the convention of Evora Monte (26th May 1834) and leave Portugal. During 1836-46 the extreme democratic party were in power and Saldanha lived partly in exile, partly in retirement, partly employed on diplomatic and other public business

abroad. Meanwhile Portugal was in a most unsettled and disorderly state. Saldanha returned home in 1846; and from that time down to 1856 was alternately at the head of the government (1847-49, 1851-56), being supported chiefly by England, and in armed opposition to his political opponents. During the reign of Pedro II. he held no great office of state, and under King Louis was kept abroad as ambassador at Rome and London, except that he was prime-minister for some months in 1870. He died in London, 28th November 1876. He had been created a duke in 1846. The highly eulogistic *Memoirs*, by Count da Carnota (Lond. 1880), must be read with caution.

Sale is an exchange of land or goods for money.

Sale of Land.—The Law of Property Act, 1925 (15 and 16 Geo. V., chap. 20, sec. 40 (1)), enacts that no action may be brought upon any contract for the sale or other disposition of land, or any interest in land, unless the agreement upon which such action shall be brought, or such memorandum or note thereof, is in writing, and signed by the party to be charged therewith. The rule applies to contracts whether made before or after the end of 1925. Such a contract, even when those conditions are not complied with, will be specifically enforced, when it has been part performed by the party seeking relief. Such part performance, according to the phrase, takes the case out of the statute. Certain conditions of sale are usually put forth on the part of the vendor, and under them the sale is conducted. The purchaser is supplied with an abstract of title going back for thirty years. Then the deeds conveying the estate are prepared and signed, the money is handed over, and the purchase completed. Before this, however, the purchaser is entitled to the estate and the vendor to the purchase-money, but the vendor has a lien for the unpaid price. The Real Property Limitation Act, 1874, gives, in the absence of fraud, a person who has held real property undisturbed for twelve years an indefeasible title thereto. The method of sale is somewhat different according as the land is freehold or leasehold. If the property is in Middlesex, or Yorkshire, or Kingston-upon-Hull, a memorial of the deed of conveyance must be duly registered in the county register; but it is not necessary so to register a memorial of any instrument made after 1925, unless it operates to transfer or create a legal estate, or to create a charge thereon by way of legal mortgage; and the registration of a memorial of any instrument not required to be registered will not effect any priority. Recent acts give power to limited owners (as tenants for life, &c.) to sell the land they occupy; but they must act under the sanction of the court, and apply the purchase-money as directed. In Scotland no contract for the sale of land is binding without writing. There is no copyhold, and leasehold is rare. There is a very perfect system of registration.

Sale of Goods.—By the 17th section of the Statute of Frauds no contract for sale of goods of the price of £10 or upward is valid unless the buyer receive and accept part of the goods sold, or pay part of the price, or the agreement be reduced to writing and signed by the parties. The title of buyer is no better than that of a seller, so that, e.g., if you purchase a watch from a man not its owner, the true owner can make you deliver it up without compensation. But there are some exceptions: thus, an agent under the Factors Acts, who may sometimes give a buyer a better title than he has himself; also goods bought in market overt become the absolute property of the purchaser, with the undernoted exception. By the custom of the City of London every shop on a week-day is a market overt;

elsewhere, only a market held at a regular time and place. The sale of horses is regulated by certain special provisions, chiefly contained in a statute of Philip and Mary. Even if goods be sold in market overt, on the subsequent conviction of the thief the property will revert to the true owner. On sale the duty of the seller is to deliver the goods, but not to send or convey them. The buyer is bound to accept and pay for what he has ordered. *Caveat emptor*, by which words is meant that the buyer takes an article at his own risk, is the rule, but a good many exceptions are admitted. The seller has a lien on the goods as long as the purchase-money is unpaid, and in case of the buyer's insolvency he may stop them in transit. In Scotland the chief theoretical point of difference is that, whilst in England the completion of the contract of sale vests the property of the goods in the buyer, in Scotland he has only a right to demand their delivery; but owing to various statutory provisions the difference is not of much practical importance. Also, the contract may be entirely verbal, and the doctrine of sales in market overt is not recognised. Among many books on the subject of sale that of Benjamin (6th ed. 1920) is the most complete. The law on the subject was codified in the Sale of Goods Act, 1893. See also BILL, CONTRACT, WARRANTY.

In the United States the sale of land is simplified by registration, but the law is based on that of England. So also with the sale of goods; only the law as to market overt is not recognised in the States, nor is warranty of title carried so far as in England.

Sale, GEORGE, an eminent oriental scholar, was born in Kent about 1690, educated at the King's School, Canterbury, and bred to the law. He assisted in getting up the *Universal History*—together with Swinton, Shelvocke, Campbell, George Psalmanazar, and A. Bower—for which he wrote the cosmogony and several portions of oriental history. He was also one of the authors of the *General Dictionary*; but he is best known by his unrivalled translation of the Koran, 'with explanatory notes taken from the most approved commentators, to which is prefixed a preliminary discourse' (1734). This translation, with its learned preliminary discourse, formed a new epoch in the study of Islam and its literature (see KORAN; and Wherry's *Comprehensive Commentary on the Qur'an, comprising Sale's Translation*, 1882-86). That his contemporaries fastened the charge of heresy upon one who spoke philosophically and humanely of other creeds is not to be wondered at. He died 14th November 1736. After his death a catalogue of his oriental MSS. was published, and they are now in the Bodleian Library, Oxford.

Sale, SIR ROBERT HENRY, British soldier, was born in 1782, the son of an officer in the army of the East India Company, and himself in 1795 joined the colours as ensign. He saw a great deal of fighting; he was present at the storming of Seringapatam (1799) and of Travancore (1809), assisted at the capture of Mauritius (1810), and fought throughout the Burmese war of 1824-25. When war was declared against Afghanistan in 1838 'Fighting Bob,' as Sale was called, was given the command of the first brigade in the Bengal division of the invading army. He greatly distinguished himself at the assault and capture of Ghazni. In the autumn of 1840 he was despatched to punish certain hostile chiefs in Kohistan and to keep a close watch upon the restless movements of Dost Mohammed. When the evacuation of Afghanistan was decided upon Sale's was the first brigade to set off back to India; but it had to fight its way through all the passes—the Khurd Kabul, Tezen,

Jagdalak—that lie between Kabul and Jalalabad. In this last fortress he was closely invested from 12th November 1841 to 7th April 1842; but in numerous sorties, and even in a general engagement (Tezen), he defeated the forces of Akhbar Khan (son of Dost Mohammed). He was at length relieved by General Pollock, and with him took part in the recapture of Kabul and the events that followed it. Sale was killed, his thigh being shattered by grape-shot, at the battle of Mudki, fighting against the Sikhs, on 18th December 1845. His wife, Lady Sale, who was captured by the Afghans during Elphinstone's retreat, and kept prisoner by them until the arrival of Pollock's army, wrote a *Journal of the Disasters in Afghanistan* (1843).

Salem, a town in the south of India, 120 miles by rail SW. of Madras, stands in a pretty position in a valley backed by hills, and is a clean though straggling place, with extensive manufactures of cotton and cutlery and carpet-weaving; there are much iron and lime near. Pop. (1921) 52,244.

Salem, (1) a city and port of entry of Massachusetts, on a peninsula in Massachusetts Bay, 16 miles by rail N. by E. of Boston. It has a good harbour, from which was formerly carried on a large foreign commerce, but now there only remains a coast trade, chiefly in coal. Principal institutions of Salem are the East India Marine Society, its collections now united with those of the Peabody Academy of Science, the Essex Institute, and the Salem Athenæum, the last two housed in Plummer Hall. The manufactures include cottons, leather, shoes, and lumber products. Salem was settled in 1626. In 1692 the great witchcraft delusion broke out, during which nineteen persons were hanged (including one clergyman) and one pressed to death. Nathaniel Hawthorne and Prescott the historian were born here. There was a great fire in 1914. Pop. 42,500.—(2) Capital of Salem county, New Jersey, on Salem Creek, $3\frac{1}{2}$ miles from its entrance into the Delaware and 36 miles by rail SSW. of Camden. It has dye-works, and various factories. It was founded in 1675. Pop. 7000.—(3) Capital of Oregon, on the east bank of the Willamette River (navigable for most of the year), 52 miles by rail S. by W. of Portland. Settled in 1834 and incorporated in 1853, it became state capital in 1860. The streets are wide and regular. Here are the state capitol, prison, and insane asylum, and schools for the blind and deaf and dumb, besides the Willamette University (Methodist Episcopal, 1851), and mills, foundries, factories, and machine shops. Pop. 18,000.

Salemi, a town in the west of Sicily, 39 miles SW. of Palermo; pop. (1921) 19,374.

Salep. See ORCHIDS.

Salerno (anc. *Salernum*), a city of southern Italy, on the gulf of the same name, 33 miles by rail SE. of Naples, with a pop. (1921) of 51,980. A hill behind the town is crowned by an old Norman castle. The beautiful Gothic cathedral of St Matthew (whose bones were brought from Pæstum in 954) was erected by the Normans (1076-84), and has in front of it a quadrangular court, the arcades of which are supported by porphyry and granite columns. The fine bronze doors of the central entrance are of 11th-century Byzantine work. Within are the tombs of Pope Gregory VII. and Margaret of Durazzo, mother of King Ladislaus of Naples; also two magnificent 12th-century ambones, a fine 11th-century altar frontal, and 13th-century mosaics (in the apse). The city was celebrated in the middle ages for its university (founded in 1150, closed in 1811), but especially for its school of medicine (*Schola Salernitana*), which was long the first in Europe (see MEDICINE, Vol. VII. p. 113).

In the neighbourhood are the ruins of Pæstum (q.v.). There is a small harbour. Silk and cotton are spun. Originally a Roman colony (194 B.C.), Salerno figures little in history until after it was taken by Robert Guiscard, who made it his capital. But the removal of the Norman court to Palermo and the sack of the city by the Emperor Henry VI. struck serious blows at its prosperity, and a third came from the decay of the medical school in the 14th century.

The *Gulf of Salerno* is a nearly semicircular indentation, separated from the Bay of Naples by the promontory ending in the Punta Campanella. On its shores stand Amalfi and Salerno.

Sales, FRANCIS DE. See FRANCIS OF SALES.

Salette, LA, an Alpine village of France, dept. Isère, 28 miles SSE. of Grenoble. Here on 19th September 1846 the Virgin is alleged to have appeared to two peasant children; from that time the spot was visited annually by thousands of pilgrims. In 1852-61 a pilgrimage church was built, in the Romanesque style, at an elevation of 5920 feet. The alleged appearance of the Virgin was, however, discredited by Pope Leo XIII. in 1879.

Saley, a group of islands lying off the southwest extremity of Celebes, in the East Indies, consists of the principal island (area, 170 sq. m.; pop. 57,000) and several small ones (their united area 130 sq. m. and pop. 24,000), and is governed by native chiefs who pay tribute to the Netherlands East India government. Principal exports, cotton, trepang, coconuts, tortoise-shell, salt, and tobacco. The people are Malay Mohammedans.

Salford. See MANCHESTER.

Sali, SALLEE, or SLA, a seaport of Morocco, stands on the Atlantic, at the mouth of the Bu-Ragreb, on the northern side of the river, opposite to Rabat (q.v.). It was for centuries notorious as a haunt of pirates (see CORSAIR), and gave its name to the Sallée Rovers, who carried the terror of their name into the English Channel, and are known to every reader of *Robinson Crusoe*. It was only within the 19th century that Britain ceased to pay an annual subsidy to the sultan of Morocco to secure safety from their attacks. The streets are mean and poor, and the houses small. A wall surrounds the town, the chief features of which are forts and the prison. Excellent carpets are made, as well as shoes.

Salicaceae. See POPLAR, WILLOW.

Salicin, $C_{13}H_{18}O_7$, is a crystalline glucoside obtained from the bark of the *Salix alba* and other species of *Salix* (Willows), and also from the bark of several species of *Populus* (Poplars). It occurs in small white crystals, without smell, but having a very bitter taste; is soluble in 28 parts of cold water, in 1 part of boiling water, and in 80 parts of rectified spirit. When treated with strong sulphuric acid it dissolves with a bright red colour; being a glucoside it is readily decomposed by suitable chemical agencies into glucose (grape-sugar) and saligenin. Saligenin can be easily oxidised to form salicylic acid. Its action and uses when given internally are much the same as those of Salicylic Acid (q.v.), into which it is converted in the body; but it is less powerful, is not so depressant, and does not disturb digestion so much. Being a bitter, it promotes appetite and digestion. Its dose is 3 to 12 decigrams.

Salic Law, a collection of the popular laws of the Salic or Salian Franks (see FRANKS), purporting to have been committed to writing in the 5th century, while the people were yet heathens. There exists several Latin texts of this code, and considerable obscurity rests over its history. It relates

principally to the compensation and punishment of crimes, and there is a chapter containing provisions regarding the succession to what are called Salic Lands, which seems to have been inserted at a later date. Although the Frankish law did not in general exclude females, the succession to these salic lands, whatever they were, was confined to males, probably from the importance of securing the military service of the chief proprietors. It was but a doubtful analogy that led the rule of succession to Salic lands to be extended to the succession to the French crown, and it seems to have been only in the 14th century that the exclusion of females from the throne became an established principle. The accession of Philip the Long was probably the first occasion on which it received public sanction, and the fact that Edward III. rested his claim on female succession doubtless led to that instance being regarded as an unquestionable precedent. See *Lex Salica, the Ten Texts with the Glosses*, edited by Hessels (1880).

Salicornia. See GLASSWORT.

Salicylic Acid, $C_7H_6O_3$, was originally obtained from Salicin (q.v.), but is now made on a large scale from carbolic acid; it may also be obtained from oil of wintergreen or oil of sweet birch. It occurs in small white crystals, slightly soluble in cold water; it has no smell, but is very irritating to the nostrils, and causes sneezing; its taste is sweetish and acid. It is used externally as an antiseptic, and in some skin diseases. For internal use the SALICYLATE OF SODIUM is preferred, as it is much less irritating to the stomach. It occurs in small white crystals, has a sweetish taste, and is highly soluble in water. It controls acute rheumatism much more speedily and thoroughly than any other drug, though of less value in chronic rheumatism. It is also employed as an antipyretic. If given in too large doses it may induce marked disturbance of the central nervous system, characterised by buzzing in the ears, deafness, and disturbances of vision. More severe results have been noted, but they are very rare. The dose is 3 to 12 decigrams (5 to 20 grains).

Salieri, ANTONIO (1750-1825), born at Legnano in north Italy, was for fifty years court musician at Vienna. He composed thirty-seven Italian, four German, and two French operas, and five masses. The friend of Haydn and teacher of Beethoven and Schubert, he was hostile to Mozart. Gluck heartily admired him.

Salii, two colleges of dancing priests in ancient Rome. The Salii Palatini who served Mars were believed to have been founded by Numa Pompilius, who entrusted to their charge a shield that had fallen from heaven, and eleven exact copies made to prevent theft. The priests were twelve in number, all patricians. Almost the whole of March, the month named in honour of Mars, in which campaigning began, was devoted to observances in honour of the god. The Salii, in ancient military garb, carried the shields in procession through the city, dancing war-dances and chanting Saturnian verses at the temples and altars of Mars. A similar festival, the Armilustrum, or purification of arms, brought the fighting season to an end in October. The Salii Collini or Agonales, priests of Quirinus, in many respects resembling the Palatini, claimed Tullus Hostilius as their founder.

Salimbene, FRA, chronicler, was born at Parma on the 9th of October 1221, the son of Guido di Adamo, a crusader, and his wife Imelda. Known at first as Ognibene, or sometimes as Balian of Sidon, he ran away from home and joined the Franciscan order in 1238, receiving the name of Salimbene. His early years as a Minorite were spent in travel through many parts of Italy, Bur-

gundy, and France, often on political errands on behalf of Innocent IV. against Frederick II. From 1249, when he took priest's orders, to 1281, he lived a more retired life in Ferrara, Ravenna, Imola, Faenza, and elsewhere, copying manuscripts and writing chronicles and theological works now lost. In 1281-88, in various convents of Emilia, he wrote his *Chronicon*. He probably died soon after. The *Chronicon*, covering the period 1167-1287, was composed for the use of his niece Agnes, a nun of the order of St Clare. Salimbene in his wanderings saw much of Italian and French life in peace and war, and met many of the most notable men of his time. Neither very virtuous nor very wicked, he observed keenly, and wrote with vivacity and remarkable candour, even of his own order. He has been compared with Peppys. See Professor Holder-Egger's edition (1905) in *Monumenta Germaniæ (Scriptores)*, and the boiling-down in G. G. Coulton's *From St Francis to Dante* (1906).

Salina, capital of Saline county, Kansas, 186 miles by rail W. by S. of Kansas City. It has a Wesleyan university and a military school. Salt and gypsum are obtained near by, and the city has flour-mills, carriage works and ice factories. Pop. 15,000.

Salina Cruz, a seaport of the Mexican state of Oaxaca, 12 miles S. of Tehuantepec, is the Pacific terminus of the Tehuantepec Railway. The construction of its capacious artificial harbour (1907), and of the railway to Coatzacoalcos or Puerto Méjico on the Atlantic, changed it from a small Indian village to an important commercial town.

Salina Formation, name given in North America to one of the subdivisions of the Silurian system, which appears to be equivalent to the lower portion of the Ludlow rocks of the British series. See SILURIAN SYSTEM.

Salinas are parts of inland drainage-basins forming natural salt-pans. They may be the beds of old salt-lakes and salt-marshes, or they may still in seasons of flooding contain marshes and shallow lakes which give place to salt-desert on evaporation. Many notable examples occur in South America. In the Argentine provinces of Santiago del Estero and Córdoba are Las Salinas Grandes, some 200 miles by about 50. The rainfall is scanty, but as it has no run-off, the water soaks into the ground and the subsoil becomes water-logged. The great heat scorches the surfaces, leaving a deposit of salt, but water can generally be found about two metres below. This of course is salt, and such inhabitants as are to be found in the Salinas, besides suffering from heat and the glare of the white surface, have to depend upon the railway for water-supply. Salinas, however, are a great difficulty to railway engineers, as the salt blown over the track eats away the rails, which must be protected by a coating of tar, and must not be allowed to touch the earth. The salt of many salinas is exploited. In some cases borax takes the place of common salt.

Saline is a very popular effervescent powder used as a gentle aperient. Sold under fancy titles, it essentially consists of a mixture of bicarbonate of soda, sugar, and tartaric acid, with a trace of Epsom salts or chlorate of potash.

Saline Plants, or HALOPHYTES, are plants which grow on or near the seashore, in salt water or salt-marshes, or on salt-steppes. Few of them are strictly aquatic plants, except the marine Algæ. Grasswreck (q.v.) and Glasswort (q.v.) are flowering plants living immersed in salt water. Others grow chiefly or only on the seashore and in salt-marshes. Some of these, as the sea-kale, may be cultivated far from the sea, but succeed best when

liberally supplied with salt. Asparagus derives benefit from similar treatment. Some of the Salt-worts and other saline plants yield much soda when collected and burned, and the produce was at one time largely imported into Britain from Spain and other countries under the name of Barilla (q.v.). The dry steppes of Russia and Tartary, having in many places a strongly saline soil, are covered with a very peculiar vegetation. Among the ornaments of these steppes is *Halimodendron argenteum*, a shrub of the family Leguminosæ, often cultivated in gardens for its beautiful rose-coloured flowers and silvery gray leaves. For the swamps of tropical coasts, see MANGROVE. Saline plants have their whole tissues impregnated with salt. The presence of salt in the assimilating cells seems to check, or if greatly concentrated altogether stop, assimilation. The presence of salt in the soil renders the osmotic absorption of water by the roots so difficult and slow that plants living in a salt-marsh or on the sea-margin are exposed to the same danger of drying up as those which grow in deserts. The soil, though it may be physically wet, is physiologically dry: 'a halophyte, in fact,' as Warming says, 'is one form of xerophyte.' Halophytes therefore adopt the same means of storing water and reducing assimilation that are seen in plants that have to contend with drought. The stem may become fleshy, leaves being suppressed, as in the Glasswort, which resembles a desert-dwelling cactus; or the leaves themselves may become fleshy, and may be leathery or covered with mealy hairs or wax. Typically halophytic families are the Chenopodiaceæ, Plumbaginæ, and Rhizophoraceæ or Mangroves.

Salinometer (sometimes SALIMETER, SALOMETER), an instrument of the nature of a hydrometer, for ascertaining the salinity of water; especially one for indicating the density of brine in marine boilers.

Salins (anc. *Salinæ*), a town of the French dept. of Jura, 22 miles S. by W. of Besançon, has some interesting churches, and valuable salt-springs, which supply baths and yield salt. Pop. 5000.

Salisbury. See GINKGO.

Salisbury (New Sarum) and **Old Sarum**. Old Sarum (*Sorbidunum*) stood about a mile north of the present city of Salisbury. It now consists of a bare conical hill encircled with entrenchments, with a central mound—from Roman times a castle and a place of much importance. Here William the Conqueror assembled the barons to renew their oath of fealty. About 1075 Bishop Herman removed the bishopric of the united sees of Ramsbury and Sherborne to Old Sarum, and began a cathedral. It was finished by his successor St Osmund, who established a chapter of secular canons and compiled the *Use of Sarum*, which was adopted throughout the greater part of England. It was rebuilt and enlarged in the 12th century. The foundations of Old Sarum Cathedral and Castle have been excavated by the Society of Antiquaries. Old Sarum returned two members to parliament until the passing of the Reform Bill, although at that time there had for many years been no inhabitants. Service was daily performed in a chapel until the Reformation, after which the place was entirely deserted. The desertion of Old Sarum and the foundation of Salisbury or New Sarum were due to the removal of the cathedral from the former place to the latter. The reasons for the change were the frequent disputes and collisions between the authorities of the castle and the cathedral, the exposed position of Old Sarum (the noise of the winds often drowning the voices of the officiating priests), and the want of water.

Salisbury or New Sarum is a cathedral city, the capital of Wiltshire, a municipal, and till 1918 a parliamentary, borough. It stands in a valley near the confluence of the rivers Avon, Bourne, Wily, and Nadder, 84 miles WSW. of London. The plan of the city is very regular, it having been laid out as a whole at its foundation in rectangular plots. Water originally ran through most of the streets, but the streams were covered over after the visitation of cholera in 1849. The removal from Old Sarum began in 1220, when the foundations of the new cathedral (B.V.M.) were laid.

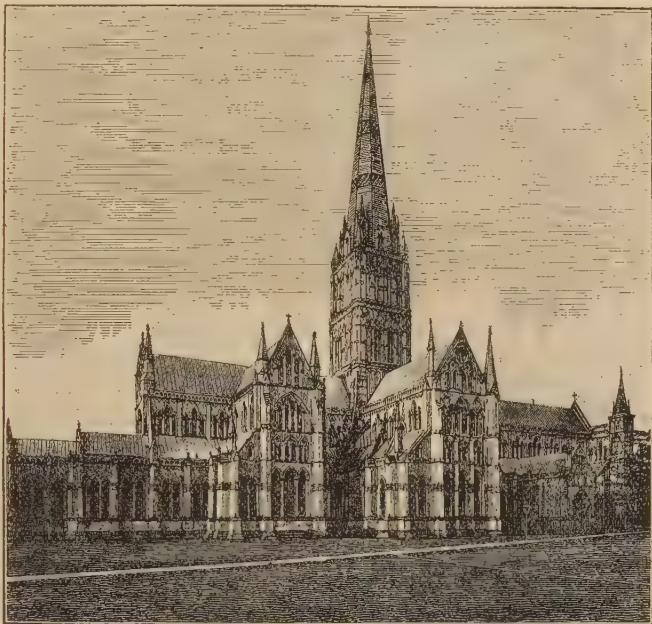
The Lady Chapel was consecrated in 1225, and the whole building, after being rehallowed in 1258, was finally dedicated in 1260. The cathedral consists of a nave of ten bays, choir, and Lady Chapel, with two aisles, and two transepts, each having a single aisle towards the east, the ground-plan being in the form of a double cross. The whole building is a perfect example of pure Early English style. The cloisters and the chapter-house were built about 1270, and the tower (Decorated) and the spire added about 1330. The spire is the highest in England (400 feet). It formed no part of the original design, and the effect of the addition became apparent in a dangerous settlement which took place within 100 years of its erection. Owing to this the spire leans 2 feet towards the south. The cathedral suffered from a disastrous 'restoration' at the hands of James Wyatt (1782-91), when two 15th-century chapels, built by Bishop Beauchamp and Lord Hungerford, and two porches were destroyed, much painted glass removed, the tombs rearranged, and a lofty campanile standing apart from the cathedral pulled down.

Much of the damage then done was repaired in the restoration begun in 1863 under Sir Gilbert Scott. There is a curious muniment-room over the vestry containing a copy of the Magna Carta of King John, said to be that handed to Longespée, Earl of Salisbury, who was one of his witnesses. The library, built about 1450, is over the east side of the cloisters, and contains many valuable MSS. The outside measurements of the cathedral are: length 473 feet, width 111 feet; the height of the nave and choir inside is 81 feet. The cathedral stands apart from any other building in the midst of a beautiful Close of about half a square mile in extent, encircled by a wall, within which stand the Bishop's Palace, an irregular building begun by Bishop Richard Poore (*circa* 1220) and added to by many of his successors, the deanery and canons' houses, and many other picturesque buildings. In 1227 King Henry III. granted a royal charter constituting New Sarum a free city, and conferred on the citizens all the liberties and immunities throughout the realm which the citizens of Winchester enjoyed. These rights and privileges were confirmed, varied, and extended by ten subsequent charters from 1270 to 1707.

The ancient parish churches are St Martin's, St Thomas of Canterbury, a handsome Perpendicular building of the 15th century, and St Edmund of Canterbury, formerly a collegiate church of secular canons. Other parishes with churches are Fisherton (St Paul's) and St Mark's.

The other most notable buildings are the council-

house, where the assizes are held, containing a fine collection of pictures; the infirmary; the 'Hall of John Hall' and Audley House, now the church-house of the diocese, two fine examples of 15th-century domestic architecture; the Old George Inn, a 13th-century hostel where Pepys stayed; Joiners' Hall; St Nicholas' Hospital, established by Bishop Bingham about 1240; the Trinity Hospital, founded in 1379 for twelve inmates and hospitality to poor travellers; the market-house; the poultry-cross; and the Blackmore Museum, which contains one



Salisbury Cathedral, from the north-east.

of the finest collections of prehistoric antiquities in England, the collection from America being probably unrivalled anywhere.

The market-place is spacious and planted with trees, and contains statues of Lord Herbert of Lea (Sidney Herbert) and Professor Fawcett, who was a native of the city. Here the Duke of Buckingham was beheaded in 1483 when Salisbury was the headquarters of Richard III. There are many charities and almshouses, and an endowed school for the choristers of the cathedral. Other endowed schools of importance are the Godolphin school for girls, Salisbury Chafyn-Grove school for boys, and Bishop Wordsworth's school for boys. The city chiefly depends upon its agricultural trade, the former manufactures of cutlery and woollens being extinct. Pop. (1851) 11,657; (1921) 22,867.

The most notable bishops of Old Sarum were St Osmund and Bishop Roger; of New Sarum, Hallam (whose death at the Council of Constance, 1417, is regarded by Dean Milman as fatal to many really effective reforms in the church), Cardinal Campeggio, Jewell, Seth Ward (a founder of the Royal Society), Burnet, Hoadley, Sherlock, Douglas, Burgess, Denison, Hamilton, Moberly, and Wordsworth. Fox the martyrologist, Hooker, Fuller, Pearson, Isaac Barrow, Joseph Butler, and Liddon have been canons of the cathedral, where George Herbert was a frequent worshipper. Among distinguished natives and residents have been Massinger, William and Henry Laves, Chiffinch (the chief agent in the intrigues of Charles II.), Harris the philologist,

Chubb 'the Deist,' and Henry Fawcett. Fielding resided at one time in the Close, and Joseph Addison was educated at the grammar-school.

For plan of Cathedral, see GOTHIC ARCHITECTURE. For the Use of Sarum, see LITURGY, and books on it by Frere (1895-1901).

SALISBURY PLAIN is an undulating tract of chalky down affording splendid pasture for sheep, with rich and well-timbered valleys. The high-lying land is too poor to repay cultivation. Of its many ancient mounds, barrows, and other antiquities, the most notable is Stonehenge (q.v.). Salisbury Plain was acquired by government for a military training-ground.

Salisbury, in North Carolina, 118 miles W. of Raleigh, had a Confederate prison during the Civil War, and in its national cemetery repose upwards of 12,000 unknown dead, victims of the war; it has a notable negro college and schools, and cotton mills, wood-working plants and granite quarries. Pop. 14,000.—**SALISBURY**, Maryland, 100 miles SE. of Baltimore, trades mainly in timber; pop. 8000.

Salisbury, the capital of Southern Rhodesia, founded in 1890 in the province of Mashonaland, 225 miles NE. of Bulawayo, is connected by railway with Beira and, through Bulawayo, with other parts of South Africa. It is situated at an altitude of almost 5000 feet. An agricultural and commercial centre, it has the cathedral of the Anglican bishopric of Mashonaland. White pop. 5000.

Salisbury, EARLS OF. Salisbury gave an earl's title in the 12th century; the first eminent holder being William, called Longespée (or Longsword), natural son of King Henry II., who in 1198 married the daughter of the second Earl of Salisbury, and with her hand received the earldom. He was Lieutenant of Gascony, Warden of the Welsh Marches and of the Cinque Ports, and faithfully served his nephew Henry III. till his death in 1226.—His son, also called Earl of Salisbury and Longespée, twice went crusading, and was killed at Mansourah in 1250. Later the Montagues held the earldom (see MONTAGU); later still the Nevilles (see WARWICK); last the Cecils (see below). For Margaret, Countess of Salisbury, see POLE (REGINALD).

Salisbury, THIRD MARQUIS OF (ROBERT ARTHUR TALBOT GASCOYNE-CECIL), son of the second marquis, was born at Hatfield House, 3rd February 1830, ninth in descent from Lord Burghley's second son, Robert Cecil (c. 1563-1612), who by James I. was made Viscount Cranborne (1604) and Earl of Salisbury (1605); the seventh earl received the marquise in 1789. As Lord Robert Cecil the third marquis passed in 1847 from Eton to Christ Church, Oxford, where he graduated in 1849. He next went on a round of travel, extending to Australasia; on his return he was elected a fellow of All Souls (1853), and entered parliament at twenty-three as Conservative M.P. for Stamford. In 1858 he opposed the abolition of church-rates; in 1859 supported Disraeli's Reform Bill by arguments which he had set forth in the 'Oxford Essays' for 1858. From this time he became a frequent speaker—studious, pugnacious, vigorous, sarcastic, often brilliant; he never spoke more warmly than in defence of the church or on education. Foreign affairs engaged his attention hardly less. In June 1865 he became Viscount Cranborne and heir to the marquise by the death of his elder brother; and he was one of the most effective opponents of Gladstone's Reform Bill of that year. In the Derby ministry (1866) Lord Cranborne became Indian Secretary; but Lord Derby and Disraeli proceeding to concoct a Reform Bill, Lord Cranborne (like others) resigned, and fought against the measure with extreme pertinacity. In 1868 he succeeded his father as third marquis, and was the strongest

opponent of the disestablishment of the Irish Church. In 1869 he was elected Chancellor of the University of Oxford. In 1870 he supported the Peace Preservation Bill, but disapproved the Irish Land Act. The bill for abolishing religious tests in the universities gave him arduous employment. In January 1874 parliament was dissolved, and the Conservatives came in with a great majority. Lord Salisbury again became Secretary for India; but before the end of the year he had again come into collision with his chief on the Public Worship Regulation Act, being described by Disraeli as 'a great master of gibes and flouts and jeers.' As envoy to the Constantinople Conference (1876-77) Lord Salisbury, by acting against the spirit of his instructions, came into direct collision with Lord Derby (then Foreign Secretary); when in 1878 Lord Derby resigned Lord Salisbury succeeded him. He signalled the change by publishing a circular despatch assertive of the British objections to the San Stefano Treaty; but soon after a famous secret agreement with Russia crept into the newspapers. In the Berlin Congress both Disraeli (now Lord Beaconsfield) and Lord Salisbury took part. The 'Midlothian campaign' (1879) was followed by a dissolution in March 1880, and that by a heavy defeat for the Conservatives. On the death of Beaconsfield (1881), Lord Salisbury succeeded to the leadership of the Conservative Opposition; in June 1885 he became Prime-minister and Secretary of State for Foreign Affairs, and settled the 'Penjdeh incident.' This was but a short-lived administration, for Gladstone (q.v.) returned to power, only, however, to be wrecked by his Home Rule Bill, and after a general election Lord Salisbury again took office (August 1886). The general election of July 1892 returned a Gladstonian majority; but in opposition Lord Salisbury and the Conservatives maintained their alliance with the Liberal Unionists, and the Home Rule Bill of 1893 was defeated in the Lords. In June 1895 the Rosebery administration fell; and in the ensuing general election, fought mainly on Irish Home Rule, the Unionists were returned with a crushing majority of 152. Lord Salisbury became for the third time Prime-minister, with a Liberal-Unionist and Conservative Cabinet. Within the next two years a succession of foreign complications brought the country several times to the verge of war, only averted by the firm, and at the same time conciliatory, attitude of the British government. Turkish massacres in Armenia led to the reopening of the Eastern Question in an acute form, nearly resulting in a European conflagration. Hostilities with the United States seemed imminent owing to the interference of the latter country in a boundary dispute between British Guiana and Venezuela. Dr Jameson's filibustering expedition into the Transvaal at New Year 1896 led to critical relations with the republic, and revealed antagonism on the part of Germany. The jealousy of France at the British occupation of Egypt was actively aroused by Lord Salisbury in April 1896 entering upon the reconquest of the Soudan. And the Cretan insurrection, with the consequent crushing defeat of Greece by Turkey (1897), severely tested the Concert of the Powers. He resigned the Foreign Secretaryship in 1900; and having remained at the head of the government during the Boer war of 1899-1902, retired from public life in July 1902, receiving the Victorian Order. He died 22nd August 1903. He was naturally a student and a scientist; a masterly and most impressive orator, he yet neglected the art of persuasion; and even in apparently well-weighed speeches some startlingly injudicious sentence often broke loose. His contributions to the *Quarterly Review* from 1860 to 1883 were numerous and important.

See *Lives* by Traill (1891), MacCarthy (1903); the article by Algernon Cecil in the 2d supplement to *Dict. Nat. Biog.* (1912), and the official Life by his daughter, Lady Gwendolen Cecil (1921).

The FOURTH MARQUIS (b. 1861) succeeded his father in 1903, and was between 1900 and 1905 Under-Secretary for Foreign Affairs, Lord Privy Seal, and President of the Board of Trade, in 1922-23 Lord President of the Council, in 1924 Lord Privy Seal, and in 1925 Leader of the House of Lords. His brothers, Lord Robert, who held various cabinet posts during the war, including Assistant Foreign Minister in 1918, and who was created a viscount in 1923, and Lord Hugh both won reputations as Conservatives in the House of Commons, and interested themselves greatly in the League of Nations.

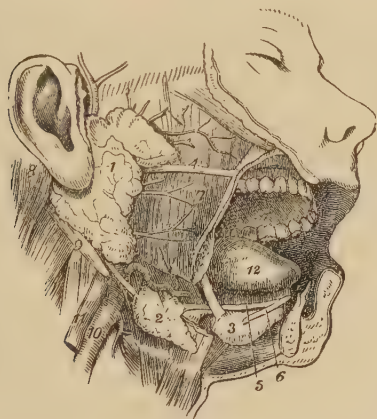
Salisbury, JOHN OF, born at Salisbury, studied at Paris, and was the confidential adviser of Becket, and, sharing his exile, became (1176) bishop of Chartres. He wrote a Life of Becket, and one of Anselm; the *Policraticus*, in which he lashes the vices of the court (edited by Webb in 2 vols. in 1909); the *Metalogicus*; the *Entheticus*; and many letters. One of the most learned classical writers of the middle ages, he died 1180. See Dr R. L. Poole's *Illustrations of Mediæval Thought* (1884).

Saliva, one of the digestive fluids, mainly the product of the SALIVARY GLANDS, of which there are three pairs—the parotid, the submaxillary, and the sublingual, with efferent ducts which convey the glandular secretions into the mouth. These, when mixed with the mucus secreted by the follicles of the mucous membrane lining the mouth, constitute the ordinary or mixed saliva. The *Parotid Gland*, so called from the Greek

Its duct is about two inches in length, and opens by a narrow orifice on the top of a papilla, at the side of the *frænum* of the tongue. The *Sublingual Gland* is situated, as its name implies, under the tongue, each gland forming a ridge on the floor of the mouth, between the tongue and the lower gums. It has a number of excretory ducts, which open separately into the mouth. The salivary glands are racemose, or of the compound acinous type (see GLANDS). The recesses which open into the fine terminal branches of the ducts are 'lined and almost filled' by the epithelial cells which secrete the saliva. True salivary glands exist in all mammals, except the cetacea, in birds, in reptiles, and in amphibians, but not in fishes; and glands discharging a similar function occur in insects, many molluscs, &c. Saliva contains about one-half per cent. of solids, chiefly salts and mucin. The proportion of its active constituent, ptyalin, is extremely small; and it has never been satisfactorily isolated (see DIGESTION).

The most common disease of the parotid gland is a specific inflammation, which has been already described in the article MUMPS. Tumours of various kinds sometimes occur in front of the ear and over the parotid gland. Their removal is often difficult. Calculi are occasionally formed in connection with the ducts of the salivary glands. *Deficient Secretion* is indicated by clamminess or dryness of the mouth, and is common in low forms of fever. It is important as indicating the condition of the system, and seldom requires treatment. If it should occur as an original affection it must be treated by local Sialogogues (q.v.), such as liquorice, horse-radish, pellitory, &c. *Alteration of the Saliva* is not infrequent in disease. For example, it sometimes loses its alkaline character, and becomes acid, as in acute rheumatism, diabetes, &c.; whilst in other cases it becomes so foetid as to be a source of annoyance both to the patient and his friends, as, for example, in scurvy, various forms of dyspepsia, salivation, &c. The undue acidity may be corrected by rinsing the mouth with bicarbonate of soda, while the fætor may be relieved by attention to diet and by antiseptic mouth-washes. *Ordinary Inflammation* of these glands (distinct from mumps) may proceed from cold, local injury, or decayed teeth. *Ranula* is a small, clear swelling on the floor of the mouth, caused by temporary blockage of one of the sublingual ducts.

SALIVATION, or **PTYALISM** (from the Gr. *ptyalon*, 'the saliva'), is the term employed to designate an abnormally abundant flow of saliva. It most commonly arises from a specific form of inflammation of the parotid glands, induced by the action of mercury, in which case it is termed mercurial salivation; but it occasionally appears under the action of other drugs, especially iodide of potassium; and sometimes it occurs without any apparent cause, in which case it is said to be *idiopathic* or spontaneous. When mercury is given in such a way as to excite salivation a metallic taste in the mouth is soon recognised by the patient, and a remarkable but indescribable smell, known as the mercurial fætor, may be detected in his breath; the gums become swollen and spongy at their edges, and usually present a few slight ulcers; and an increased flow of saliva takes place, accompanied by pain in the teeth on pressure. If these symptoms be not checked (and *a fortiori* if more mercury be given) the tongue, cheeks, and throat swell and ulcerate, and the saliva that flows away amounts to several pints in the course of the day. Until a comparatively recent period profuse salivation was deemed the only certain indication that the system was duly under the influence of mercury (and, indeed, it was believed that the cause of the disease



The Salivary Glands:

1, the parotid gland; 2, the submaxillary gland; 3, the sublingual gland; 4, Steno's duct; 5, Wharton's duct; 6, Bartholin's duct; 7, masseter muscle; 8, mastoid process; 9, digastric muscle; 10, internal jugular vein; 11, external carotid artery; 12, the tongue.

words *para*, 'near,' and *ous*, 'the ear,' is the largest of the three glands occurring on each side. It lies upon the side of the face immediately in front of the external ear, and weighs from half an ounce to an ounce. Its duct is about two inches and a half in length, and opens into the mouth by a small orifice opposite the second molar tooth of the upper jaw. The walls of the duct are dense and somewhat thick, and the calibre is about that of a crow-quill. It is called, after its discoverer, Steno's duct.

The *Submaxillary Gland* is situated, as its name implies, below the jawbone (part of which is cut away in the figure), and is placed at nearly equal distances from the parotid and sublingual glands.

was carried out of the body with the saliva); but it is now recognised that salivation is harmful, and in administering mercury the object aimed at is not to allow its effect at farthest to go beyond the production of slight tenderness of the gums and slight mercurial tætor. Mercurial salivation is therefore very rarely to be seen at the present day. Moreover, there is a more or less marked tendency to salivation in scurvy, smallpox, hysteria, hydrophobia, some forms of mania, and not infrequently in pregnancy.

Salle, DE LA. See CHRISTIAN SCHOOLS (BROTHERS OF).

Sallee. See SALL.

Sallow (*Salix*). See WILLOW.

Sallow-thorn. See SEA-BUCKTHORN.

Sallust. CAIUS SALLUSTIUS CRISPUS, a Roman historian, was born of plebeian family at Amiternum in the Sabine country, 86 B.C. He had risen to be tribune of the people in 52, when he helped to avenge the murder of Clodius upon Milo and his party. An intrigue with Milo's wife may have given a spur to his love of justice; indeed, such was said to be the licentiousness of his life that he was expelled in 50 from the senate. It is true, however, that his attachment to Cæsar's party may well suggest a plausible reason for his expulsion. In 47, when Cæsar's fortune was in the ascendant, he was made prætor, and was consequently restored to his forfeited senatorial rank. Soon after this he nearly lost his life in Campania, in a mutiny of some of Cæsar's troops about to be shipped to Africa. Next year he carried off the enemy's stores from the island of Cercina, and at the close of the African campaign he was left as governor of the annexed kingdom of Numidia, formed into the province of Nova Africa. Charges of oppression and extortion brought against him by the provincials failed before the partial tribunal of Cæsar. With his spoils he laid out those famous gardens on the Quirinal which bore his name for centuries, the splendid mansion on which became an imperial residence of Nerva, Vespasian, and Aurelian. Here he lived apart from public cares, devoted to literary labours; and here he died, 34 B.C. In his retirement he wrote his famous histories, the *Catiline*, or *Bellum Catilinarium*, a brief account of Catiline's conspiracy in 63, during the consulship of Cicero; the *Jugurtha*, or *Bellum Jugurthinum*, a history just twice as long of the five years' war between the Romans and Jugurtha, the king of Numidia; and the *Historiarum Libri Quinque*, commencing with the year of Sulla's death (78 B.C.) and coming down to 67 B.C., of which, unhappily, but a few fragments have come down to us. The two letters *Ad Cæsarem senem de Republica* and the *Invectiva Sallusti in Ciceronem* are not authentic.

As a historian Sallust is not accurate in details of fact and chronological sequence—a defect caused, no doubt, by his love for broad effects and unity of treatment. He was one of the first Roman writers to treat a subject rather than a period of time, and to look directly for a model to Greek literature. He brought to his task strong prepossessions and a fatal readiness to sacrifice anything to his antithesis or epigram; but we need not suppose with Mommsen that his main object was to discredit the old regime and vindicate the memory of Cæsar. He loves to explore in philosophic fashion into the tone of the age and the hidden motives of men, and he falls a victim to his own subtlety and confidently presents his inferences as facts. The high morality which he inculcates harmonises but ill with what is reported of his life, although it may be it was a legitimate enough fruit of after reflection and repentance which supplied its characteristic tinge of pessimism to his tone. In his labour to be

brief and concise like his great model Thucydides he is not seldom merely obscure and involved, and his historical style is overlaid too thickly with rhetorical ornament, the narrative overloaded with general reflections that are often little better than pretensions commonplaces. The speeches are dramatically effective though not authentic, the structure of the sentences simple, the repetition of favourite words and rapid changes of construction to secure vivacity being characteristic marks. The Græcisms are mostly close echoes of Thucydides, and even his favourite arrangement of short contrasted phrases is imitated from the same master. Moreover, he makes use of many words and phrases in an archaic sense, and is supposed especially to have drawn much from the elder Cato; while in other ancient critics, again, we read of the innovations of his style. The influence of Sallust is plainly marked on the greater Tacitus, who styles him (*Ann.* iii. 30) 'rerum Romanarum florentissimus auctor.' Martial also places him first in Roman history, and Quintilian does not fear to match him with Thucydides and sets him above Livy, although admitting that the latter is a safer model for boys. His diction and rhetorical colour found him many imitators from the time of Fronto down to the Christian writers of the 5th century.

There are English translations by Thomas Heywood (ed. Whibley in 'Tudor Translations'), Watson (1852), A. W. Pollard (1882), and Rolfe (Loeb Library, 1921).

Sallustius, 'the philosopher,' wrote in Greek a Neoplatonist treatise, *Concerning the Gods and the Universe* (ed. Nock, 1926). He was perhaps a friend of Julian the Apostate.

Sally-port, a gate or passage by which the garrison of a fortress may make a sally or sudden attack on the besiegers.

Salmagundi, a word of uncertain origin, unless it be derived from the Countess Salmagondi, lady of honour to Marie de' Medici and the inventor of the dish; for salmagundi is a dish of minced meat, seasoned with pickled cabbage, eggs, anchovies, olive-oil, vinegar, pepper, and similar ingredients. In an applied sense the word means a pot-pourri, a medley, a miscellany.

Salmasius, CLAUDIUS, the Latinised name of a celebrated French scholar, CLAUDE DE SAUMAISE, who was born at Semur in Burgundy, 15th April 1588. His father, Benigne de Saumaise, a man of superior erudition, was his first teacher. At the age of ten young Salmasius translated Pindar and composed Greek and Latin verses. He studied philosophy at Paris, under Casaubon; and at Heidelberg (1606) he devoted himself to the science of jurisprudence, and publicly professed Protestantism. So insatiable at this time was his thirst for book-knowledge that he was wont to devote two whole nights out of three to hard reading, in consequence of which he brought himself to within an inch of the grave. In 1608 he published from MSS. two treatises against the primacy of the pope, one by Nilus Calabrian, Archbishop of Thessalonica, and one by the monk Barlaam. In 1620 he greatly expanded Casaubon's notes on the Augustan History. In 1629 appeared his chief work, his commentary on the *Polyhistor* of the 3rd century compiler Solinus—practically on Pliny, on whom Solinus based. Next he set himself, without the help of a master, to acquire a knowledge of Hebrew, Arabic, Coptic, and other oriental tongues. In 1631 he was called to Leyden, to occupy the chair that Joseph Scaliger had held there, and it is from this period that his European reputation as a scholar and critic dates. Various efforts were made (1635-40) to induce Salmasius to return to France, but he declined them on the ground that his spirit was too 'liberal' for his native land. He was in vain invited

to Oxford, Padua, and Bologna. Queen Christina of Sweden, however, managed to bring him to Stockholm, and fix him there for a year (1650-51), after which he returned to Holland. Among his later works were treatises on the primacy of the pope, on the Hellenistic dialect, on usury, and on the military art of the Romans. He died of an illness due to imprudent draughts of the waters at Spa, 6th September 1653. In the scholastic world Salmasius was probably the most famous personage of his day in Europe: 'the miracle of the world, the most learned of mortals.' The most exalted personages courted his friendship. Christina of Sweden declared that 'she could not live without him.' When Mazarin failed to induce him to return to France, he nevertheless sent him the order of knighthood, as a proof of Louis XIV.'s desire to honour him as a Frenchman. Though his attainments were prodigious, Salmasius does not rank with scholars like Casaubon or the younger Scaliger; he had neither Casaubon's balanced judgment nor Scaliger's grasp or insight. Hence, though his industry and learning could not have been inferior to theirs, his work has no distinctive value in the history of scholarship. In England Salmasius is best known in connection with his controversy with Milton regarding the execution of Charles I. At the request of Charles II., Salmasius, as the highest scholastic authority in Europe, published (1649) his *Defensio Regia pro Carolo I.*, which was answered in 1651 by Milton in his *Pro Populo Anglicano Defensio*. The preparation of his pamphlet cost Milton his eyesight, but, as Salmasius died shortly after writing a rejoinder, the English poet boasted that his adversary had the worst of the encounter. The brutal coarseness of both disputants seems now the main feature of their controversy.

For the life of Salmasius, see the *Éloge* by Clément prefixed to the collection of his letters published at Leyden in 1656; Papillon's *Auteurs de Bourgogne* (1745); Haag's *La France Protestante* (1883). For his controversy with Milton, see Masson, *Life of Milton*, vol. iv.

Salmon (*Salmo salar*). This fish occupies a somewhat distinctive position on account both of its famous sporting qualities and the excellent flavour of its flesh. No form of sport is now more sought after than salmon-angling, and in the market no fish commands so high a price. The nutritive value of the salmon as a food is also very high.

The majority of the family to which the salmon belongs are marine fishes with a very wide distribution. They are also regarded systematically as comparatively recent fishes, and are subject to considerable variations under the influence of local conditions. This is especially true, perhaps, in the trouts. *Salmo salar* is found on the coasts and in the rivers of western Europe from Spain to the Arctic. It is absent from the Mediterranean, but is found in northern rivers of the Eastern States and Canada, and is reported to be also found in northern rivers of Asia. In contradistinction to the group of allied species which inhabit the Pacific coast of North America, it is frequently referred to as the Atlantic salmon. In Europe, other species of large size inhabit fresh waters only in the Danube and the great rivers of northern Russia. A land-locked salmon is found in Lake Wenern in Sweden and in certain lakes of North America, but this fish is commonly of no great weight, and of inferior quality.

Amongst all the Salmones, *Salmo salar* is the most elegant in form, and this fact accounts for the particular distinguishing feature by which, amongst others, the salmon can be most surely distinguished from allied European species. The tapering of the body towards the 'small' of the

tail, or caudal peduncle, results in a smaller number of scales being found in a transverse series. If, in the salmon, the scales be counted from the



Fig. 1.—Salmon (*Salmo salar*).

back of the adipose fin downwards and forwards to the lateral line, either eleven or twelve will be found. In the sea-trout or common brown trout the corresponding series will be found to number fourteen to sixteen, and commonly the latter.

The life history of the fish has ever been a source of great interest and much discussion. Not till 1837 was the parr of our streams discovered to be the young of the salmon. All writers up to that time described *Salmo salmulus*, as it was then called, as a distinct species, and even went the length of pointing out the distinctions between this little fish and the young of the salmon. The modern angler has more difficulty in satisfying himself as to the distinctions between the salmon parr and the trout of similar size. The parr has a very small mouth; the brown trout has a considerable gape; hence, if the two be compared, it will be found that in the parr the posterior border of the maxillary bone forming the angle of the mouth reaches only to a line vertically below the middle of the eye; while in the trout the posterior border of this bone reaches to a line vertically below the back of the eye. This is considered the surest test in these early stages, but as the salmon advances in size after its migration to the sea the test does not hold good, as the maxillary bone gradually extends backwards. Other features of the parr are the dark colour of the fins, including the adipose fin, and the very forked appearance of the tail fin. Again, as the fish grows the appearance of the fins changes, and especially the tail fin becomes less and less forked, till it is 'straight' or not forked at all in old fish.

The great majority of salmon spawn, in British rivers, during the months of November and December, but spawning is not infrequent later in the winter; while fish full of spawn, which have apparently failed to find mates, sometimes occur even in May. These fish are in some localities termed 'rainers,' and by decision of the courts they must be regarded as foul or unclean fish which cannot legally be taken. Salmon in the kelt or spent condition have been noticed as late as July. Fish which have entered fresh waters in spring, as clean, fresh-run salmon, usually push on to the highest possible tributaries the following autumn, and, much discoloured through their long continuance in fresh waters, secure the purest streams and cleanest gravel for the deposition of their eggs. Late-running fish, although they frequently also ascend considerable distances, are the fish which commonly occupy the middle and lower reaches. The female fish scoops out a trough or 'redd' in the gravel, and deposits a proportion of her eggs therein, where they are immediately fertilised by an attendant male fish. At intervals during, it may be, a week or ten days the process is repeated till all the eggs of the female are shed. In small rivers, where the protection to large fish is scanty and the water-flow liable to fall away in frosty weather, the spawning-out of a female salmon seems to occupy a much shorter time. Considerable disproportion of the sexes occurs in some rivers, an excess of males being noticeable in

Scottish rivers north of the Moray Firth. After spawning, and before good condition is restored by feeding in the sea, the salmon, whether male or female, is termed a kelt; in Ireland, a slat. The eggs of the salmon die if subjected to salt water, or to more than about a third salt water. The fish entering our rivers are therefore the breeding stock from which all salmon, whether caught for commercial purposes in the sea, or for sport in rivers, must necessarily spring.

The eggs, having been fertilised in the redd, are covered with gravel by the spawning fish, and are then left alone. The temperature of the water influences the time of hatching, but with a usual temperature of 40° to 45° F., hatching may be expected in from 90 to 100 days. On hatching, the little creature has gradually to wriggle its way through the interstices of the stones; it is still incapable of feeding, but has a yolk-sac attached to it from which nourishment is drawn. This is described as the alevin stage. By the time the yolk-sac is absorbed the little fish is able to feed by the mouth.

The early river life of the salmon parr is exactly similar to that of a young trout, and in Scottish rivers usually continues for rather more than two years. Towards the conclusion of this period a gradual descent of the river has been made, and a silvery coat has been assumed. In this silvery condition, when great numbers of the young fish congregate just above tide reach, the young salmon is called a smolt. By law, the breeding fish and the parr and smolts are protected from capture.

Recent investigations in Norway have shown that in that country the very different conditions of river life cause a diversity of habit in smolt migration. In the southern rivers, it would appear that the smolts leave the river for the sea when only one year old, and that as investigations have been pursued northwards into colder and colder waters, so the period of the smolt's river life has been found to be prolonged, till in the extreme north of Norway smolts are ascertained as living three, four, and even at times five years in the fresh water before they migrate to the sea. There is evidence to show that in British rivers the same wide range of ages can be found, though to a less degree. The great majority leave, however, when fully two years old.

After entering the tidal estuary of the river, the salmon smolt, unlike the sea-trout smolt, seems at once to make for the sea. Experimental fishing in the Tay estuary resulted in salmon smolts being caught only in the run of the main channel and during ebb-tide. Fishing by small-meshed sweep-net on the shores of the estuary, or by an anchored net during flood-tide, produced sea-trout only.

Grilse are adolescent salmon, usually three years old. They are the fish which, after leaving as smolts, have spent one year in the sea. A smolt is about 6 inches long, and weighs about 2 ounces. It commonly goes to the sea in May or June, although migrations at other times also occur. After a summer, winter, and spring in the sea, the grilse, if it returns to fresh water in this stage, appears commonly in June and July as a fish of 2 to 6 lb. Grilse, intent on entering fresh water, continue to arrive in our rivers through summer and autumn, and according to the length of time spent in the sea, so the weights are greater—up to about 8 lb. In the months already named as those in which salmon most frequently spawn, the grilse spawn, and thereafter return to the sea; and it has been observed that their return to the sea is usually more prompt than the return of adult female salmon, which, as kelts, may spend four or five months in the quiet pools of our largest rivers. In all small rivers the fish go to the sea more quickly

after spawning, and, in whatever locality, males descend more quickly than females. The latter become 'mended' or restored in condition, and in many cases take on a very bright, silvery, metallic lustre before leaving large rivers; but several instances have occurred of kelts descending one river, and being afterwards caught, not yet fully mended, in other rivers. Kelts which descend rapidly from small rivers commonly remain in brackish water till 'well mended.'

An important fact to notice in the life of the salmon is that the ascent from sea to river is usually made only once or twice in the fish's life. The fish is not an annual spawner, as many people even still suppose. The mere reflection that clean-run fish, with reproductive organs quite undeveloped, ascend our rivers in the winter and spring, when the spawning fish are either on the redds or already returning to the sea as kelts, should in itself be sufficient to show this. A long series of experiments in the marking of salmon by the attachment of numbered silver labels, conducted by the Fishery Board for Scotland, has clearly shown that after descent to the sea, some fish return towards the end of the same year, while others may spend one, two, or three years continuously in the sea before returning to fresh water. This has been referred to as the divided migration of the salmon. Marking of fish in the smolt stage has further clearly shown that the first possible return is in the grilse stage, one year after the first descent, but that numbers of grilse do not then return to fresh water, but pass through this stage in the sea, and make their first return after a second winter in the sea, being then representatives of the small class of spring fish, 8 to 10 lb. in weight. These are the fish caught in spring in the Aberdeenshire Dee, Beaully, Conon, Brora, Helmsdale, Naver, &c. As summer advances the usual summer fish of 12, 14, or 16 lb. appear, and are simply fish of the same class which have remained longer in the sea to continue feeding; for the sea, not the river, is the feeding-place of the salmon. A proportion still further delay their return to fresh water. When we reach fish of 20 lb. in weight, in rivers where such fish are common, we have reached a stage in which representatives of different classes of salmon may be mixed up. The large spring fish common in the Tay, for instance, are in most cases fish of nearly five years old—fish which, after descending as smolts of two years old, have passed the grilse stage and the small spring-fish stage in the sea, and have remained a further year before returning to fresh water for the first time. Such fish, however, may have amongst them a few fish which were previously in the river as grilse, and which have spawned, descended, and are now reascending fresh water. In many of our smaller rivers, fish caught at this weight may have remained longer than three years in the sea before returning to fresh water.

The actual history of the migrations of such fish can also be ascertained by a study of their scales, for the scale of the salmon has imprinted upon it a record of the successive summers and winters of growth. As the fish rapidly grow under the rich feeding in the sea, the scales increase in size by the addition, at their edges, of layers of scale-forming material. These, when the scale is examined under the low power of the microscope, appear as lines or rings not dissimilar to the rings showing the growth of a tree. Since, however, food is much more abundant in summer than in winter, summer lines are more numerous and more strongly marked than winter lines. A broad belt of numerous well-marked lines indicates summer growth; a narrow belt of about six lines placed close together indicates winter growth. In all

ordinary cases, therefore, it is not difficult to tell the age of a salmon. The central portion of the scale contains the miniature scale of the smolt, after which the rapid growth of the fish in the sea is indicated by the summer and winter rings. One portion of the scale is, however, destitute of lines. This is the portion exposed on the surface of the fish's body. The larger area of the scale lies in a skin pocket, and it is upon this covered portion of the scale that the lines are shown. When a salmon approaches the spawning condition, a considerable amount of absorption from various tissues of the body takes place. The fish has already ceased feeding, and has entered fresh water. The genitalia receive nutriment at the expense of other tissues, and even the scales are affected, absorption occurring at the edges. Both males and females are affected in this way. When, after they re-enter the sea, feeding and rapid growth again obtain, the frayed edges are made up as a wound is healed, and lines are again added to the periphery of each scale. This healed place remains evident, as does a cicatrice, and indicates that the fish has spawned. It is termed the 'spawning-mark.' It persists throughout life, but varies very much in appearance, and sometimes shows on the plain exposed portion of the scale. In very large and old salmon the possibility of reading the age and history of the fish is more difficult than in younger fish, since in these the lines often have become blurred, and the various divisions showing years of growth more or less coalesced.

Certain variations undoubtedly occur in scales taken from the same fish. Some observers have placed much importance upon the number of rings in each area or belt or zone of the scale. A detailed study of groups of scales taken from different parts of the same fish has shown, however, that the number of the rings increases as the examination moves from the head along the body as far as the adipose fin, and then decreases from this point towards the tail. On the caudal peduncle or 'small' of the tail, moreover, it is difficult to find scales sufficiently perfect for comparison. Also the scales above the lateral line have, as a rule, rather more lines than those below the lateral line. It is essential, therefore, if comparisons of scales from different fish are to be made, that the scales be taken from the same places on the different fishes. As a rule, it is found satisfactory and preferable to take scales from the 'shoulder' of a fish.

Great support to the correctness of scale-study data has been secured by the taking of scales from salmon when marked, and afterwards when recaptured. It is found that the known intervals of time exactly correspond with the deductions drawn from scale-study alone. It is always essential to remember, however, that a salmon entering fresh water and remaining there till it spawns is not nourished by any food, and therefore does not show any addition of lines for this period. In judging age, therefore, it is necessary to notice when the salmon left off feeding before the spawning-mark (if present) was formed.

An important discovery in the economy of our salmon-fisheries, largely brought to light by scale-study, is the infrequency of spawning of the salmon. The great majority of fish appear to spawn only once. It is rare to find a salmon in the river for a third time, and five times is the maximum in Britain.

It is found that the salmon of certain districts increase more rapidly than do fish in others. From

actual fish which have been marked when in the kelt state, and recaptured in the river after a single season's feeding, it appears that in a district famous for large fish, such as the Tay, a 9-lb. kelt has on an average increased to a clean-fish weight of 17 lb. Similar fish in the Helmsdale, where salmon do not run so heavy, show kelts of 7 lb. increasing on an average to 12½ lb. When we deal with fish from these two rivers which have spent two consecutive seasons in the sea, the Tay kelt has become a fish of 26 lb., and the Helmsdale



Fig. 2.—The Scale of a Salmon marked when a Smolt, and recaptured in third summer after entering the sea; a fish of 12½ lb.

kelt a fish of 15½ lb. Instances of remarkably rapid growth and increase of weight are at times noticed, some fishes doubling their kelt weight in six months. The commonly accepted belief that salmon return to their own rivers is pretty generally borne out by records of marking and recapture. Only about 8 per cent. of the fish recaptured can be definitely regarded as having gone to other rivers. A few clean fish have been recaptured in coast nets fully 100 miles from where the fish were marked; but although marking has been simultaneously carried on in Ireland and England, only one recapture in Scotland of an Irish fish has yet been recorded. The maximum distance travelled by a marked fish is instanced by a fish marked in the Spey in November found in the Eden near Carlisle the following June.

The food of the salmon is chiefly herring, small and great, but sand-eels, the young of other fishes, and various crustacea are also found in the stomachs of sea-caught fish. Salmon caught in estuaries and rivers have no food or remains of food in them, and an examination of the cells lining the digestive tract shows that no food is then passing into the system. The tissues are usually richly stored with fats when the fish leaves the sea, and the development of the reproductive organs as the spawning season is approached has been very clearly shown to be at the expense of the stored nourishment.

Anglers are very commonly sceptical about the non-feeding of salmon in fresh water. That the fish take artificial flies, natural worms, and spinning baits of various kinds (frequently smelling strongly of the formaline in which they are preserved) is undoubtedly true. In this limited and erroneous sense the fish feed; but in the truer sense of taking nourishment the salmon does not feed in fresh water, and steadily loses weight and condition.

The reproductive period in the female seems to be over when the fish is eight years old, and no older females are found in Britain. The male appears to remain fertile for a slightly longer period, and hence old males of large size are more common than large females. Hen fish of over 35 lb. are extremely unusual, but males of 40 and 50 lb. are taken every year in some of the largest rivers. A male of 61½ lb. was caught by rod and

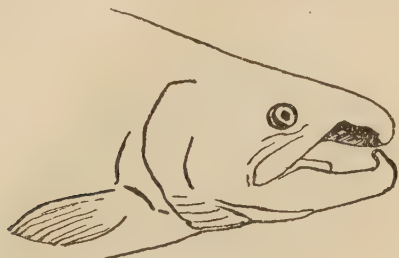


Fig. 3.—Head of Old Male Salmon.

line in the tidal waters of the Tay in 1907; in the Deveron in 1924 a 61 lb. fish was caught. Both those heavy fish were taken by ladies. The record Scottish fish appears to be a male of 84 lb. which was caught in the Tay estuary, in a sparling-net, in the winter of 1869. The heaviest Scottish rod-caught fish is, it is believed, a Tay fish of 71 lb. caught in June 1870. It measured 4 feet 4 inches in length, and was 32 inches in girth. The record rod-caught fish of the Tweed is a fish of 57½ lb., 53 inches by 28½ inches, taken at Floors. The Shannon in Ireland, and the Severn, Wye, and Tyne in England, have also yielded very heavy salmon.

It has frequently been noticed that certain rivers hold early fish, the so-called spring fish, while other rivers do not contain salmon till late summer and autumn. Various theories have been advanced to account for this, and the temperatures of rivers in different localities have been commonly brought prominently into the arguments. When actual thermometric readings are taken both in sea and river, it is found that the spring salmon leaves a cold sea for a much colder river, and that in the spring months the temperatures of our rivers do not materially differ, although the North Sea shows a lower mean temperature than the Atlantic on our western coasts. Till April the sea is warmer than our rivers; thereafter, till September, our rivers are warmer than the sea. In all probability the absence of a spring run of salmon in any river of good volume is to be laid to man's account in over-netting. There is strong presumptive evidence, but as yet no proof, that early runs and late runs are separate races of fish, and that either may be influenced independently of the other. It is the case, however, that most western rivers, in Scotland at least, do not contain salmon at so early a date as do the large rivers of the east coast. From the study of temperatures, however, it has been shown that when salmon are ascending a main river, they do not enter a cold tributary till such time as it has approximated to the temperature of the main river. At the same time, this has to be read together with the observation that early fish habitually pass the tributaries which enter the main river near its mouth.

In their attempts to ascend waterfalls and rapids, also, salmon are considerably influenced by the temperature of the water. A fall which offers little difficulty to a salmon in summer or autumn will not be attempted when the river is running cold in winter and spring. In Norway, however, salmon ascend very rough falls in glacier-fed water.

In Scotland many rivers have low falls which stop the spring fish. In the Helmsdale, for instance, all spring angling is below Kildonan Falls; but whenever the wintry conditions have left the water, the fish leap the falls and may be fished for above. In the Inverness-shire Garry the same obtains. Other instances are at the Falls of Orchy, Falls of Mucomer, Falls of Rogie, &c.

If a deep pool exists at the foot of a fall—and the water erosion usually secures this condition—the salmon is capable of leaping a considerable height. The fish swims with utmost speed from the depths of the pool, and projects itself into the air. Probably the highest perpendicular leap accomplished in this country is about 8 or 9 feet, but where falls are broken up into series of cascades and rapids, considerable heights can be ascended by combined leaps and rapid swims.

Artificial obstructions, such as weirs, in salmon rivers are required by statute to be provided with salmon-ladders or passes. In the case of natural waterfalls, passes can be secured by the consent of the proprietors. The conception of what constitutes an efficient pass has undergone considerable modification since these structures first came into use. A gradient of about 1 in 20 is now sought; the entrance for fish at the lower end should be placed where the run of water gives a natural lead-in close to the obstruction, and the pass should be adjusted to a level of water at which salmon will naturally attempt the ascent. It is well, also, to have the outlet at the upper end suitably protected from flooding and violent current. Many passes in former days have proved to be inefficient, and where circumstances permit, it is still true that the best method to allow of the ascent of fish is to remove the obstruction altogether.

SEA-TROUT (*Salmo trutta*).—In the adult state this fish is known also as the Salmon-trout and, chiefly in Ireland, as the White Trout. In the early grilse stage it is known as the Pinoc, Whiting, or Herling, the two former names being common in the north of Scotland, the last in the Solway. In systematic natural history it is an open question whether, in the trout family, the sea-trout or the brown trout should be regarded as the type. Reference to this point, and to the modern tendency to disregard the separation of the family into many distinct species, is made under TROUT. Certain varieties of trout are so closely allied as to make any definite separation impossible. The brown trout commonly associated with fresh waters assumes an estuarial habit in many localities, and under certain conditions takes to even pure sea-water, so that it cannot be distinguished from *S. trutta*. Nevertheless there is great convenience in regarding sea-trout separately, since the variety is well marked as a rule, and has habits quite distinct from those of the great majority of brown trout. The Sewin of Wales and south England, commonly called *Salmo cambricus*, is, further, a well-marked local race of sea-trout, and the Bull Trout (q.v.) of the Tweed and Coquet represent another such race.

The sea-trout spawns in fresh water in the same manner and at much the same time as the fresh-water trout. The early stages are spent in the river as in the case of salmon, and a gradual migration takes place with the assumption of silvery scales. The smolts of the sea-trout are very commonly called Yellow Fins or Orange Fins, since the pectoral and pelvic fins and the tip of the adipose fin are almost invariably yellow or orange. In the salmon smolt these fins are gray-coloured. For the further distinguishing of the salmon smolt from the sea-trout smolt, the test of the relation of the maxillary bone to the centre of the eye is most valuable. This test applies also to salmon parr

and the young of common fresh-water trout. In the salmon the gape of the mouth is small, and when the mouth is closed the hind-border of the maxillary bone reaches only to a point vertically beneath the centre of the eye. In either the orange fin or the young brown trout, the hind-border of the maxillary bone reaches to a point vertically beneath the posterior border of the eye.

A marked difference in habit has also been noticed. The salmon smolt when it leaves fresh water makes straight to the sea, whereas the sea-trout smolt likes to linger in the estuary. This tendency persists throughout life. The sea-trout has at all times a fondness for estuarial life. This is the most distinctive feature in its habit. If a number of salmon and sea-trout smolts are caught as they are congregating before leaving fresh water, it is noticeable that the sea-trout smolts are commonly larger than the salmon smolts. This seems to be explained partly on account of the sea-trout being rather older than the salmon, since the spawning is earlier, and also by the tendency of sea-trout to drop down to the estuary and return again. This habit is more strongly noticed in the whiting or phinoc stage. These beautiful little fish are found ascending from the estuary in the summer months. They may be only about $\frac{1}{2}$ lb. in weight in July, and by November, when they are dropping back again to the estuary, a few of them may have reached almost a pound weight in our largest rivers. In rivers where there is a wide extent of estuary, these little fishes are frequently caught in great numbers. They never ascend fresh waters very far, as fish intent on spawning do, and when dropping back to the estuaries in autumn and winter and in early spring, they are frequently in very poor condition. This is especially the case after cold winters, since at such seasons the food is much more limited. It has been ascertained that some of them spawn, and are actual kelts, so that they harmonise with the adult sea-trout kelts which are dropping down at the same time.

This habit of ascending fresh water from the estuary and dropping back again in the first season of migration is peculiar to the sea-trout. The salmon does not do so. Also, the whiting or phinoc feed freely in fresh water. The salmon, after leaving fresh water as a smolt, remains in the sea for a whole year before making a first ascent of the river, which ascent culminates in the spawning of the grilse. Further, as described above, very many do not return to fresh water as grilse, but pass through this stage in the sea.

Sea-trout frequent small streams which hold but few salmon. In the Orkney and Shetland Islands, where sea-trout are very plentiful, they may be said to have the streams almost to themselves at spawning-time, although at rare intervals grilse have been caught in these islands. In all such small streams sea-trout ascend late. In the Shetlands they ascend very late. Yet, contrary to the belief of some, sea-trout in not a few localities ascend fresh water in spring. Even on the west side of the Outer Hebrides, where the rivers are small, this is the case; while netmen in large rivers like the Tay catch them regularly, and send them to market in February, March, and April.

The average sea-trout known to sportsmen is probably the fish of about $1\frac{1}{2}$ to 2 lb. In the small rivers of the west coast sea-trout of 4 to 6 lb. are considered large. The same is true of English and Irish rivers. In larger rivers, however, specimens of 8, 10, to 13 lb. are obtained. The largest sea-trout known to the writer was taken in the Tay in 1900, and weighed $18\frac{1}{2}$ lb. The bull trout of the Tweed, already referred to

as a local race of sea-trout, has been taken up to 22 lb. in weight.

Sea-trout, also, do not usually ascend fresh waters for any very great distance. They are very commonly found in small rivers and streams, and in lochs from which such streams flow. In large rivers they usually ascend some tributary not very far up. As a rule they favour small waters for spawning purposes. They are wonderfully energetic in ascending obstacles, and will frequently manage to overcome falls almost impassable to salmon, through their smaller size enabling them to swim and leap in comparatively shallow water. Their great energy and dash make them most excellent sporting fish for the angler, and on light tackle their capture is by some preferred to the capture of the salmon.

SALMON DISEASE.—When salmon disease is spoken of, the particular ailment meant is that which for many years has been associated with the presence of the fungus *Saprolegnia ferax*. The fungus is, however, a secondary product. The disease is caused by a microbe which has been named *Bacillus salmonis pestis*. Only after the tissue has been attacked by this bacillus does the fungus grow. The fungus is killed when the fish succeeds in entering salt water, but great numbers of salmon die in certain rivers each year. Kelts are for the most part affected. The fungus arises in circular spots of a dull-white colour, giving the appearance of wet blotting-paper. These patches coalesce as the disease spreads, and the fish meanwhile becomes lethargic. The fungus spreads more rapidly on dead tissue than on living, so there is every reason to have badly diseased and dead fish removed from the river and destroyed.

SALMON-FISHERY LAWS.—The salmon is protected by special laws in the United Kingdom. (1) In England the right to fish salmon in the sea and navigable rivers belongs to the public as a general rule; and the right to fish salmon in rivers not navigable belongs to the riparian owner on each bank, the right of each extending up to the centre line of the stream. But though the public have, as a rule, the right to fish in the sea and navigable rivers, there are various exceptions, which arose in this way. Previously to Magna Carta the crown, whether rightly or wrongly, assumed power to make grants to individuals—generally the large proprietors of lands adjacent—whereby an exclusive right was given to such individuals to fish for the salmon within certain limits. This right, when conferred, at times applied to the shores of the sea, but more generally applied to navigable rivers and the mouths of such rivers. The frequency of such grants was one of the grievances redressed by Magna Carta, which prohibited the crown thenceforth from making such grants. But the then existing grants remained, and hence every person who at the present day claims a several or exclusive fishery in navigable rivers should show that his grant is from the crown, and is as old as Magna Carta. It is not, however, necessary that he be able to produce a grant or chain of grants of such antiquity; for if he has been in undisturbed possession for a long time—say sixty years and upwards—it is presumed that such title is as old as Magna Carta, and had a legal origin. When a person is entitled to a salmon-fishery (and if he is entitled to a salmon-fishery he is entitled also to the trout and other fish frequenting the same place), he is nevertheless subjected to certain restrictions as to the mode of fishing salmon. These restrictions were imposed by a series of acts from 1861 to 1921. In 1903 the care of the fisheries was transferred from the Board of Trade to the Board of Agriculture and Fisheries, which body subsequently was raised to the position of a ministry.

All the earlier acts may now be disregarded, however, since, by the Salmon and Fresh-water Fisheries Act, 1923, their provisions have been consolidated. By this important act, nineteen statutes were affected, eighteen being entirely repealed. Of the remaining act, that of 1891, only one section remains, so that in the 1923 act we have a code of statutory law on this subject.

The term salmon used in this act no longer includes migratory trout, a provision which affects the marketing of the trout. Local fishery boards are reconstituted, and have upon them representatives of net-fishers in public waters, as well as rod-fishers who angle for fish other than salmon. There are clauses for the prevention of the destruction of fish and their ova, and the food of fry, by pollutions; and also to enable the amount of netting to be restricted. Fishery boards are given additional powers to enable them to raise adequate funds for the administration of their local affairs, and for the regulation of the fisheries by bylaws. The weekly close time may be extended by bylaw to seventy-two hours, forty-eight being otherwise the period, and fishermen may be required to furnish a return of salmon and trout caught. The act has ninety-four clauses and five schedules. A first part deals with the salmon and fresh-water fisheries; and a second with pollutions and the Rivers Pollution Acts, 1876 and 1893.

(2) In Scotland the conditions under which salmon-fisheries are held are fundamentally distinct from those which obtain in England. Scottish salmon-fishing was originally the private patrimony of the sovereign, and the right of catching salmon has only been obtained legally by charter from the crown. To the present time the right of salmon-fishing is vested in the crown—now in this matter represented by the Office of Crown Lands—or is held by subjects, or successors to subjects, to whom such rights have been alienated. The right is a separate heritable estate, and has, at law, no connection with rights in land; although as a matter of fact the two commonly go together where rights have been granted. There are, however, not a few instances where the right of salmon-fishing in rivers is held by those who do not own the banks of the rivers. The great majority of river-fisheries have been alienated from the crown to individuals, but the coast salmon-fisheries are still held to a very considerable extent by the crown, and are let on lease or otherwise by the Office of Crown Lands. The public have no right anywhere in Scotland to fish for salmon either with net or rod. By virtue of many old statutes all fixed engines for catching salmon in rivers and estuaries are illegal, and it is settled that everything is in the nature of a fixed engine unless it is held in the hand of the fisherman and is in motion while he is fishing; but a mechanical contrivance which enables the fisherman to go a little farther into the river with his coble or boat which is to drag the net is not illegal. Even drift-nets worked in estuaries have, by House of Lords decision, been found to be fixed engines, and therefore illegal. A very limited number of cruives or fishing weirs still, however, exist in rivers by virtue of special charters. Fixed nets proper—i.e. stake-nets, bag-nets, and fly-nets—are largely fished on the open coast, but may not be used within the limits of estuaries, which limits are scheduled in a bylaw of the Salmon Fisheries (Scotland) Act, 1868. In 1862 and 1868 statutes were passed for regulating the Scottish salmon-fisheries. By these acts fishery districts are authorised to be managed by boards. These boards consist of qualified proprietors of fisheries. The boards appoint constables, water-bailiffs, and watchers, forming a kind of river-police. The board has power to assess the various proprietors

so as to raise funds for purposes of protection, &c.—similar funds being raised in England chiefly by license-duties. The general superintendence of the salmon-fisheries is vested in the Fishery Board for Scotland, and is conducted by the Inspector of Salmon-fisheries. Annual reports are made to the Secretary for Scotland and presented to parliament. Trout-fishing in Scotland is a pertinent of the land, and is not held by separate charter. In 1902 the Fresh-water Fisheries (Scotland) Act was passed, which for the first time instituted a close time for trout. This close time is from 15th October to 28th February, both days inclusive. This act also made it illegal to expose trout for sale, or to have trout in possession between those dates. It also, by incorporating the penalties of the Fisheries (Dynamite) Act, 1877, made it illegal to employ any explosive for the capture of trout.

(3) In Ireland the salmon-fisheries are, as regards title, somewhat similar to those in England. There is a public right of fishing, and several private fisheries also exist.

See *British and Irish Salmonidæ*, by Francis Day (1887); *Salmon and Sea-trout*, by Sir Herbert Maxwell (1898); *The Life of the Salmon*, by W. L. Calderwood (1907); *The Law relating to the Salmon Fisheries of England and Wales*, by J. W. Willis Bund (1876); *The Law of Scotland relating to Rights of Fishing*, by Charles Stewart (2nd ed. by J. C. Shairp, 1892); *The Law of Scotland as applied to the Game Laws, Trout and Salmon-fishing*, by J. Hunter Tait (1901); *The Fishery Laws of Ireland*, by H. D. Conner (1892; 2nd ed. 1907); *Bibliotheca Piscatoria*, by T. Westwood and T. Satchell (1883, 1901). Also the articles ANGLING, FISHES, POACHING, PISCICULTURE, TROUT, and works there named.

Salmon, GEORGE (1819–1904), a great mathematician and divine, was born in Dublin, and had his education at Cork, and at Trinity College, Dublin, where he graduated as senior moderator in mathematics in 1839. He was appointed to a fellowship in 1841, took orders in 1844, became regius professor of Divinity in 1866, and provost of the college in 1888. His contributions to mathematical learning include many papers in the special journals, and admirable treatises on *Analytic Geometry*, *The Modern Higher Geometry*, *Conic Sections*, *The Higher Plane Curves*, and *Geometry of Three Dimensions*. In the department of theology his writings comprise four volumes of strong and thoughtful sermons, *College Sermons* (1861), *The Reign of Law* (1873), *Non-miraculous Christianity* (1881), *Gnosticism and Agnosticism* (1887), and two collections of his lectures, the first forming an excellent *Introduction to the New Testament* (4th ed. 1890), the other on the *Infalibility of the Church* (1888), a vigorous and unusually readable controversial work.

Salmonidæ, a large and important family of Teleostean fishes in the order Physostomi. The family includes salmon and trout (*Salmo*), smelt (*Osmerus*), grayling (*Thymallus*), vendace, pollan, and 'white fish' (*Coregonus*), and about a dozen other genera—about eighty species in all. They inhabit both salt and fresh water, and many migrate from the one to the other. With one exception (in New Zealand), the fresh-water forms are restricted to the temperate and arctic zones of the northern hemisphere. The body is generally covered with cycloid scales, the head is naked, there are no barbules, there is an adipose or fatty fin behind the dorsal, the pelvic fins are situated about the middle of the ventral surface, the outline of the belly is rounded, the air-bladder is large and open, and with the stomach numerous pyloric cæca are associated. The eggs are large, and are shed into the abdominal cavity before they are spawned. In beauty, activity, and also in palatability, the Salmonidæ rank high among fishes.

See SALMON, SMELT, TROUT, &c.; Day's *British and Irish Salmonidæ*, (1887); and for the acclimatisation of Salmonidæ since 1864 at the antipodes, the book by Nicols (1882), and articles by Allport in *Proc. Zool. Soc.* (1870), by Arthur in *Tr. N. Z. Inst.*, (1881), and by Seager and Johnston in *Proc. R. Soc. Tasman.* (1888).

Salò, GASPARO DI BERTOLOTTI DA (c. 1542-1609), a celebrated maker of double basses, and of other instruments of the viol and violin families, was a son of the painter Francesco di Bertolotti, and worked in Brescia.—His son FRANCESCO, born in Brescia in 1565, succeeded him; and died after 1614.

Salome, the daughter of Herodias (see JOHN THE BAPTIST), with an associated love-story, was made the subject of a play (in French) by Oscar Wilde; and on this Richard Strauss based his opera (1905).

Salomon, JOHANN PETER, violin-player and musical composer, born at Bonn in 1745. When young he was attached to the service of Prince Henry of Prussia, for whom he composed several operas. He settled in London, and his series of Philharmonic Concerts there in 1790, for the first of which he arranged to have Haydn present, form an era in the history of music, in that they led to the production of Haydn's twelve greatest symphonies. After his retirement in 1800, he continued to compose songs, glees, and violin solos and concertos. He died on 25th November 1815, and was interred in Westminster Abbey.

Salon, the French word for a large and lofty hall of reception in a palace—later, for an ordinary drawing-room—appears in English in the 18th century either in the same spelling or, in Richardson and Horace Walpole, as *saloön*, now used in another and a less dignified sense both here and in the United States. The Salon of ordinary parlance, the *Salon par excellence*, is the French or Parisian Salon, the annual exhibition at Paris of paintings and sculptures by contemporary artists, originally held in the Palais Royal (1667), later in the Salon Carré of the Louvre (whence the name), and now in the Palais de l'Industrie. The Paris Salon was the precursor and model of like exhibitions in London and elsewhere.

In the history of French culture and French society 'the salon' has also quite another and specific meaning, and refers to a characteristic French institution which originated in Paris, and in its fullest developments was peculiar to the French capital—the reception-room of the Parisian society queen for the time being transformed into a meeting-place of notabilities in society, literature, art, and politics, the focus of fashion and the parliament of taste and social usage. We may say that Aspasia had her salon, in which Pericles and Socrates were almost equally conspicuous; in the first half of the sixteenth century many of the courtesans of Venice, learnedly educated and highly accomplished in poetry and the arts, enjoyed the friendship of the foremost poets and painters, and their salons were crowded by philosophers and great scholars as well as noble courtiers. Vittoria Colonna, Margaret of Navarre, and brilliant and accomplished women in all ages have attracted to their houses and to their society the most distinguished men of their time and country. Chivalric devotion to women's service is said to have been first specially cherished in Provence. But in its most characteristic shape and highest influence the salon is a Parisian phenomenon; this particular homage to women's fascination and women's influence—women's rights is one special department—dates from the opening of the Hôtel de Rambouillet in 1617. At the shrine of the marquise—young, beautiful, refined, witty—Richelieu, Malherbe,

Balzac, Corneille, and Voiture worshipped; and later Bossuet, Scarron, St Evremont, and La Rochefoucauld. The original members of the French Academy were perhaps the most distinguished guests. There too Madame de la Fayette, Mademoiselle de Scudéry, the Duchesse de Longueville, Madame de Sévigné, the Duchesse de Montpensier, trained themselves in the arts they practised so skilfully when they in turn opened salons for themselves, and were, some of them at least, satirised in Molière's *Précieuses Ridicules*. Then came the salons of Madame de Sablé, Ninon de l'Enclos, and Madame de Scarron (afterwards De Maintenon). The Marquise de Lambert, learned but vivacious, had the most noteworthy salon in the first half of the 18th century, said to be 'the ante-chamber of the Academy.' Madame de Tencin was one of the cleverest but least estimable queens of the salon. Madame du Deffand—aristocratic, beautiful, most accomplished in conversation and as a letter-writer—had a long reign, and when blind and frail was not wholly deserted after her *protégée*, Julie de Lespinasse, poor, plain, nobly but not honourably born, set up her rival salon, to which D'Alembert brought the notable encyclopedists with him. Madame de Geoffrin, *bourgeoise* by birth and a manufacturer's wife, devoid of beauty or literary accomplishment, had yet the *esprit* and personal charm which attracted to her salon the chief men of letters and the most aristocratic women of France. Her salon, like those of Madame Necker and Madame Roland, was a centre of the new doctrines that prepared the French Revolution; and Madame d'Épinay, who gave scope to the genius of Rousseau, had a high reputation in philosophical, literary, and political circles. In the 19th century the tradition was revived or maintained by Madame de Staël, Madame de Récamier, Madame Vigée le Brun, Madame de Girardin, and Madame Mohl.

According to M. Arthur Meyer, the last salon that influenced elections to the Academy was that of the Comtesse de Loynes (Amaury Duval's 'Lady of the Violets'), frequented by the younger Dumas, Sardou, Flaubert, Gautier, Mistral, Coppée, Lavedan, Sarah Bernhardt, and Anatole France.

In no typical salon were the claims of birth paramount; in some wit or political, literary, or artistic eminence was a sufficient passport. Madame du Deffand was not content with genius, but demanded elegant manners, tact, gaiety, and good sense; she admired Voltaire, disliked Diderot, held Rousseau in contempt, despised Marmontel, and would not admit Grimm at all. But possessed of the required qualifications, representatives of all ranks, and often of diametrically opposed schools, sects, and coteries, met on the same footing. The salon was a centre where pleasant people were to be met, good conversation to be enjoyed, and a liberal interchange of ideas promoted. The salon might have its special tone—literary, philosophical, artistic, political, philanthropic, religious even; but it was always the home of good talking, and of intellectual companionship between cultivated men and women. The parties were small and select, and did not break up into groups; the conversations were general and not *tête-à-tête*; and the hostess was understood to direct the discussion, tossing the ball from one to another, so that vanity had no room to display itself in monologues. The interchange of ideas in the salon diffused new thought and new light throughout society generally. The salons governed opinions; opinions governed the French world. A standard of conduct was maintained, not the highest perhaps, but higher than generally obtained at court in a licentious age; a pattern of manners was set which tended to become universal. Brunetière has maintained that if literary refinement and elegance was promoted by the salon, spontaneity, freedom,

and originality were correspondingly checked and dominated by formality.

In England the 'matchless Orinda,' Mrs Katherine Philips (q.v.), was early in the field. Later, the select assemblies of Mrs Montagu and other 'Blue Stockings'—Mrs Delany, Hannah More, Mrs Chapone, Elizabeth Carter, Mrs Vesey—were but pale reflections of the glory of the French salons, and neither socially, politically, nor in respect of their influence on art or literature took the same pre-eminent place; nor did those of Mrs Piozzi (Thrale) and the Della Cruscan (q.v.), of Lady Anna Millar and the Bath-easton coterie, or of Lady Blessington. Rohand House at its best, when its rooms were haunted by Sydney Smith, Macaulay, all the living magnates and political stars, the social and literary lions of the time, most nearly rivalled the Parisian prototype. The 'society-leader' aims at a salon of a kind. The women of the American colonies imitated their French sisters to some purpose; and in Germany Henriette Herz, Bettina von Arnim, Rahel, Carolina von Schlegel, and Queen Louisa were pre-eminent.

See Bassanville, *Les Salons d'Autrefois* (1862-70); Miss Clergue, *The Salon* (1907); Arthur Meyer, *Forty Years of Parisian Society* (trans. 1912); Miss Wheeler, *Famous Blue Stockings* (1910); Huchon, *Mrs Montagu and her Friends* (1907); Lloyd Sanders, *The Holland House Circle* (1908); Miss Hargrave, *Some German Women and their Salons* (1912); Wharton, *Salons Colonial and Republican* (1900); Boulting, *Woman in Italy* (1910); C. B. Tinker, *The Salon and English Literature* (1915); L. Daudet, *Salons et Journaux* (1912); and the articles on the several founders of salons in this work.

Salona, an ancient ruined city of Dalmatia, at the head of a gulf, about 3 miles NE. of the spot on which Diocletian afterwards built his palace of Spalato (q.v.). It was made a Roman colony in 78 B.C., and later became the capital of Dalmatia and one of the most important cities and seaports of provincial Rome. But it was frequently captured by the Goths and other barbarians, and in 639 was completely destroyed by the Avars. The inhabitants who escaped took refuge in Diocletian's palace. The ruins having been excavated during the 19th century, there are now to be seen remains of the city walls, the shell of the ancient Christian cathedral, remains of other churches, traces of an amphitheatre, and other structures. The city was early made the seat of a bishop, who was soon advanced to the dignity of archbishop of all Dalmatia. After the destruction of the city the archbishop converted the temple of Jupiter at Spalato into his cathedral.

Salonika, or SALONIKI (Turk. *Selanik*), a great commercial city of Greece, second city of the republic, and chief European port of the Ægean, stands at the head of the Gulf of Salonika. The city climbs up the rocky heights that stretch back from the shore, and is overlooked by a citadel, the ancient acropolis. From the sea it has a fine appearance, being surrounded with white walls, 5 miles in circumference, and having its houses and churches embowered in trees of dark foliage. The streets previous to 1889 were narrow, rough, and dirty; since that year they have been widened and excellently paved and drained. The principal buildings of interest are the churches (used as mosques during the Turkish occupation), which preserve on their walls many valuable evidences of Byzantine art. St Sophia, supposed now to date from about 500 A.D., and therefore older than its namesake at Constantinople, is shaped like a Greek cross surmounted by a dome, and contains beautiful mosaics and capitals. In the great fire of September 1890, which did enormous damage to the town, it was a good deal injured, but not irreparably, though the archives were burned. St George,

dating probably from the time of Constantine, is circular in form, with a dome also covered with fine mosaics. St Demetrius (7th century), one of the most beautiful of all Byzantine churches, lined with marbles and mosaics, was damaged so much in the great fire of August 1917 (which destroyed the commercial quarter) that only the bare walls remained. Eski Djuma (5th century) is a superb basilica with marble columns and mosaics. Salonika is an important railway centre, lines running to Constantinople, Belgrade, Monastir, and Athens (the extension to the Thessalian border, linking up the Greek capital with the European railroads, was only completed in 1916). A new harbour was opened in 1901, and the commerce is very considerable, the principal imports being metal wares, cereals, and textiles, and the exports silk cocoons, skins and hides, wine and olives. Cotton, rice, tobacco, and vines are grown locally. A university began work in 1925. Pop. (1900) estimated at 100,000; (1923) at 263,000 (of whom 75,000 may be Jews of Spanish descent), but it is doubtful whether this figure includes the Armenian and other refugees from Asia Minor, that poured into Greece after the Great War.

Thessalonika, as the town was anciently called, was built by Cassander about 315 B.C., on the site of an older city named Therme, and was called after his wife, sister of Alexander the Great. It soon became a place of importance as the principal harbour of Macedonia, and later was the chief station on the Via Egnatia, the great high road from the Adriatic coast (and so Rome) to Byzantium. To the Christian community here St Paul addressed the two Epistles to the Thessalonians. In 390 A.D. there took place the notorious massacre of 7000 citizens by the Emperor Theodosius. Under Byzantine rule, the town successfully withstood the Goths and Bulgarians, but was captured by Moslems from Africa in 904 and by the Normans of South Italy in 1185. The Turks took it in 1430 from the Venetians, and it became the headquarters of the Young Turk movement (1908). The Greeks invested it in the First Balkan War (1912) and kept it, in spite of Bulgarian opposition. In 1915 an Anglo-French force under General Sarrail landed here, but King Constantine adopted a policy of neutrality. The next year, Venizelos formed a provisional government at Salonika in opposition to the court at Athens. After the evacuation of Gallipoli, the Serbian debacle, and the abdication of Constantine, a huge allied force collected here in 1917, and finally in 1918 completely crushed the Bulgarians. See GREECE (*History*). The fire of 1917 was followed by very active rebuilding with spacious if pretentious avenues, and the wiping out of traces of Turkish tenancy.

Saloop. See SASSAFRAS.

Salop. See SHROPSHIRE.

Salpa, a remarkable genus of free-swimming Tunicates, included along with Dolium and Anchinia in the order Thaliacea. Several species occur in the warmer seas, transparent pelagic animals, complex in structure and in life-history. The body is somewhat barrel-shaped, open at both ends, ringed round by several distinct but incomplete hoops of muscle, controlled by a complex nervous system, possessed of eyes and other less definite sense-organs, with compressed lateral viscera. In the life-history there is an alternation of generations. There are asexual forms or 'nurses,' from which there grows out a long ventral 'stolon.' This stolon is segmented into a chain of sexual buds, and the whole chain is set free. As the individuals become mature they separate from one another, the chain breaks into its links. Each of these produces an ovum, which after fertilisation

develops into an embryo and into the asexual 'nurse' form with which we began. The sexual forms are hermaphrodite, like all Tunicata, but cross-fertilisation seems to occur.

Sal Prunelle, purified nitre in mass, or fused and rolled into small balls. See NITRE.

Salses. See VOLCANO.

Salsette, an island lying N. of Bombay, with which it is connected by a bridge and a causeway. It is a beautiful island, diversified by mountain and hill, studded with the ruins of Portuguese churches, convents, and villas, and rich in extensive rice-fields, coconut groves, and palm-trees. Area, 246 sq. m.; population, 150,000; chief towns, Bandra (22,000) and Thana (q.v.), the headquarters of the district. Nearly one hundred caves and cave-temples exist at Kánhari or Keneri, in the middle of the island, five miles west of Thana. They are excavated in the face of a single hill, and contain elaborate carving, chiefly representations of Buddha, many of colossal size. Salsette was occupied by the Portuguese early in the 16th century, and was captured by the Mahrattas in 1739 and by the British in 1774.

Salsify, or **SALSAFY** (*Tragopogon porrifolius*), a compositous biennial growing in meadows throughout Europe, locally indigenous in the south-eastern counties of England, cultivated in gardens for the sake of its root, which is used in the same manner as the carrot, and is very delicate and pleasant, with a flavour resembling asparagus or scorzonera. Cooked in a certain way it somewhat resembles the oyster in flavour, hence the popular name *Oyster Plant*. The root is long and tapering, and in cultivation white and fleshy, with much white milky juice; the stem 3 to 4 feet high, with smooth and glaucous leaves, which resemble those of the leek; the flowers are of a dull purple colour. The seed is sown in spring, and the root is ready for use in winter. Next spring, when the flower-stalks are thrown up, they are used like asparagus. The Yellow Goat's Beard (*T.*



pratensis), a native of Britain, was formerly cultivated in England for its roots, which are similar in quality to salsify. Scorzonera is sometimes called Black Salsify.

Salt, or **CHLORIDE OF SODIUM** (sym. NaCl; sp. gr. 2.15). This substance is called by chemists common salt to distinguish it from a great number of other bodies termed Salts (q.v.) in scientific language. Rock-salt or halite crystallises in cubes, colourless and usually transparent when pure, and sometimes measuring an inch on the side. It is, however, generally coloured by the presence of some foreign body, and occurs of yellow, red, blue, and purple tints. When decidedly impure it is often of a dull-gray colour. Salt is one of the few substances which are nearly as soluble in cold as in hot water. A saturated solution has a specific gravity of 1.205. Sea-water, which contains salt to the extent of from 2.5 to 2.7 per cent., has a mean specific gravity of 1.027. Salt has a saline but not a bitter taste, and is inodorous. Some of the physical properties of rock-salt are remarkable (see HEAT). Salt is of great importance as a condiment and antiseptic, and equally so in some chemical manufactures.

As rock-salt it is found in most countries, and in some extensively; but salt from any source is scarce and costly in some places—certain parts of the interior of Africa, for example. It can, of course, be obtained by evaporating sea-water. Some beds or deposits of rock-salt have no doubt been formed by the slow evaporation of large bodies of salt water, which by one means or another—by a sandbank, for example—have been cut off from communication with the sea. This process would sometimes be repeated by sea-water again getting in through a breach in the bank, and this again being filled up. There are instances where it has certainly been formed in this way on a limited scale. But geologists seem to be of opinion that beds of rock-salt have more generally arisen from the long-continued evaporation of large inland lakes without outlets; these had long been fed by rivers or streams which dissolved salt out of the soil or strata over which they flowed. The Dead Sea and the Great Salt Lake of Utah are examples of lakes without outlets at the bottoms of which rock-salt is forming. All salt, wherever found, has probably come originally in some way or other from the sea. Rock-salt beds are usually associated with deposits of sulphate of lime (calcium sulphate), and are more common in the Trias than in other geological formations.

Valuable beds of rock-salt, usually accompanied with brine, occur in England. The Cheshire deposits, which are in the basin of the river Weaver, have been long worked and are still productive. At Northwich in that county rock-salt is found at from 200 to 250 feet below the surface. There are four beds of an aggregate thickness of 240 feet, but the two lower ones are mixed with marls. The two upper beds each average about 90 feet in thickness, with some brine just above the top bed. At Winsford and Wheelock in the same county thick beds of rock-salt also occur at moderate depths. In Worcestershire, at Stoke Prior and at Droitwich, rock-salt occurs, 154 feet thick including marls in the former locality, and brine is likewise found at both places. At Stafford Common in Staffordshire the salt is 78 feet thick; and in these two counties the deposits are not far below the surface. In the west of England, most of the salt is obtained from brine naturally overlying the rock-salt or from inundated salt-mines. In 1889 an important discovery of rock-salt was made at Walney Island and at Fleetwood (Preesall), in Lancashire, where the deposits are roundly from 100 to 500 feet in thickness, and at the former place from 270 to 360 feet below the surface. This Lancashire salt was first worked (as Preesall brine) in 1890. On the east side of England, between Middlesbrough and Hartlepool, there is an extensive deposit of rock-salt, which was accidentally discovered in boring for water in 1862. Its proved area is between 30 and 40 sq. m., the salt is from 50 to 115 feet thick, and its depth below the surface varies from 800 to 1600 feet. This is greatly deeper than the beds in the west of England. A bore-hole is made, into which a double iron pipe—one within the other—is inserted, and in the jacket or annulus thus formed fresh water is let down to form brine, which is pumped up through the inner tube by a steam-engine.

Rock-salt is found in Galicia, the mines at Wieliczka, which have been worked since the 13th century, being the most famous in the world. The system of mines extends over an area of about 6 miles from east to west, and 2 miles from north to south, with underground streets, squares, &c., and about 30 miles of tramway; the greatest depth reached being about 1000 feet. In Wallachia, Transylvania, Hungary, Upper Austria, Styria, Salzburg, and Tyrol important salt-mines are

worked. Rock-salt is also found in Russia, Italy, and largely at Stassfurt in Germany and Córdoba in Spain. Of eastern countries Persia is perhaps the best supplied with salt; India has productive mines in the Salt Range (q.v.), but salt is also largely imported; and both rock-salt and salt lakes occur in Asiatic Russia. The Wieliczka rock-salt is of Tertiary age; that of Cheshire, Bavaria, and the Austrian Alps Triassic; in Permian deposits near Berlin borings have gone down in rock-salt for nearly 4000 feet. Deposits of the same age occur also in Holstein, and in eastern Russia. Brine-springs rise from many other geological systems: thus, in Northumberland and Leicestershire they issue from Carboniferous strata, while in some parts of the Alps they come from rocks of Jurassic age. Similarly in North America saliferous formations occur on several geological horizons. Thus, the salt-works at Syracuse, New York, and in the neighbourhood of Goderich on the Canadian side of Lake Huron, are in the well-named 'Salina group' of the Upper Silurian. Brine-springs also rise from the Carboniferous strata of Michigan, Ohio, and Virginia, while a thick bed of rock-salt of apparently Cretaceous age occurs in southern Louisiana.

Not infrequently rock-salt occurs in considerable abundance at the surface; some of these accumulations are of quite recent formation, while others are of great geological age. Thus, at Cardona (Montserrat) in Spain rock-salt forms hills some 400 and 500 feet in height—the deposits being probably of Cretaceous age; and similar masses occur near Orenburg in Russia, and in the Punjab. Superficial saline deposits are met with covering extensive areas in many more or less desert regions, where they evidently indicate the sites of dried-up lakes and inland seas of comparatively recent age. As examples may be cited the rock-salt deposits of the Kirghiz Steppes, those near Lake Urumiah, and in various parts of South America. Salt lakes from the bottoms and shores of which rock-salt is obtained are met with in many regions, both in the Old and New Worlds. Thus, it is collected in Cyprus, Melos, the Crimea, and the Aral-Caspian area; and many saline lakes, pools, and marshes occur in the great western region of North America. Even in dry warm regions where no salinas may happen to exist, an efflorescence of salt not infrequently covers the ground after rains—the salt having doubtless been derived by capillary attraction from the underlying subsoils and rocks. Rock-salt also occurs as a product of sublimation in volcanic regions, from which it has been inferred that much of the steam emitted by volcanoes has come from water introduced by underground fissures from the sea.

When brine is pumped up to the surface it is run into cisterns or reservoirs situated at a higher level than the evaporating pans, into which it descends through pipes. These pans are large shallow iron vessels, heated either by coal-fires placed beneath them or by other means, such as waste steam. With a high heat and a short time in the pan a fine salt is produced; with a comparatively low heat and a longer time in the pan a coarse salt forms. Agitation of the brine tends also to produce a fine salt. Brine boils at 226° F., and it is at this temperature that ordinary table-salt, called also 'lump' or 'lumped' salt, is produced. At about 165° F. what is called 'common' salt is obtained; large-grained salt forms at between 130° and 140° F.; and fishery-salt, also large grained, at from 100° to 110° F. The salt crystallises on the surface of the brine in the pan, floats about a little, and then falls to the bottom, leaving the surface free for a fresh crop of crystals. Twice or thrice in twenty-four hours fine salt is drawn from the pans, which are kept nearly full of

brine, by raking it to the side and lifting it out with perforated scoops. It is then put into moulds called 'tubs,' and left for about half an hour to let the water drain off, after which the shaped lumps are put into a stove, where they remain till they are quite dry. Sometimes even fine salt is not stove, and it is then called butter salt or cheese salt. To make salt of the largest grain the brine is left for nearly a fortnight before removing the crystals. In this process the 'bitter' or magnesium chloride remains in solution after the common salt separates.

At different places around the British coasts salt was formerly obtained by evaporating sea-water, and to such salt the name bay-salt (often used for coarse salt) properly belongs. In Spain, Italy, and southern France the manufacture of salt in this way is practised on a large scale. Besides common salt sea-water contains much smaller quantities of potassium chloride, magnesium chloride and sulphate, calcium sulphate, and more minute quantities of other bodies. The water of the Mediterranean, which is slightly more salt than the open ocean, contains 2·72 per cent. of sodium chloride. As the evaporation goes on calcium carbonate separates first and then calcium sulphate. When the water reaches the density of between 1·22 and 1·31 sodium chloride separates along with small quantities of other salts; and when the specific gravity becomes 1·33 very little of anything but magnesium chloride remains. A series of shallow rectangular basins are usually so arranged that the water can flow from basin to basin, and when it has reached the lowest the partially concentrated sea-water is collected in a well. From this it is raised to the first of another series of basins, and finally into the series where the salt crystallises. The salt is then stacked in heaps, which are protected from rain and left for months to drain. This to a large extent gets rid of deliquescent and bitter impurities. It then contains about 95 per cent. of chloride of sodium, in which state much of it is sent into the market.

In some northern countries sea-water, suitably placed for the purpose, is frozen over in winter in order to increase the proportion of salt in what remains liquid, since the ice so formed is fresh. The water is then evaporated by artificial heat till the salt is obtained.

Besides its universal use as a condiment, salt is an all-important substance in the manufacture of soda, hydrochloric acid being obtained from it in large quantities in the process as a by-product. It is also employed in the manufacture of soap and for producing what is called a salt-glaze on stone ware. Agriculturists destroy slugs and grubs with salt, and it appears to improve the fertility of soils when mixed with certain manures. Brine is used in the pipes of freezing-machines. Rock-salt is carved into cups and vases in the Punjab, and it is said that houses are built of it in certain very dry regions, as in the Desert of Caramania, where this material is abundant.

The salt-tax was or is in some countries an important source of revenue, though it is recognised by economists as one that presses unfairly on the poor. The salt-tax of the ancient regime in France is referred to at GABELLE. In Britain salt duties were first exacted in 1702; the rate was 5s. per bushel in 1798, during the great French war, but was ultimately increased to 15s. per bushel, thirty or forty times the cost of the article! The duty was finally remitted in 1825. Salt-makers or salters used in some parts of Britain to be, like colliers, serfs (see SLAVERY). For the value of salt in preserving food, see ANTISEPTICS, PRESERVED PROVISIONS. For the varying saltiness of the

sea at various depths, see ATLANTIC, PACIFIC, SEA, &c.

Salt, SPIRITS OF, an old name for hydrochloric acid.

Salt, SIR TITUS (1803-76), a public-spirited English manufacturer, was born at Morley, near Leeds. He began business as a wool-stapler at Bradford, and being successful started wool-spinning in 1834, and was the first to introduce the manufacture of alpaca fabrics into England. He was responsible for the model village of Saltaire (q.v.). Titus Salt was mayor of Bradford in 1848, was returned as member of parliament in 1859, and was created a baronet in 1869. See *Life* by Balgarnie (1877).

Salta, a northern province of the Argentine Republic, touching Chile and Bolivia, and nearly enclosing the province of Jujuy. Minerals are abundant, but have been neglected for agriculture and cattle-raising. Salta is watered by the Salado, San Francisco, and Bermejo. Area, 48,302 sq. m.; pop. 154,000.—**SALTA**, the capital, on the Rio Arias, 535 miles by rail N. by W. of Córdoba, founded in 1582, is an important agricultural centre. Pop. 30,000.

Saltaire, a model village on the Aire, 3 miles from Bradford and 11½ miles by rail from Leeds, founded and built by Sir Titus Salt (q.v.), who opened his worsted and alpaca factory here in 1853. The place has a Byzantine church, hospital, school, park, workmen's club and institute, technical schools, &c. It forms part of Shipley urban district.

Saltash, a picturesque ancient municipal borough and seaport of Cornwall, on the west side of the estuary of the Tamar, and 4½ miles NW. of Plymouth by a railway that crosses the Tamar by Brunel's iron Royal Albert Viaduct (1857-59), 2240 feet long and 240 high. The church of St Nicholas dates from 1225. Pop. 3600.

Saltburn, a picturesque Yorkshire watering-place, on lofty cliffs facing the sea, 4 miles SE. of Redcar, dates only from the opening of the railway in 1861. Strong brine baths are provided from wells at Middlesbrough. Pop. 4600.

Saltbush. See CHENOPODIACEÆ.

Saltcoats, a watering-place and burgh of Ayrshire, on the Firth of Clyde, 1 mile ESE. of Ardrossan and 30 miles SW. of Glasgow. It was a great seat of salt manufacture from 1686 to 1827. Pop. (1921) 13,480.

Salters. See SLAVERY.

Saltillo, capital of the Mexican state of Coahuila, by rail 237 miles SW. of Laredo, Texas, and 603 N. by W. of Mexico City. Shawl-making is a local industry. Cattle-farming, cotton, grain, and sugar-growing are carried on, and there is some mining of gold, silver, lead, &c. in the surrounding country. Pop. 35,000.—Near it is Buena Vista (q.v.).

Saltire. See HERALDRY.

Salt Lake City, the chief town and ecclesiastical capital of the state of Utah, is on the river Jordan, 12 miles from Great Salt Lake (q.v.), and 4300 feet above the level of the sea. By rail it is 36 miles S. of Ogden and 833 miles from San Francisco. It was settled by the Mormons (q.v.) in 1847, incorporated in 1851, and is beautifully laid out with parks and open spaces. The chief public buildings are the Mormon temple (dedicated in 1893, being forty years in building; the Tabernacle (1870), an immense elliptical building seated for 8000, with a dome-shaped ('dish-cover') roof resting on sandstone pillars, and a magnificent organ (en-

larged 1915); the Latter-day Saints office building; the state capitol (1916); the City and County building; the Catholic cathedral, the First Presbyterian church, together with churches of nearly every denomination; the High School (technical), the university (1850), and some fine hospitals. Manufactures are unimportant, but salt-refining is carried on, and there are very important large mining interests in the vicinity. In the neighbouring agricultural district irrigation is largely practised. Pop. (1870) 12,854; (1900) 53,531; (1910) 92,777; (1920) 118,110.

Salto, (1) a north-western department of Uruguay on the Uruguay River, is a picturesque hill-country, watered by the Arepey and its many tributaries, and devoted to cattle-rearing. Area, 4865 sq. m.; population, 88,000.—The chief town, Salto, the third city of the republic, stands on three hills almost at the head of navigation on the Uruguay, 306 miles from Buenos Aires, and 86 by rail N. of Paysandú, and 366 miles NNW. of Montevideo. It carries on an active frontier trade with Brazil, and is the centre of live-stock and agricultural interests. Pop. 30,000.—(2) **SALTO**, in Argentina, is 107 miles by rail W. of Buenos Aires. The surrounding district abounds in fossil remains of prehistoric animals.

Salt of Saturn, a name for acetate of lead.

Salt of Sorrel, the common name for binxalate of potash. See OXALIC ACID.

Salt of Tartar, a commercial name for carbonate of potash in a very crude form.

Saltpetre. See NITRE.

Salt Range, a mountain-system in the Punjab, India, consists of two main chains running east and west, and embracing between them an elevated tableland. It begins on the south side of the Jhelum, runs west to the Indus, and varies from 3200 to 5000 feet in height. Its appearance is exceedingly bleak and barren, but not without much savage grandeur. The system gets its name from the beds of rock-salt that occur on the edges of the plateau, and form the largest known deposits in the world.

Salts constitute an extremely important class of substances in chemistry, of which common or sea salt (sodium chloride) may be mentioned as the most familiar example. Epsom salt (magnesium sulphate), Glauber's salt (sodium sulphate), saltpetre (potassium nitrate), Rochelle salt (sodium potassium tartrate) are other well-known salts. Common salt appears to have been known from the earliest times, and the fact that the same Greek word *hals* is used in the feminine, signifying the ocean, and in the masculine, signifying salt, would seem to indicate the sea as the source from which common salt was obtained in the first instance. The application of the name salt to substances other than common salt would follow from the more or less general similarity of these to common salt in appearance, and in the more easily observed properties, such as solubility, taste, &c.

By the term salt chemists now ordinarily understand a substance which may be looked upon as derived from an acid by the replacement of part or the whole of the hydrogen of the acid by means of a metal or of a Radical (q.v.) capable of playing the part of a metal; such as, for instance, the radical NH_4 , which is called ammonium. The acids themselves are even looked upon as constituting the hydrogen terms in the various series of salts, and are sometimes called hydrogen salts.

There are several general modes of formation of salts. One of the most important of these depends upon the mutual action upon each other of an acid

and a Base (q.v.), when the typical characters of each of these substances disappear and a salt is produced, usually with the simultaneous production of water. For example, when nitric acid and the basic oxide of lead act upon each other, lead nitrate and water are produced, thus: $2\text{HNO}_3 + \text{PbO} = \text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{O}$. Salts are also frequently produced when metals are dissolved in acids, the hydrogen of the acid being displaced by the metal. Thus, iron dissolves in dilute hydrochloric or sulphuric acid with the evolution of hydrogen and the formation of a ferrous salt: $\text{Fe} + \text{H}_2\text{SO}_4 = \text{H}_2 + \text{FeSO}_4$. Strictly analogous to the displacement of hydrogen from sulphuric acid by means of iron is the displacement of copper from cupric sulphate by the same metal—this action also giving rise to ferrous sulphate while copper is precipitated: $\text{Fe} + \text{CuSO}_4 = \text{Cu} + \text{FeSO}_4$. In the process called double decomposition (see the article CHEMISTRY) two new salts are frequently produced when the solutions of two salts are mixed together, as, for instance, when sodium chloride and silver nitrate act mutually upon each other, yielding silver chloride and sodium nitrate: $\text{NaCl} + \text{AgNO}_3 = \text{AgCl} + \text{NaNO}_3$. There are other modes of salt formation which are of minor importance.

Salts are frequently considered as consisting of metal and salt radical, the latter comprising all that portion of a salt which is not metal, as explained in the article RADICAL. In the cases of the so-called haloid salts (fluorides, chlorides, bromides, iodides) the salt radical consists of one element only, while in other salts the salt radical contains two or more different elements. The names given to certain classes of salts may be shortly explained. Normal salts are those resulting from the displacement of the whole of the displaceable hydrogen of an acid by means of a metal. Neutral salts are such as do not exhibit either the acid or the alkaline reaction when dissolved. Basic salts and acid salts, as contrasted with the normal salts, are respectively intermediate in composition between the normal salt and the base and between the normal salt and the acid. These salts still possess the respective characters of a base and of an acid. Double salts may contain two or more metals in combination with the same salt radical, or two or more salt radicals in combination with the same metal, or they may contain more than one metal and more than one salt radical.

SMELLING-SALTS are a preparation of carbonate of ammonia with some of the sweet-scented volatile oils, used as a restorative by persons suffering from faintness. The pungency of the ammonia is all that is useful, and the oils are added to make it more agreeable. Oils of lavender, lemon, cloves, and bergamot are those chiefly used.

Saltus, EDGAR (1858–1921), an American author, born in New York City, studied at Paris and in Germany, and in 1880 graduated at Columbia College law-school. His writings include a good biography of Balzac (1884); a history of Pessimistic philosophy—*The Philosophy of Disenchantment* (1885), and *The Anatomy of Negation*—both treated with a curious whimsical briskness and humour; and a series of striking stories, full of an odd passionate materialism and biting cynicism, painful, but original and clever, though disfigured by a fantastic style and eccentric vocabulary—*Mr Incoul's Misadventure* (1887), *The Truth about Tristrem Varick* (1888), *Imperial Purple* (1893), *The Poms of Satan* (1904), *The Lords of the Ghostland* (1907), *The Monster* (1913), &c.

Saltwort (*Salsola*), a genus of plants of the family Chenopodiaceae, having hermaphrodite flowers, with 5-parted perianth and a transverse

appendage at the base of each of its segments, five stamens and two styles, the seed with a simple integument. The species are numerous, mostly natives of salt marshes and seashores, widely diffused. One only, the Prickly Saltwort (*S. Kali*), is found in Britain. The plant is annual, with prostrate much-branched stems, awl-shaped spine-pointed leaves, and axillary solitary greenish flowers. It was formerly collected in considerable quantities on the western shores of Britain, to be burned for the sake of the soda which it thus yields. *Halogeton sativa* is the chief Barilla (q.v.) plant of the south of Spain. For Salicornia, see GLASSWORT.



Prickly Saltwort (*Salsola Kali*).

Salutations are customary forms of address at meeting or at parting, or of ceremonial on religious or state occasions, including both forms of speech and gestures. Through the influence of heredity and habit many of these have become reflex irrepressible actions, their observance fortified with all the sanctity of moral or religious obligation. For although it is true that etiquette is entirely a matter of relative, and not absolute, obligation, and that such a feeling as modesty itself is mainly a question of latitude, yet the average modern European dreads the unfavourable judgment of society upon a solecism more than the condemnation of his own conscience on some breach of the weightier matters of the law. And it seems to be a general rule among races of men, not to speak of individuals, that extremes of ceremonious salutation stand in inverse ratio to their moral value. The ceremonious politeness of modern Europe has descended in great measure from the unworthy regime of the Lower Roman Empire, and its traditions, now as well as then, are incapable of being taken literally, its metaphors translated into fact. It is a complete mistake to suppose that savages are at all informal or extemporary in their salutations and ceremonies. Salutations tend to become less elaborate in progressive civilisation, the tendency being toward the preservation only of those which help to soften the asperities of social intercourse.

One of the most ancient and wide-spread, as well as natural, forms of salutation by gesture is the embrace in testimony of affection, as we find it in the Old Testament and in Homer. The kiss was at no time universal, being unknown among Fuegians, New Zealanders, Papuans, Australians, and Eskimos. It was used by the ancient Hebrews, Greeks, and Romans, and among the early Christians was adopted as a sign of fellowship, survivals of which are the Eastern kiss of peace at the Eucharist and the Western modified use of the *osculatorium* or *pax*. In England it was formerly the custom to kiss at the beginning and end of a dance, as well as on meeting a lady or taking leave of her; and the game of 'kiss-in-the-ring' is the last survivor of many similar old English pastimes.

As a general form of salutation, however, it appears to have been a custom peculiarly English; Æneas Sylvius describes the Scottish women of his day as 'giving their kisses more readily than Italian women their hands'; Erasmus, in a letter to a friend, describes it as a custom never sufficiently to be praised, and Bulstrode Whitelocke describes his satisfaction in teaching the English mode to Queen Christina's ladies at the court of Sweden. The Puritans objected strongly to it, but its disuse was really the result of the French airs that came in with Charles II., and it lingered among honest country-folk till the times of the *Spectator*. It is still used ceremoniously between royal personages, and still on the Continent even between men at parting or meeting again after an absence, as well as in the more servile forms of kissing the hand of a royal personage or the foot of the pope. The custom of grasping or shaking hands is now widely spread over the world, either in the English method, with its many gradations of heartiness, or the Moslem variety of pressing the thumbs against one another as well; but it is not really a primitive custom everywhere, and as Tylor showed, is by no means to be explained with Herbert Spencer as a compromise between a simultaneous effort of two persons to kiss each other's hands in token of submission. Its real origin lies deeper in the universal gesture-language of mankind, the essential act being a joining of hands to express compact, union, peace, or friendship. The Roman *dextrarum junctio*, in making a contract of marriage, preserved by ourselves, and the early Christian 'right hand of fellowship,' point to the real origin of what has become a mere salutation with us as with the Romans themselves. Other forms of salutation that recall the civilities observed among dogs, cats, and other animals are forms of bodily contact, as the rubbing of noses of the Laplanders and New Zealanders; the patting of each other's arms, breasts, or stomachs by North American Indians; the Polynesian stroking of one's own face with another's hand or foot; the clapping of hands and leaping backwards and forwards in Loango; the snapping the fingers in Dahomey; the Batongan rolling on the back along the ground, slapping the thighs the while; the blowing with the breath upon another in Africa; or the Abyssinian custom of holding another's hand and pretending to spit upon it. The Polynesians and Malays always sit down when speaking to a superior; on the Congo and elsewhere in Central Africa it shows respect to turn the back upon a superior in addressing him. The Tongans reserve the use of certain words for the king alone, and they employ the third person in token of respect. Still more marked is the difference between ceremonial and common speech in Samoa, and here also they use the plural in speaking to a superior. In Fiji if a great man slips or falls every one of inferior rank must at once do the same.

Other groups of ceremonial salutations are the prostrations before a superior of ancient Egypt and Assyria, as well as of modern Dahomey, and of regular Moslem divine worship; the lying with the face in the dust of China and Siam; the ancient Malagasy custom of a wife crawling on all fours before a husband and licking his feet; the Arab refinement of putting the hand upon the ground and then lifting it to the lips and forehead; the kneeling on one knee to express homage to a European sovereign, as on both in divine worship; the turning towards the east, the genuflection before the host, or bowing at the pronouncing of the name of Jesus in Christian churches. These are all originally signs of submission or of inability to resist, meant to deprecate the majesty or the wrath of

superior power. We find falling on the face before a potentate in the Old Testament, and in China until modern times among the eight kinds of obeisances, increasing in humility, the first was putting the hands together and raising them before the breast; the second, bowing low with the hands joined; the third, bending the knee; the fourth, actual kneeling; the fifth was kneeling and striking the head on the ground; the sixth, kneeling and thrice knocking the head, which again doubled made the seventh, and trebled, the eighth—the famous *kotow* which Lord Amherst refused in 1816: this last being due to the emperor and to heaven. Among the Hebrews repetition had a kindred meaning—'Jacob bowed himself to the ground seven times, until he came near to his brother.' Survivals amongst ourselves of ancient more abject forms are the *curtsy* in the one sex, and in the other the *scrape* till lately accompanying the bow, made by a backward sweep of the right foot. From the profound bow, expressive of great respect, our usage shades away to the modern curt nod, in which respect has faded into mere recognition.

Uncovering, again, is a characteristic symbol of submission in presence of a superior (Isa. xx. 2-4), whether to the waist, as in Tahiti, or of the entire clothes, as in the case of the female attendants upon the king of Uganda. In Europe we only uncover the head, and this in many cases is minimised to a mere touching of the hat. In the Coptic and Abyssinian churches the Semitic custom of uncovering not the head but the feet is still preserved. We find the same ceremonial uncovering of the feet in ancient Peru and Mexico; and in Burma it was long a point of dispute whether foreigners should comply with the native custom on approaching the king.

Again, as for the words and phrases which accompany the gestures of salutation, we find the widest variety in form and nature. The oriental forms, both scriptural and modern, are full of grave dignity and religious character. Mohammed took advantage of this characteristic, and made the use of certain forms rigorous as religious passwords; exactly like the once common Spanish form, 'Ave Maria purísima,' which had to be answered by 'Sin pecado concebida.' The Eastern phrases, 'The Lord be with thee,' 'Be under the guard of God,' 'Blessed be thou of the Lord,' have degenerated into the Spanish 'Vaya con Dios, Señor,' the French 'Adieu,' and our own 'Good-bye,' abridged from 'God be with ye.' The Basque verb has distinct inflectional forms for use in addressing a man, a woman, a superior, or an equal. Our familiar abridged forms, 'Bless you,' 'Mercy me,' 'Save you, sir,' show an English reticence in a light and familiar use of sacred names which is not seen in the familiar French 'Mon Dieu,' the German 'Mein Gott' or 'Herr Je.' The *citoyen* and *citoyenne* of the French revolution, an attempt to obliterate the natural growth of ages, never lasted, and it is not a little striking that 'Merci, monsieur,' was the phrase that came to the lips of the wretched Robespierre a moment before his end. The familiar *sir*, *signor*, *señor*, *mon-sieur* are of course ultimately referable to the Latin *senior* expressive of the reverence due to age; *madame*, *mademoiselle* lead up to Latin *dominus*, 'the master of a house.' The use of 'sir' may convey a sense of scorn, just as the archaic *sirrah* always implied anger or contempt. And even 'madam' and 'mistress' are not without an odious sense. The Greek phrase, both at meeting and parting was χαίρε ('be joyful'); the Romans usually said 'Salve' at the one and 'Vale' at the other. These words express wishes for cheerfulness, peace,

health; specialised forms of the same are the Pauline *χάρις καὶ εἰρήνη* ('grace and peace') and the ecclesiastical 'Pax vobiscum' and 'Benedicite.' A special salutation is due, as everybody knows, to any one who has just sneezed, perhaps as a tribute of respect to a sign of mortality. The English 'How do you do?' the French 'Comment vous portez-vous?' the German 'Wie geht's?' are mere forms that one uses without waiting for or thinking of the answer, just as the Spanish custom of offering to a visitor anything he happens to admire in one's house is expected to be answered by a ceremonious form of refusal. Many phrases are used which may have once expressed inferiority, but are now mere forms without meaning. The Chinese in particular have an elaborate vocabulary of complimentary epithets for the person addressed, and deprecatory terms for themselves. A wife calls herself 'a mean concubine'; the speaker's opinion is 'the stupid opinion,' his house 'the tattered shed'; your father is 'the honourable grey-beard,' 'the honourable severity'; your mother, 'the good gentleness.' Even a simple question takes a ceremonious and complimentary form, as, for example, 'To what sublime religion do you in your wisdom belong?' An interesting chapter in the study of salutations is the history of the pronouns of address in the modern European languages, singular or plural, second or third person—in German, Italian, Rumanian, and Spanish. In English the use of the plural for the singular form was established as early as the beginning of the 14th century. In old English *ye* was always used as a nominative, and *you* as a dative or accusative—a distinction carefully observed in the Authorised Version of 1611. In Shakespeare's time, as Abbott points out, *thou* was proper from superiors to inferiors, and as expressing companionship, affection, permission, or contempt and anger towards strangers; *ye* and *you*, again, are proper from a servant to a master, and as expressing compliment, submission, or entreaty.

In the Navy and Army a salute is a compliment paid when a royal or other distinguished personage presents himself, when squadrons or armed bodies meet, when officers are buried, and on many other ceremonial occasions. There are several modes of saluting: firing great guns and small arms, dipping colours, flags, and topsails, presenting arms, manning yards, bangle-sounds, &c. A royal salute consists in the firing of twenty-one great guns, in the lowering by officers of their sword-points, and the dipping of the colours. A form of salute of more frequent occurrence is when a soldier 'presents arms' or touches his cap to an officer.

See the articles ADDRESS (FORMS OF), KISS, KOTOW, TOASTS, &c.; Tylor's *Early History of Mankind* (1865); Herbert Spencer's *Ceremonial Institutions* (1879); the *Cornhill Magazine*, November 1879; Sir E. B. Tylor in *Macmillan*, May 1882; and treatises on anthropology and sociology.

Saluzzo, a city of northern Italy, at the foot of the Alps, 42 miles S. by W. of Turin, with a semi-Gothic cathedral (1480), the Gothic church of S. Giovanni, and some silk and other manufactures. The famous printer Bodoni and Silvio Pellico were born here. Pop. 15,680.

Salvador, the smallest but most thickly populated of the Central American republics, consists of a strip of territory stretching along between Honduras and the Pacific, and bounded on the W. by Guatemala, and on the E. by Fonseca Bay, which separates it from Nicaragua. It has an area of 13,176 sq. m. with a coast-line 160 miles in length, and the population is estimated at about 1,600,000. The capital is San Salvador, with a population of 85,000. Other towns are Santa Ana and San Miguel, with 73,000 and 36,000

inhabitants respectively. Except for a rich, narrow sea-board of low alluvial plains, Salvador consists of a level plateau, some 2000 feet above the sea, furrowed by river valleys and broken by numerous volcanic cones, and bounded along the northern frontier by a portion of the Central American Cordillera. Of the volcanoes, which rise from 4900 to 6900 feet, many are extinct, but others break into eruptions at intervals. Earthquakes are of frequent occurrence (see SAN SALVADOR). Of the rivers, all of them flowing towards the Pacific, the most important are the Lempa (140 miles), which receives the surplus waters of the Laguna de Cuija—a large lake on the borders of Salvador and Guatemala—and the San Miguel, which drains the south-east portion of the republic. The climate varies according to the altitude, healthy in the interior, but in the low-lying country very hot, though less unwholesome than on the Atlantic side of Central America. The land is well watered, and the soil exceedingly fertile, the annual rainfall being about 100 inches. The principal product is coffee, 140,000 acres being under cultivation; others are tobacco, sugar, cocoa, rubber, balsam, and ornamental woods. The Balsam of Peru (see BALSAM) grows only in part of the sea-board known as the Balsam Coast. On the whole the flora and fauna resemble those of Guatemala (q.v.), but the forests present a less dense vegetation than on the Atlantic side, and beasts of prey, such as jaguars and pumas, are seldom seen. Heneguen is cultivated for fibre, and there is a certain amount of maize and fruit-growing. The minerals include both gold and silver. In 1922 there were 253 miles of railway open in the republic.

The bulk of the population is composed of Indians and mixed races. The Indians are of the Aztec (Pipil) race, and all speak the Spanish language and profess the Roman Catholic religion (the one established by statute), except on the Balsam Coast, where alone they retain their old habits and language. Education is free and compulsory, but there is an enormous amount of illiteracy. The government is carried on by a president (for four years) and four ministers. The legislature consists of a congress of forty-two deputies (three for each of the fourteen departments), elected by universal male suffrage for one year. The departments are controlled by governors appointed for four years. The capital, San Salvador, is the seat of an archbishopric, a national institute, and a national university. Salvador, originally called *Cuscatlán*, was conquered after a long and obstinate contest by Pedro de Alvarado in 1525-26. In 1821 it threw off the Spanish yoke, and from 1823 to 1839 it belonged to the Central American confederacy. Since 1859 it has been an independent republic, but various unsuccessful attempts to unite with one or more of the neighbouring republics were made in 1842, 1850, 1885, 1895, and 1921. Severe fighting took place in 1885 and 1898. In 1908, Salvador was represented at the Central American Court of Arbitration at Washington. During the Great War she was the only one out of the five isthmian states that remained neutral.

See Squier, *Central America* (1868); P. F. Martin, *Salvador in the Twentieth Century* (1912); Leiva, *Republic of El Salvador* (1913); and books in Spanish on topography by Guzman (1883), on history by Gavidia (1917), and on economics by Quinónez (1919).

Salvage is the remuneration due by the owner of a ship or cargo in respect of services rendered by persons, who are under no obligation to render such services, in preserving the ship or cargo from shipwreck, fire, or capture—the perils to which property at sea is peculiarly exposed. If nothing is saved no salvage is due, however meritorious may have been the services rendered at sea to a vessel in

danger or distress. By statute—Merchant Shipping Act, 1894, sec. 544—salvage is also due for the saving of the lives of persons on board a British vessel anywhere, or on board a foreign vessel in British waters. The word salvage is also used to denote the services rendered. In the earliest maritime codes, such as the laws of Rhodes, Oléron, and Wisby, salvage was recognised; and salvage reward is allowed by all modern maritime states. At common law the person who saves a ship or cargo from imminent peril may, if the property is in his possession, retain possession of it until the salvage is paid. The salvor, too, has a right, known as maritime lien, which may be enforced against the property saved even though that property is not in his possession. The Admiralty Division of the High Court or, in Scotland, the Court of Session, has jurisdiction to decide upon all claims relating to salvage. Where the value of the property saved does not exceed £1000, or where the amount claimed as salvage does not exceed £300, the claim is properly brought in a county court having Admiralty jurisdiction, and, in Scotland, in the sheriff court. An action to enforce a claim for salvage must be commenced within two years from the date when the services were rendered—Maritime Conventions Act, 1911, sec. 8. In fixing the sum to be paid in name of salvage, the elements to be considered are—the value of the property saved, the peril of the saved ship and the risk encountered, the labour incurred and the skill shown by the salvors. The amount, if not fixed by agreement, is assessed by the court. The court, too, where there is no agreement for division of the salvage, may apportion the amount among the owners, master, and crew of the salvaging vessel, and, where salvage services have been performed by several independent sets of salvors, among these different sets. It is provided by statute that all goods saved from shipwreck are to be delivered to the Receiver of Wrecks appointed for each district by the Board of Trade (see *WRECK*). Where salvage is due to any person, the receiver must detain the goods until payment is made for salvage, or until security is given for its payment. In marine insurance the expression salvage is used to denote the thing saved. Thus the thing insured, when transferred by abandonment to the underwriter, is called the salvage, and the losses, which give the right of abandonment, are spoken of as 'salvage losses.' On abandonment the assured is entitled to the whole amount of the insurance, and the underwriter, on payment of such amount, is entitled to the 'salvage,' i.e. the property saved, after deducting the expenses of saving and recovering it.

Salvage. The methods employed in salvage directly depend upon position of ship, rise and fall of tide, probable state of weather, probable extent of damage sustained. A vessel to be saved may be stranded, i.e. lifted out of her floating draught, through running on a bank, shoal, or rock, or sunk either partly or entirely. In either of the above categories she has lost her buoyancy, and cannot be saved until this is restored. Water-ballast tanks being fitted to modern vessels reduce the chances of total loss when stranded, and it is now a rare thing to leave even a badly-damaged vessel to break up upon the most distant shore. Water-ballast tanks mean that there are two watertight bottoms to the vessel, and although the outer plating may be pierced, the filling of a tank thereby is a small matter as compared to the piercing of an open hold.

Simple Salvage.—In a case where a vessel is stranded on, say, a shoal it is often just a question of jettisoning the cargo, or pumping overboard water-ballast in order to get the desired buoyancy,

when, by simply putting engines astern, or by the use of tug-boats, she can be floated. If the sea-water is leaking into the vessel's hold through a considerable number of damaged places then recourse to pumping is necessary. Should tides at low-water leave the vessel quite dry, then ordinary carpenters may be able to patch or plug up the torn plating, and as the tide rises any leaks may be kept in hand by using salvage pumps on board with suction into the damaged compartments; on the other hand, the vessel may be partly submerged at low-water, then divers must be employed to plug up or patch the torn plating, and, of course, much more pumping power is required for the floating operations, i.e. enough to pump out the water before the high-tide moment is reached.

Air.—Where a vessel's bottom is considerably damaged and it is impossible to reach the fracture or to patch it, recourse to the 'air' method may be adopted. In this it is not at all necessary to patch or plug up any of the damaged plating on the bottom, but only so far down the vessel's side in order to leave a box form of compartment with the necessary buoyancy. This method calls for decks, hatchways, and bulkheads being made airtight in the damaged compartments, the fitting-up of air-compressors with the necessary piping from air-tank to damaged section. When this is attained the compressors force air into the sealed compartment; as the pressure increases the sea-water is blown out through the torn plating, and when the displacement equals the weight of the ship she starts lifting and continues until safely afloat. Care is necessary in this operation to see that decks, bulkheads, and hatchways are of sufficient strength to withstand the air-pressure required.

Variation of Air Methods.—There are several variations of the 'air' method, such as the placing of air-bags in the damaged compartments or filling the space with watertight barrels; in none of these is it required to have hatchways or decks made airtight, but, on the other hand, the compartments must be empty of all cargo.

Lifting.—In quiet waters, or in a river such as the Thames, when a vessel is sunk it is the custom to 'lift' her in towards the shore out of the traffic. This 'lifting' is carried out by means of barges properly fitted out for the purpose. Barges are ranged along each side of the sunken ship, and steel ropes are passed from one barge right under the vessel and connected to the barge directly opposite; sometimes as many as six steel ropes are thus connected to each barge. The barges are filled with sea-water to sink them as far as possible, and at about low-water the ropes are hove tight by means of specially designed winches, made fast, then the water in the barges pumped out (by means of either steam or motor pumps of great power). As the water is discharged the vessel in the cradle of ropes is lifted, and as the tide rises she comes well clear of the mud or sand, the whole mass then being towed ashore until the vessel again touches the bottom. The operations are resumed at low-water, and wires shortened to suit the new draught, and hence by a system of floating she is eventually taken where she may lie high and dry at low-tide, and be patched up and dry-docked when able to float without the barges' assistance. In this method the greater the rise and fall of tide the quicker the operations.

Cigar-shaped pontoons are much used on the Continent for lifting purposes. These are watertight, and connect up to the vessel in a similar manner to that described above, but the water within them is blown out by means of air in place of the pumping referred to.

Coffer-damming.—Coffer-damming is another method employed in salvage, and is resorted to

when it is not possible to obtain barges enough to give the necessary 'lift.' In this operation great skill is required, and, besides, salvors are at the mercy of the elements more than in any other method. The work of months may be destroyed in a few moments. Suppose a vessel has been sunk with a minimum of constructional damage to her bottom, or with an easily temporarily repaired damage, and her decks are entirely submerged at any state of tide, then a coffer-dam must be erected. It may be only a continuing up of hatchways with wood, or it may be necessary to build up the ship's side with wood until at all states of the tide the inside of the vessel is contained in the one structure reaching above water. When this additional erection is duly fastened and shored strong enough to withstand the pressure (which is at a maximum just at the moment the vessel begins to float), pumps are started, and when sufficient discharge is made the vessel lifts. When she is safely afloat the added structure can be removed, and it then remains only a question of pumping until she is safely dry-docked. In the above operation all classes of skilled tradesmen are utilised, and generally it is the most expensive method employed.

Uprighting.—When a vessel is upset and lies on her side a combination of methods may be necessary to right and float her. Sometimes by erecting tripods on her upper side, over which ropes are placed and connected to tackles made fast to anchors or to places on shore, she may be pulled upright. In some cases where there is a considerable rise and fall of tide tripods may be dispensed with, and by a mechanical use of the compartments the necessary leverage to upright the vessel may be got.

Salvation Army, a religious and social organisation which had its birth in the year 1865, when the Rev. William Booth, encouraged by his wife, Mrs Catherine Booth, broke away from the Methodist New Connexion. Being an ardent mission preacher, he desired the adoption of less conventional methods for reaching the poor and neglected classes in great centres of population. Of strong individuality and magnetic force, William Booth gradually gathered together a number of workers and converts in the Christian Mission, with headquarters in the East End of London; and in 1878, acting upon inspiration, he changed the title of his mission to 'Salvation Army.' Gradually he evolved a religious organisation with military rules and characteristics, and on these lines it has extended to a remarkable degree in all parts of the world. The general of the army for the time being, according to deed, is in supreme command, and under certain conditions nominates his successor. This position was keenly criticised in the early days, but it has stood the test of time, and remains to-day as the pivot on which this great organisation works in all its numerous agencies, both in the United Kingdom and elsewhere. General Booth (q.v.) died 20th August 1912, the Salvation Army being the memorial of his forty-seven years' labour. By trust-deed he nominated as his successor his eldest son, who had served in the army since its commencement, and from 1880 as chief of the staff; and General Bramwell Booth took office with the support of all his father's staff. To the wisdom of that nomination remarkable developments bear ample testimony. Contrary to the predictions of critics and fears of friends that the army would fall into decay when its gifted founder was no longer at its head, in 1926, fourteen years after his death, every phase of the work then in operation was not only still in existence but was found to be in a healthier and more advanced position, and everywhere new departments have been opened. Soldiers and ad-

herents have increased in numbers, the work for young people has grown beyond all expectation, and twenty-six additional countries and colonies have been entered. During his period of generalship, Bramwell Booth has made a tour of inspection to nearly every country where the army is at work.

From the commencement the Salvation Army has maintained an independent attitude in relation to other churches. Informal approaches were made in 1882 by the Church of England through a committee of the Upper House of Canterbury Convocation, consisting of Dr Benson (then Bishop of Truro, and afterwards Archbishop of Canterbury), Canon Wilkinson (afterwards Bishop of Truro and Primus of Scotland), and the Rev. Randall Davidson (then chaplain to Archbishop Tait, afterwards Archbishop of Canterbury). They interviewed General Booth, between whom and the committee a considerable correspondence followed, and they also visited army institutions. On his side, General Booth was willing that the National Church and the Salvation Army should run side by side like two rivers, with bridges thrown across over which the members could mutually pass and repass. But the difficulties in the way of a working arrangement proved insurmountable, and finally some of the leaders of the Church of England established the Church Army as their contribution to the evangelisation of the masses.

In its principal 'Articles of War,' the Salvation Army accepts the essential doctrines approved by the Protestant churches. These may be defined as belief in the inspiration of the Bible, the depravity of human nature through the Fall, atonement through the sufferings and death of the Lord Jesus Christ, salvation as a result of repentance towards God and faith in Jesus Christ, regeneration by the Holy Ghost, and justification through grace. Its soldiers and officers express their belief in the immortality of the soul, in the resurrection of the body, in the general judgment at the end of the world, in the eternal happiness of the righteous, and in the everlasting punishment of the wicked. In addition to these beliefs, the army preaches holiness, or entire sanctification by the Holy Spirit. Primarily, however, whether in the halls, meeting-places, or in the open air, its message is one of instant salvation and an entire change of life. Ardent revivalism characterises all the army's religious work.

Discipline and loyalty are demanded of every officer. Before candidates are accepted for appointment as officers, a searching cross-examination has to be faced in a series of more than eighty questions, and the replies thereto constitute the conditions of service. Officers must not drink intoxicating liquor, smoke tobacco, or use snuff; they must not marry until they have been at least four years in the service, including training, except in special cases; nor must any male officer be married before he is twenty-three years of age unless required for special work. Each candidate also agrees in writing not to enter into any engagement to marry without first informing his divisional or responsible officer or headquarters. Consent is not given to the engagement of any male officer unless the young woman is likely to make a suitable wife and, if not already an officer, is prepared to enter a training college. Officers pledge themselves to spend at least nine hours every day in active work on behalf of the army, and to accept the allowances which are set forth in the list of questions, with the understanding that no salary or allowance is guaranteed.

If accepted, the candidate is trained at one of the army training garrisons. The training garrisons for the United Kingdom are situated at Clapton and Mildmay, London, and there are

usually 400 to 500 young men and women cadets in residence. The erection of a new and up-to-date Garrison—a memorial to the founder—was begun in 1926 at Denmark Hill. The nine months' course of training includes the study of the history and teachings of the Bible, the doctrines and discipline of the Salvation Army, first aid, home nursing and domestic hygiene, book-keeping, and a variety of minor subjects bearing directly upon the probationer's future work. Each probationer is asked to give or collect a small sum towards the initial expenses. In addition to the colleges already mentioned, a staff training institute has been established at Sunbury, Middlesex. Other training colleges are established in the United States, Canada, Australia, Denmark, Finland, Germany, Holland, Norway, Sweden, Switzerland, France, the West Indies, South Africa, Japan, India, and Java.

From the beginnings of the army the position of women has been clear and definite. Mrs Catherine Booth, to whom the army owed so much in its early days, was one of the most effective women preachers or speakers that ever addressed great audiences. She was a fearless upholder of her sex, and without the slightest hesitation her husband utilised the services of women in all departments of the work. The same rule obtains to-day, and East or West, in the Colonies, India, America, or Japan, the woman officer is welcomed and appreciated, and she is as eligible for the highest posts as the male officer. Mrs Bramwell Booth was in charge of the Women's Social Department in Great Britain and Ireland until the death of the first general; Miss Eva Booth is the commander of the work in the U.S.A.; Commissioner Lucy Booth-Hellburg commands the work in Norway; and Colonel Catherine Booth is in charge of the women's social work in Great Britain and Ireland.

In the first year (1878) the Salvation Army numbered 80 corps and 127 officers. In December 1925 the statistics were as follow:

INTERNATIONAL STATISTICS.

Countries and colonies occupied	82
Languages in which salvation is preached	59
Corps and outposts	14,719
Social institutions and agencies	1,612
Day-schools	1,028
Naval and military homes and hostels	27
Officers and cadets engaged on field work	18,635
Persons without rank wholly employed in the work	8,207
Officers and cadets engaged in social work	4,212
Local officers (senior and junior)	97,598
Songsters	54,323
Corps cadets	30,356
Bandsmen (senior and junior)	43,471
Periodicals { Number issued	108
{ Total copies sold per issue	1,881,327

SOCIAL STATISTICS.

Number of food depôts (separate)	15
" " shelters and food depôts (men)	127
" " " " (women)	15
" " hotels for working-men	135
" " " " working-women	32
Total accommodation	31,841
Beds supplied during year	9,199,739
Meals " "	13,719,551

INDUSTRIAL INSTITUTIONS (MEN)—

Number of homes, elevators, workshops, and woodyards	200
Accommodation of working capacity	7,226
Men supplied with work during twelve months (temporary and permanent)	376,706

LABOUR BUREAUS—

Number of branches	160
Situations found during year	167,377

PRISON-GATE WORK—

Homes	15
Accommodation	642
Ex-criminals received during year	2,741
Number passed out satisfactory	2,439

INEBRIATES' HOMES—

Branches	6
Accommodation	286

CHILDREN'S HOMES—

Branches	97
Accommodation	4,758
Crèches	25
Industrial schools	20
Accommodation	1,270

WOMEN'S INDUSTRIAL HOMES—

Branches	131
Accommodation	4,519
Women received during year	9,798
Passed out satisfactory	9,050

MATERNITY HOMES—

Branches	64
Accommodation	2,153

Farms	12
Slum posts	176
Other social institutions, including hospitals, &c.	282

This progress has been gained despite persecution, which in the years immediately following the army's establishment proved of a violent character. During the first decade 'Skeleton Armies' were organised in many towns in order to upset Salvation Army processions and intimidate the followers. Women as well as men were frequently treated with much cruelty, and female captains whilst leading their corps through the streets were stoned or otherwise maltreated by half-drunken roughs. One noted instance of such persecution took place at Basingstoke. In some cases police and magistrates 'winked at' these oppressive acts, until the late Sir William Harcourt, then Home Secretary, made it clear to civil authorities that their duties consisted in the protection of peaceable processions, and the punishment of disorder and assault against defenceless men and women. After a time the firmness of the Home Office induced a new spirit, and without open assault the army was allowed to proceed on its way.

The royal favour bestowed upon the army, especially the gracious honour extended to its founder by King Edward VII. and by Queen Alexandra, has influenced the popular mind. In 1904, on the eve of an International Congress of the army held in London, King Edward commanded William Booth's presence at Buckingham Palace, and during a long interview expressed his warm sympathy with the army's aims and objects; afterwards sending a hundred guineas as a further demonstration of his good wishes. King George and Queen Mary also acknowledged the work of the first General, who was likewise received by many of the rulers of Europe and the East, including the King and Queen of Denmark, the Queen of Sweden, the Emperor of Japan, as well as by presidents of the United States and governors of British dependencies.

One of the most important events in the history of the Salvation Army was the launching in 1891 of the 'Darkest England' scheme. Towards the close of 1890 General Booth issued his book, *In Darkest England and the Way Out*, in which he asked for £100,000 in order to attempt carefully devised plans on a large scale for the social and spiritual betterment of the 'submerged tenth' of society. The book caused a profound sensation throughout Great Britain, as well as in other parts of the world, by the skill with which its pleadings were made. By way of response, a sum of more than £100,000 was raised. Hostile criticism as to the expenditure of the money subscribed made a public inquiry advisable, and Lord James of Hereford, the Earl of Onslow, Mr Sydney Buxton, M.P., Mr Walter Long, M.P., Mr Edwin Waterhouse, C.A., and Mr Hobhouse, M.P. formed a committee for the purpose of investigation. Eighteen meetings were held and twenty-nine witnesses examined. Members of the committee

also visited and inspected the labour colonies then in operation, and Mr Waterhouse, with the aid of his office staff, instituted a careful investigation of the books and vouchers relating to the scheme. After a searching examination, the committee placed on record their verdict to the effect that 'it appears that the methods employed in the expenditure of such have been and are of a business-like, economical, and prudent character; that the accounts of such expenditure have been and are kept in a proper and clear manner.' Some few suggestions were made as to the management of the vast undertakings; but on the whole the findings endorsed the general management. The committee elicited the fact that General Booth did not draw a salary from either the spiritual or social wing of the army, but found that he had a small income partly settled on him by a personal friend, and partly derived from the sales of his literary works, 'which seemed to them commensurate with the maintenance of his personal establishment.'

The social work of the army in England has developed in many important respects. In addition to the farm colony there are cheap food and old clothes depôts for slum families, inebriate homes for men and women, labour bureaus and industrial labour homes, inquiry offices for the lost and missing, anti-suicide and reconciliation bureaus, prison visitation and assistance, and schemes for colonisation in British colonies. The latest developments in the latter connection include the assisting of widows, many hundreds of whom have been comfortably settled overseas, and the training and placing of workless lads. The women's department includes agencies and institutions for the relief of erring women, the rescue of children living in vicious surroundings, hostels for working-women, slum centres, and Eventide Homes for aged people. A hospital for mothers at Clapton was opened by Princess Louise, and has received the patronage and personal inspection of Queen Mary. This institution includes a training school for midwives.

Outside the British Isles the army possesses a network of agencies for dealing with religious and social problems. In India, for instance, the government has provided buildings and land in order that the army may deal with the difficult problem of the hereditary criminals of India, of whom there are three millions. As a beginning the army established several settlements in which these outlaws, who had not previously been trained in industrious habits, were encouraged to obtain their living by agriculture, weaving, and other handicrafts. The venture proved highly satisfactory, and several thousands of these criminals are now under the army's care. The government of Ceylon has sought the aid of the army in dealing with the beggar population. Here again remarkable success has been achieved in reforming apparently hopeless men, and making them into useful citizens. A hand-loom has been invented by an army officer, by means of which the village weavers of India have been taught to develop the weaving industry, which was threatened with extinction through the competition of the mills and the increase of imported goods. For the same purpose, silk-weaving and the culture of silkworms have also been commenced under the army's auspices. In South Africa the natives are instructed in agriculture, cattle-raising, lime-burning, building, and other branches of knowledge suitable to their circumstances. In Java, at the request of the Dutch government, the army has undertaken the control of the leper colony and several other social agencies, with marked success. In the United States army officers have access to all the principal prisons in the country, and valuable work is being accomplished among both long and short

sentence prisoners. In some of the jails there is now a regularly organised corps of Salvation Army soldiers. Similar work is carried on in nearly every country where the army operates, and accommodation is provided for prisoners on release. On the great prairies of South America, amidst the log cabins of Canada or Australia and throughout the British colonies the army is carrying on its work of mercy and salvation. Europe has also benefited in varying degrees by the advent of the army, especially in countries like Germany, Denmark, Holland, Norway, Sweden; and in some of these substantial progress is reported with regard both to the evangelistic and to the social agencies.

During the Great War (1914-18) the army lent its services to the nations. In England, France, and Belgium cheap food and recreation huts were established, and a system of hospital visitation instituted. A fleet of ambulances, manned by Salvationists, assisted in carrying the wounded from the firing-line to the base hospitals. Chaplains officiated, and religious services were held. Thousands of parcels of cheer were distributed to needy or lonely men. Since the conclusion of hostilities, more than 25,000 men and women have been conducted to France and Belgium to visit the graves of the fallen. In Germany army work was maintained, and since the war has developed in a surprising manner. Army work in China began during this period, while, with the cessation of war, Serbia, Czechoslovakia, and Hungary opened for its administrations.

Apart from the social departments of the army, its financial arrangements are planned upon two main principles. Each local corps must meet its own needs and contribute something to the cost of oversight, and also to the requirements of the world at large. Every soldier gives towards the support of his corps. Ten per cent. of the total income of the local corps is due to the divisional officer, while another quota is allotted to special funds. Each year the army organises a week of self-denial, when Salvationists save a proportion from their cost of living in order to contribute funds for the maintenance of the army's missionary, social, and training enterprises throughout the world. In 1926 the amount given or collected by the army members in Great Britain and Ireland totalled over £189,744, and since the establishment of the Self-denial Fund nearly £3,000,000 has been raised in the United Kingdom alone. Of the proceeds of the annual Harvest Festival celebrations three-fifths of the amount contributed is devoted to the slum, retirement, and building funds, the balance being retained for the assistance of the corps. In addition to local requirements the army collects central and missionary funds in order to maintain its world-wide evangelisation. Duly audited balance-sheets are issued every year, and can be obtained from the headquarters, 101 Queen Victoria Street, London, E.C. Apart from the certificate of chartered accountants, the army's organisation includes an auditor-general, who travels all over the world.

See BOOTH (WILLIAM); also Booth-Tucker, *Life of Catherine Booth* (1892); Bramwell Booth, *Social Reparation* (1899), *Echoes and Memories* (1926); Railton, *Heaven England and Twenty-one Years' Salvation Army*; Begbie, *William Booth, Founder of the Salvation Army* (1920); and books by Arnold White (1900-10) and Rider Haggard (1910). Monson, *The Salvation Army and the Public* (1906), was critical, and evoked replies.

Salvator Rosa. See ROSA.

Salve Regina, the first words of the antiphon, addressed to the Blessed Virgin Mary, said after Lauds and Compline, in the Roman Catholic

Church, from Trinity to Advent. It dates from the 11th century, but first found a place in the Breviary of Cardinal Quignon (1536), and thence was adopted into that of Pope Pius V. (1568).

Salvi. See SAGE.

Salviati, ANTONIO. See MURANO.

Salvini, TOMMASO (1830–1915), tragedian, was born at Milan, his father and mother both being actors. In 1849 he fought with distinction in the revolutionary war. He made many tours abroad, visiting the United States twice (1874, 1881) and Britain twice (1875, 1884), after which he retired from the stage to enjoy a life of learned leisure in his villa near Florence. He scored his greatest successes in the plays of Shakespeare and Racine. See his *Autobiography* (1893) and *Ricordi* (1896).—His son Alexander adopted his father's career, and inherited much of his talent.

Salvinia, a genus of Water-ferns (q.v.), inhabitants of tropical and warm temperate regions.

Sal Volatile, a well-known remedy for faintness, consists essentially of a solution of carbonate of ammonia in alcohol. It contains in addition free ammonia and the volatile oils of lemon and nutmeg. As it is a strongly caustic liquid, it should never be taken unless well diluted with water. See SALTS, and AMMONIA.

Salwin, a river of Asia that flows south through the Shan country, then between Siam and Burma, and flows into the Gulf of Martaban a little below Maulmain. It is navigable for only about 80 miles up from its mouth; its bed is then interrupted by rapids and the dangerous ravines through which it passes. The Chinese call it the Lukiang; they also give the same name to the Tibetan Giama Nu-chu. It was long uncertain whether this last, which has a course of some 700 miles through Tibet, was the upper part of the Salwin or the upper part of the Irawadi (q.v.); but the latter view is now abandoned. The valley of the Salwin (also spelt *Salween*, *Salween*, and *Salouatin*) is little used for traffic by land or by water. Except at points where the river is ferried there is scarcely any population. The Salwin gives its name to a district of Lower Burma.

Salzbrunn, a group of three villages (New, Lower, and Upper Salzbrunn) in Lower Silesia, 40 miles by rail SW. of Breslau; they have eight mineral springs, which attract visitors. The water is alkalo-saline; much of it is exported. There are glass and porcelain factories, yarn-spinning works, brick-works, and coal-mines.

Salzburg, a land of Austria, bounded by Bavaria, Tyrol, Carinthia, Styria, and Upper Austria. Area 2762 sq. m.; pop. (1880) 163,570; (1923) 223,023. It lies on the northern face of the eastern Alps, and is a mountainous region, reaching altitudes of 12,000 feet in the Hohe Tauern. Snow-fields and glaciers cover 115 sq. m. in the more elevated regions. The river Salzach (190 miles), a tributary of the Inn, flows east and then north through one of the most picturesque of the Alpine valleys, and drains the greater part of the land. The climate is variable but healthy. Two-fifths of the surface are covered with forests, and two-fifths consist of Alpine meadows. The rearing of cattle and horses is an important branch of industry. Salt is obtained in large quantities, especially at Hallein (q.v.). Iron, copper, gypsum, and marble are mined. The hot springs of Gastein (q.v.) are widely celebrated.

SALZBURG, the capital (1350 feet above sea-level), occupies a charming situation on the Salzach, by rail 195 miles W. by S. of Vienna and 80 miles E. by S. of Munich. At this point the river passes between two extensive but isolated

masses of rock, the Capuzinerberg (2130 feet) and the Mönchsberg (1645 feet), the latter crowned by the old fortress of Hohen-Salzburg, dating originally from the 11th century. These hills and those that close in the valley are picturesquely wooded. The river divides the city into two parts; on the west is the old city, with many dark, winding streets, getting access to the valley and plain on the north through a gallery 150 feet long, hewn (1767) in the solid rock of the Mönchsberg. This portion of the city contains the cathedral, with florid stucco ornamentation, built (1614–34) in imitation of St Peter's at Rome; the Romanesque abbey church of St Peter (1127), in the graveyard of which are old monastic cells and a couple of chapels hewn out of the Mönchsberg, besides the chapel of St Margaret (1485); the handsome fountain in the Residenz Platz; the Residenz, in the Italian style (1592–1725); the former grand stables of the archbishops, partly constructed of marble (1607); the Benedictine monastery, with a valuable library of incunabula and ancient MSS.; the Franciscan Church (13th century) and the archbishop's palace. On the opposite bank—both banks are laid out as tree-shaded drives and promenades—lies the modern town, with Italian-looking, flat-roofed houses; here is situated the Castle Mirabell (1607), the former summer residence of the archbishops. The city possesses also a theological faculty, all that remains of the former university (1623–1810); the Carolino-Augustum museum of Celtic and Roman antiquities, &c.; a bronze monument (1842) to Mozart; a Mozart museum in his birthhouse; a conservatorium (the Mozarteum); the government buildings (1588); the town-house (1407), &c. Industry is not much developed, being confined chiefly to the manufacture of musical instruments, marble ornaments, &c. Pop. (1923) 37,856. The city stands on the site of the Roman settlement *Juvavum*, which was ruined by the Goths and Huns. The nucleus of a new city was made by St Rupert of Worms, who established a monastery here in the 6th century. Boniface made it a bishop's seat in the 8th century, and in 798 it was elevated to an archbishopric. The archbishops had a seat and vote in the German diet, and were perpetual legates of the pope, primates of Germany, and princes of the empire. They were generally noted for their ecclesiastical severity; in 1498 the Jews were expelled from the archbishopric; in 1525 the peasantry rose in revolt; in 1732, after five years' bitter persecution (in spite of all friendly efforts on the part of the Protestant princes of Germany), 30,000 Protestants left their homes (as illustrated in Goethe's *Hermann und Dorothea*) and settled, on the invitation of Frederick-William I., in Prussia, mainly in Lithuanian districts that had been desolated by plague. The archbishopric was secularised in 1803, and given to the Grand-duke of Tuscany, but restored in 1824. Save in 1810–14 the country has been Austrian, from 1849 a duchy and crown-land of the Austrian empire; from 1918 a land of the Austrian republic. It has been more than once declared by plebiscite for union with Germany.

Salzkammergut, called the *Austrian Switzerland*, one of the most picturesque districts of Europe, lies in Upper Austria and Austrian Styria. Area, about 250 sq. m. The scenery combines in rare beauty the features of valley, mountain, and lake. The highest peak, the Dachstein, reaches an altitude of 9830 feet. But the district derives its principal attraction from its lakes, the most famous of which are Hallstatt, Traun or Gmunden, Atter, St Wolfgang, Aber, Mond, and Zell. A domain (Kammergut), now of the republic, it derives its name from its salt springs and mines. The chief seats of the salt-works are Ischl (q.v.),

Hallstatt, and Ebensee. Little or no agriculture is carried on; the inhabitants not engaged in the salt industry are employed in cattle-breeding and in the timber trade.

Salzwedel, in Prussian Saxony, 72 miles by rail NW. of Magdeburg, has manufactures of sugar, linens and woollens, chemicals, and pins; pop. 12,000.

Samara, a town of European Russia, stands on the left bank of the Volga, at the influx of the Samara, and on the railway from Moscow (656 miles to WNW.) to Orenburg (261 miles to SE.). One of the principal river ports on the Volga, it carries on a large trade in corn, salt, tallow, timber, &c.; it has also tanneries, tobacco-factories, soap-boiling-works, iron foundries, and brick works. It is the seat of a university (1919) and of a bishop, and has three annual fairs. Pop. 150,000.

Samara, a dry indehiscent, usually one-seeded fruit, with a wing—as in Ash (q.v.), Elm (q.v.), and Maple (q.v.)—the last a *double samara*.

Samarang, a seaport on the north of Java, 255 miles E. of Batavia. The European quarters have all the appearance of a typical Dutch town. The more important buildings are a military hospital, the town-house (1854-64) and Christian churches and schools. The port is suitable as a haven only for large vessels, since the weather is often extremely rough, especially during the west monsoon. A harbour for lighters covering an area of 32 acres was built in 1910, and there are excellent warehouses. Pop. 100,000.

Samaria, the capital (which gave its name to the whole district) of the northern kingdom of Israel, after Israel (the ten tribes) and Judah became two independent states. The city was founded by Omri, on a commanding site, about 5 miles NW. of Shechem, and near the middle of Palestine. It stood on the long flat summit of an isolated hill (1450 feet), that was reached by a succession of terraces, and itself commanded a magnificent view on all sides. Consequently it was easy to make it a place of considerable strength; the Syrians indeed laid siege to it unsuccessfully more than once during the following reigns. But in 722 B.C. it fell before the three years' persistency of the Assyrian monarchs, Shalmaneser and Sargon. The conqueror carried away 27,290 of the Hebrew inhabitants of Samaria and the country of the Israelites captive into Babylonia. In their place were sent Assyrian colonists, from Babylon, Hamath, Sepharvaim, and Cuthah; hence the Jews often called the Samaritans 'Cutheans.' The new settlers, whilst retaining for a time their heathen forms of worship, gradually adopted the characteristic religious practices and beliefs of the remnant of the Israelites amongst whom they dwelt. When the Jews returned from the Captivity and set about the rebuilding of the temple (Ezra iv. 3), the Samaritans came desiring to participate in the work. But the Jews rejected their assistance, and would not permit them to have any part or share in the worship of Jehovah, on the ground that they were unorthodox and condoners of idolatry. This of course caused an estrangement between the two sections of the nation, and the Samaritans tried to prevent the Jews from fortifying their new city. The breach seems to have grown suddenly wider after the expulsion about 430 B.C. from Jerusalem of a member of the high priest's family who had become a son-in-law of Sanballat, the civil governor of Samaria. Some years later the Samaritans, augmented from time to time by numbers of renegade Jews, built on Mount Gerizim above Shechem (Nâblus) a sanctuary to Jehovah intended as a rival to the temple at Jerusalem. This converted them into bitter

enemies, so that henceforward, at all events for very many years, the 'Jews had no dealings with the Samaritans,' and the Samaritans none with the Jews. At some time during the growth of this enmity between the two peoples, the Samaritans introduced the revised Pentateuch of Ezra as their religious code-book, and became extremely strict and puritanical in the observance of its laws. The prophetic and historical books of the Old Testament they never received. They practised circumcision and the observance of the Sabbath, both very strictly, and, in later times at any rate, developed their own doctrine of a resurrection and a Messiah, of demons and angels. Yet their religious system has always remained much simpler and more primitive than that of the Jews. At the present day there do not survive more than 150 of them, all at Nâblus, the ancient Shechem, where they have a synagogue. The Samaritan language proper is an Aramaic dialect. In it are written an early version (Targum) of the Pentateuch (see below), certain prayers, hymns, and a sort of commentary. Since the 11th century they have used Arabic as their vernacular.

Samaria was taken by Alexander the Great, colonised by Macedonians, and Hellenised. They fortified it, and it grew and prospered. Twice it was besieged and taken by the successors of Alexander—viz. by Ptolemy I. (312 B.C.), and by Demetrius Poliorcetes (circa 296). The Jewish captain John Hyrcanus laid siege to it, and his sons (circa 110) destroyed it utterly. Nevertheless the Samaritans joined the Jews in offering fierce resistance to the Romans; they entrenched themselves on Mount Gerizim, and only submitted after a desperate and bloody siege. Their city was again destroyed; but the consul Gabinius ordered it to be rebuilt. Augustus gave it to Herod the Great, who refounded it under the name of Sebaste. The Samaritans seem to have been involved in the 'dispersal' of the Jews, as they were found at Byzantium, at Rome, in Egypt, and elsewhere. Yet some of them remained in the old city, and in 529 A.D. revolted against the rulers of the eastern empire. On the ruined site of the ancient place, now called Sebastiya, there still exist parts of a colonnade of the age of Herod, remains of a temple to Augustus, and an old crusading church (now a mosque) built over the tomb of John the Baptist. American excavators have also found there the ruins of a palace and other remains of the time of Ahab. The tombs of six or eight (Omri, Ahab, Jehu, &c.) of the kings of Israel and traditionally also those of the prophets Obadiah and Elisha were at Samaria. See J. A. Montgomery, *The Samaritans* (Philadelphia, 1907).

Samaritan Pentateuch, a recension of the Hebrew text of the Pentateuch, in use with the Samaritans, and accepted by them as canonical to the exclusion of the other Old Testament writings. That such a recension once existed had always been known from certain allusions in Origen, Jerome, and Eusebius, and also in the Talmud; but Julius Scaliger was the first modern scholar to suggest that it might still be recoverable, and to point out its possible importance if obtained. Early in the 17th century the famous traveller Pietro della Valle succeeded after much inquiry in procuring at Damascus a copy not only of the text of this Pentateuch of the Samaritans, but also of the translation, or Targum, in the Samaritan Aramaic dialect. Both documents passed in 1623 into the hands of the Oratorians in Paris, and were published in the Paris Polyglott (1628-45) by J. Morinus. In his *Exercitationes Ecclesiasticae*, with which Morinus accompanied the Pentateuch of the Samaritans, he placed it far above the received Hebrew text, a view which had a polemi-

cal bearing on current theological discussions between Protestants and Catholics about the 'rule of faith,' and led accordingly to prolonged controversy, the principal disputant on the Protestant side being the Zurich theologian, J. H. Hottinger. Both the Samaritan Pentateuch and the Samaritan Targum (from the text of Morinus) were afterwards printed by Brian Walton in the London Polygot (1653-57) with a collation of the various readings of the Massoretic and Samaritan Hebrew texts. Through Ussher and others a number of additional Samaritan codices were brought to Europe in the course of the 17th century, so that Kennicott was able to use for his Hebrew Bible sixteen MSS. more or less complete. The first to arrange the variants in a systematic way, and to determine with any scientific accuracy the kind and amount of authority that can be claimed for the Samaritan recension of the Pentateuch was Gesenius (*De Pent. Sam. origine, indole, et autoritate*, 1815). Most of the variants do not materially affect the sense, representing merely a different fashion in spelling. Some, however, are more important, as in Exod. xviii. 25, xx. 18, 19; Num. xxi. 22; Deut. v. 18, x. 7, xxiii. 12, xxxiv. 1; the additions in Exod. xi. 3, xx. 17, 21; Lev. xvii. 4; Num. iv. 14, x. 10, xii. 16, xiii. 33, xx. 13, xxi. 11, 12, 20, xxvii. 23, xxxi. 20; Deut. ii. 7; the transposition of Exod. xxx. 1-10 after xxvi. 35, and the substitution of Gerizim for Ebal in Deut. xxvii. 4. As is well known, the Samaritan Pentateuch varies from the received text in the figures it gives in Gen. v. and xi. and also in Exod. xii. 40, thus presenting a scheme of chronology materially different both from the Massoretic and from that of the LXX. Moreover, its relation to the LXX in general still awaits investigation. Of the MSS. that have reached Europe none are known to be older than the 13th century. All are written in a peculiar modification of the old Semitic character (see ALPHABET). There is no ground, either external or internal, for assigning to the Samaritan recension a higher authority than that of the Jewish text, though, from its use in northern Palestine, it was formerly argued that it must have had an independent existence before the fall of the northern kingdom, or even before the revolt of Jeroboam. The text is printed (incorrectly) in the Paris and London Polyglots, and separately, in Hebrew characters, by Blayney (Oxford, 1790), and more critically by August von Gall (Giessen, 1914-18). The Samaritan Targum, a translation of the Samaritan Pentateuch into Samaritan Aramaic, is probably of the 4th Christian century. It was printed in a very corrupt form in the Paris and London Polyglots, but there is a more critical edition by Petermann and Vollers (*Pentateuchus Samaritanus, ad fidem librorum Manuscriptorum apud Nabulsienses repertorum*, Berlin, 1872-91); see also Nutt, *Fragments of a Samaritan Targum* (1874). The Samaritan Targum of Genesis, in Hebrew characters, is given in Heidenheim's *Bibliotheca Samaritana* (1884) and the whole by A. Brüll (Frankfurt-a.-M., 1874-79). There is also an Arabic translation of the Samaritan Pentateuch, made in the 11th or 12th century, generally attributed to Abu Said, but probably by Abulhasan of Tyre, based on the work of Sandia.

Samarkand, or SAMARQAND, a city selected to be capital of Uzbekistan, about 4 miles S. of the Zarafshan, 130 miles E. by S. of Bokhara, and 2300 feet above sea-level. It is the ancient *Marcanda*, the capital of Sogdiana, destroyed by Alexander the Great. It was again captured in 712 A.D. by the Arabs, who supplanted the Græco-Bactrian civilisation, of which it was the centre. Ever since it has been a sacred city in the eyes of the Moslems,

especially after Timur made it his capital (1369). Genghis Khan took it (1219) and destroyed three-fourths of its half a million inhabitants. In Timur's time it had a population of 150,000. Its most remarkable buildings date from the 14th and 15th centuries; the Ulug-beg *Madrasa* (1388), which with two other colleges, the Tilla-Kari and Shir-dar (founded early in the 17th century), encloses the chief square, called the Rigistan; the Gur Emir (Timur's mausoleum), the tomb of Timur's wives, the shrine of Shah Zinde. These are magnificent structures, grandly decorated with arabesques, enamelled tiles of different colours, marble pavements, inscriptions in gold, and similar rich ornamentation. In the 15th century Samarkand was renowned as a school of astronomy and mathematics. The citadel, on a steep hill, contains Timur's audience-hall and the great stone from which he used to dispense justice. After the decay of Timur's empire the city had a chequered history, falling at last into the hands of the emirs of Bokhara, from whom it was taken by the Russians in 1868. They laid out a new town, with broad and handsome streets, to the west of it. On the other side of the citadel is the old city, walled, with dark and narrow streets and dirty houses. Since 1888 Samarkand has been connected by rail with the Caspian Sea, and since 1905 with Tashkent and so with Orenburg. Pop. 90,000, including some 25,000 Russians. The people carry on gardening and viticulture (their grounds being irrigated by water from the Zarafshan), distilling, and the manufacture of textiles, harness, gold and silver wares, leather, tea-boxes, lead, paper, pottery, boots, &c., and conduct a brisk trade in cotton, silk, raisins, fruits, wheat, rice, salt, and horses. See TURKESTAN.

Sámaveda. See VEDA.

Sambhal, an Indian town in the United Provinces, 23 miles SW. of Moradabad; pop. (1921) 41,585.

Sambor, a town in Poland, in Galicia, on the Dniester, 41 miles SW. of Lemberg; pop. 20,000.

Sambourne, EDWARD LINLEY (1845-1910), cartoonist, born in London, was apprenticed at sixteen to marine engineer works at Greenwich, but in April 1867 began his connection with *Punch*. He also illustrated Kingsley's *Water-babies*, Andersen's *Fairy Tales*, &c.

Sambre, a tributary of the Meuse or Maas, rises in the French dept. of Aisne, flows 112 miles in a north-easterly direction, and at Namur in Belgium joins the Meuse from the left. It is navigable up to Landrecies, 90 miles, and is connected with the Oise by a canal 40 miles long. Valuable prehistoric remains have been discovered in caves in the Sambre valley, and are now preserved in the neighbouring museums of Charleroi, Floreffe, and Namur.

Sambul. See MUSK-PLANTS.

Sambur (*Cervus aristotelis*), a species of stag abundant in the forest-land of some parts of India, Burma, and China. It stands about five feet high, is a powerful animal, and is much hunted. The colour is dark brown; the antlers are rounded, and belong to a type known as Rusine.

Saphitá is the name of that portion of the Vedas which contains the Mantras or hymns. See VEDA.

Samland, a district of the province of East Prussia, stretching between the Frisches Haff and the Kurisches Haff. Its western coast is known as the Amber (*Bernstein*) coast. This district gave title to a bishopric from 1249 to 1525.

Samnites, an ancient Italian people of Sabine origin, who occupied an extensive and mountainous

region in the interior of Southern Italy. They were surrounded on the north by the Paeligni, Marsi, and Marrucini; on the west and south-west by the Latins, Volscians, Sidicini, and Campanians; on the south by the Lucanians; and on the east by the Apulians and Frentani. It was not till after a long series of wars (of which the first began in 343 B.C., and the third did not conclude till 275 B.C.) that the Romans conquered the Samnites, ultimately making them allies; see ROME. It was in the second Samnite war that the Romans endured the humiliation of the *Caudine Forks* (q.v.). See PYRRHUS.

Samoa, or Navigators' Islands, a group of islands in the Western Pacific, lying in $13\frac{1}{2}^{\circ}$ to $14\frac{1}{2}^{\circ}$ S. lat. and 168° to 173° W. long. They are between 400 and 500 miles NE. of Fiji. The group consists of nine islands, in addition to rocks and islets, some belonging to the United States, and the rest administered by New Zealand under a mandate from the League of Nations (see *History*). They are all, with the exception of Rose Island, of volcanic formation, and are for the most part surrounded with coral-reefs. They are very mountainous, but at the same time well wooded, for the decomposition of the volcanic rock has resulted in a very rich soil, which produces a most luxuriant vegetation. Four islands alone are of any size, Savaii, Upolu, Tutuila, and Manua (Manua really consisting of three islands, the largest of which bears the name of Tau Island). These four lie in order of size from west and north-west to east and south-east. The climate of Samoa is very moist and variable; the pleasantest time of the year is from May to November, when the south-east trade-winds prevail; during the rest of the year heavy gales and rains are frequent, and occasionally, especially from January to the middle of April, the most disastrous hurricanes occur. The products of Samoa are almost entirely vegetable, consisting of tropical trees and plants. There are rich pastures, upon which imported live-stock thrives; almost the only indigenous mammal being a kind of bat. Among birds there is to be found on the island of Upolu a very rare species of ground pigeon, the didunculus or little dodo (a near relation of the dodo), which, nearly extinct, changed its habits to be out of the way of pigs, and took to nesting in trees.

Western Samoa, formerly the German Samoan Islands, comprises the islands of Savaii, Upolu, Apolima, and Manono. The areas of the two former are 660 and 600 sq. m. respectively, while the others are extremely small. The total population amounts to 38,230 (1925), mostly natives. The government, under New Zealand (1920), is in the hands of an administrator, with legislative and native councils. The chief products are copra and cocoa, but cotton, fruit (avocado pears and bananas), and Pará rubber are also grown. The plantations have been worked very efficiently, and there are some 60 miles of good roads. Most of the trade is done with the United Kingdom or the Dominions, as there is a regular steamship service between New Zealand and Apia (pop. 1400), the port of Upolu, on the northern side of the island, entered between coral-reefs. In 1889 R. L. Stevenson settled at Vailima, near Apia, and there in 1894 he was buried.

American Samoa includes the island of Tutuila and the Manua group, with a total area of 58 sq. m. and a population (1922) of 8194. Nearly all the land is owned by the natives, and there is a considerable amount of native self-government. The land is fertile, and copra, coconuts, and fruit (oranges, bananas, &c.) are grown, but copra is the only article exported. Tutuila possesses a good harbour at Pago Pago, or Pango Pango, a deep

indentation in the southern coast, which nearly cuts the island in two. It is a United States naval station, and also a port of call for mail-steamers between the United States and Australia.

History.—The Samoans belong to the brown Polynesian race, and are therefore akin to the New Zealand Maoris. Samoa is by tradition the birth-place of the race, and the Samoans, a well-formed and prepossessing race, are perhaps the lightest in colour of all the Pacific islanders. The islands were visited by Bougainville in 1768, and from him received the name of *Îles des Navigateurs*, as a tribute to the skill of the native boatmen. In 1787 some members of a French exploring expedition under La Pérouse were killed in a quarrel with the natives at Massacre Bay in Tutuila. The Christian religion was first introduced in 1830, and the result of missionary enterprise is that the Samoans are now nearly all Christians (Protestants, Roman Catholics, and Mormons), while a considerable amount of attention is paid to education. For many years Samoa, like other groups of Pacific islands, suffered from the want of a stable government, able to control at once the native inhabitants and the European settlers. In 1889 a conference was held at Berlin between representatives of Britain, Germany, and the United States, who recognised the independence of the Samoan government, but at the same time made provision for a supreme court of justice and certain regulative restrictions. In 1892 and 1899 there was again civil war and foreign intervention, followed by the abolition of the native monarchy; and by a treaty between Britain and Germany, agreed to by the United States, it was settled that thenceforth Upolu and Savaii and the adjoining small islands should belong to Germany, Tutuila and its islets to the United States, the meridian of 171° W. being chosen as the dividing line. Dominion troops occupied German Samoa in 1914, and in 1919, by the Peace of Versailles, Germany surrendered her possession. The next year West Samoa was assigned to New Zealand under a mandate of the League of Nations, with the stipulation that the islands were not to be administered for any military or naval purposes.

See POLYNESIA, &c.; books by R. L. Stevenson (q.v.); Turner, *Samoa a Hundred Years Ago* (1884); Stair, *Old Samoa* (1897); H. J. Moors, *With R.L.S. in Samoa* (1910); R. M. Watson, *History of Samoa* (1919); and books in German by Reinecke (1901) and Krämer (1902).

Samogitia, a district of western Lithuania, inhabited by pure Lithuanians.

Samos (Turk. *Susam Adassi*), an island in the Aegean Sea, lying close to the coast of Asia Minor, about 45 miles SSW. of Smyrna. Its length is 30 miles, its mean breadth about 8, and its area 180 sq. m. A range of mountains, which may be regarded as a continuation of Mount Mycale on the mainland, runs through the island, whence its name—'Samos' being an old word for 'a height.' The highest peak, Mount Kerki (anc. *Cerceteus*), reaches 4725 feet. Between its eastern extremity and the mainland is the narrow channel of Mycale (called by the Turks the Little Bosphorus), scarcely a mile wide, where in 479 B.C. the Persians were totally defeated by the Greeks under the Spartan Leotychides. Between Samos and Nicaria (anc. *Icaria*) on the west is the Great Bosphorus, from 3 to 8 miles broad, the passage traversed by vessels sailing from the Dardanelles to Syria and Egypt. Samos is well watered and very fertile. Its principal product is wine, which, though little esteemed in ancient times, is now largely exported to France, Germany, Italy, and Austria. Besides wine, the exports embrace olive-oil, carob beans, raisins, and hides, and the imports are principally manufactured

goods, corn and flour, tobacco, spirits, groceries, hides. The chief industry is tanning. The capital of the island is Vathy (pop. 12,000), on the north coast. Previous to 1832 the capital was Chora, near the south coast. The site of the ancient city of Samos is occupied by Tigani. This ancient city was renowned for three architectural works of great magnitude, an aqueduct cut through the heart of a mountain nearly one mile long, a gigantic mole to protect the harbour, and a large temple to Hera, a rival to that of Diana of the Ephesians. All that now stands of this last is a solitary pillar; the mole survives; the aqueduct was rediscovered in 1882. The island was in ancient Greek times celebrated for its red glossy pottery, which was imitated by the Romans in their so-called Samian ware (see POTTERY). Pop. of island, 84,000, all Greeks.

Anciently Samos was one of the most famous isles of the Ægean. At a very remote period it was a powerful member of the Ionic Confederacy, and (according to Thucydides) its inhabitants were the first, after the Corinthians, who turned their attention to naval affairs; Colæus the Samian was the first Greek who sailed through the Pillars of Hercules into the Atlantic. The Samians founded numerous colonies in Thrace, Cilicia, Crete, Italy, and Sicily. But the celebrity of the island reached its acme under Polycrates (q.v., 532-522 B.C.), in whose time it was mistress of the archipelago. Subsequently it passed under the power of the Persians, became free again after the battle of Mycale, stood by Athens during the Peloponnesian war, and after several vicissitudes became a portion of the Roman province of Asia (84 B.C.). Being a Byzantine possession, it was conquered by the Turks. When the war of independence broke out in 1821 no Greeks were more ardent and devoted patriots than the Samians; and deep was their disappointment when, at the close of the struggle, European policy assigned them to their former masters. They were, however, governed by a Greek, with the title of Prince of Samos, and by a native council. Union with Greece was accomplished in 1912, and confirmed by the Treaty of Lausanne (1923).

See books on the islands of the Ægean by Tozer (1890), Marden (1907), and Volonakis (1922).

Samos'ata (mod. *Samisat*), the capital till 73 A.D. of the Syrian kingdom of Commagene, on the Euphrates, 130 miles NNE. of Aleppo. It was the birthplace of Lucian and of Paul of Samosata (q.v.).

Samothrace, an island of the Ægean Sea, lies in the north-east corner, nearly opposite the mouth of the river Maritza and 40 miles NW. of the Dardanelles. Next to Mount Athos it is the most conspicuous object in the northern Ægean, rising to 5248 feet in Mount Saeo (Phengari), which occupies nearly the whole of its surface (68 sq. m.). It was from this peak that Poseidon watched the fights on Troy plain (*Il.* xiii.). Bare and repellent, the island possesses no harbour and only one village, Chora, of 2000 inhabitants, and is the meeting-place of the Ægean storms. In ancient times it was celebrated for the worship of the Cabeiri (q.v.), mysterious divinities of (probably) Pelasgo-Phœnician origin, and was one of the most sacred sites in the Ægean. The temples and subsidiary buildings forming the sanctuary of these deities were excavated in 1873-75 by Professor Conze (see his *Archäologische Untersuchungen auf Samothrake* (1875 and 1880). Parts of the cyclopean walls of the ancient city still remain. For several centuries the island belonged to the Byzantine empire; but in 1355 it was given to the princely merchant family of the

Gatilusi. They kept it until it was conquered in 1457 by the Turks, who then, and again in 1821, nearly exterminated the population. The Greeks regained it in 1912.

Samoyeds, the name of a Ural-Altaic race widely spread over the extreme north of Europe and Asia, especially along the middle course of the Obi River and on the Arctic coast between Cheskaya and Khatanga bays. They seem formerly to have possessed nearly all the vast regions between the Altai Mountains and the Arctic Ocean. Numerous grave-mounds of the Bronze period that have been found in western Siberia are attributed to a semi-civilised nation of Ugro-Samoyeds. The Samoyeds were gradually driven northwards by the Turko-Tatar races (Huns, Ugrians, &c.). They are short in stature, somewhat broad-headed, with Mongolian eyes, but without epicanthic fold. They dress in skins, use bone and stone implements, keep reindeer, live by hunting and fishing, and are Shamans in religion (mixed with fetishism). See Fred. G. Jackson, *The Great Frozen Land* (1895).

Samphire (*Crithmum*), a genus of Umbelliferae, having compound umbels, and an oblong fruit, rather flattened at the back, with five winged ridges, and many vittæ spread all over the seed. Common Samphire (*C. maritimum*) is a perennial, a native of Europe, growing chiefly on rocky cliffs near the sea. It is rare in Scotland, but common in the south of England, and a fatal accident in 1922 proved the gathering of it still a 'dreadful trade' on Dover cliffs, as in Shakespeare's day (*King Lear*, IV. vi. 15). Its radical leaves are triternate; those of the stem have lanceolate and fleshy leaflets. The stem is about 1½ feet high, the flowers



Common Samphire
(*Crithmum maritimum*).

yellow. Samphire makes one of the best of pickles, and is also used in salads. It has a piquant, aromatic taste, and is considered very diuretic. It is generally gathered where it grows wild, but is sometimes very successfully cultivated in beds of sand, rich earth, and rubbish, occasionally supplied with a little salt. *Inula crithmoides*, a perennial plant, allied to Elecampane (q.v.), and of the family Compositae, a native of the sea-coasts of England, is used in the same way as samphire, and is often called Golden Samphire. The young shoots of *Salicornia herbacea* (see GLASSWORT) are also substituted for it as a pickle, and sold under the name of Marsh Samphire.

Samsö, an island belonging to Denmark, lies in the entrance to the great Belt, between Zealand and Jutland. Area, 42 sq. m. The people are engaged in cultivating the fertile soil and in shipping.

Samson (Heb. *Shimshon*, LXX and Heb. Judges, xiii. 24 *Sampson*, Vulg. *Samson*; the name is derived from *Shemesh*, 'sun'—cf. 'Shimshai the scribe,' *Ezra*, iv. 8, 17—and the Greek transliteration represents an older pronunciation than that of the present Hebrew text) 'judged Israel twenty years' (Judges, xv. 20, xvi. 31), being the last of the series of twelve in the Book of Judges. The

narrative of his adventures, however (Judges, xiii.-xvi.), does not represent him in the capacity of ruler of Israel, or even as leader of his own tribe, either in war or in peace; his action is always that of a private individual and for his own hand, without co-operation. He was a native of Zorah, one of the ancient stations of the Danites before they removed to Laish at the roots of Mount Hermon; and the name of his father, Manoh, reappears in that of the Manahathites (1 Chron. ii. 52, 54; cf. Gen. xxxvi. 23). The circumstances of his birth were similar to those of Gideon's, with the addition that he came under the Nazarite vow, or something equivalent to it (for the unshorn head and abstinence from wine used to be observed by the Arabs also when they were engaged in war or pursuing revenge). His numerous exploits, variously reckoned as seven, or eight, or twelve, have suggested to modern interpreters the idea that possibly elements of solar mythology may have come into his story, and it is in any case obvious that it owes much to popular legend (e.g. in the etymology of Leli); but there is no reason to doubt that it also incorporates an authentic tradition of a strong, child-like, patriotic hero who on various occasions in the days of Israel's oppression had wrought havoc among the Philistines.

See the full discussion of the mythical and other aspects in Burney's commentary on the Book of Judges (see also JUDGES).

Samsun (anc. *Amisus*), a port on the S. coast of the Black Sea, 35 miles SE. of the mouth of the Kizil Irmak, is the great centre of the tobacco trade.

Samuel (Heb. *Shemû'el*, i.e., most probably, 'name of God'), next to Moses the greatest personality in the early history of Israel (Jer. xv. 1; Ps. xcix. 6), was, according to the narrative in 1 Sam. i.-iii., an Ephraimite, native of Ramathaim or Ramah in Mount Ephraim (probably the Arimathea of the New Testament, the modern Er-Ram, about five miles north of Jerusalem). As a child he was dedicated by his mother to the priesthood (not to the Nazirate, Num. vi. 1-21, as is sometimes supposed), and, clothed in priestly ephod and robe (1 Sam. ii. 18, 19), he became a temple attendant under Eli the high-priest at Shiloh. Later tradition represented him as a Levite (1 Chron. vi. 27, 28, 33, 34). While still a child he received the prophetic gift and foretold the fall of Eli and his house, a prediction soon fulfilled in the national disaster at Ebenezer. The story of Samuel contained in 1 Sam. vii.-xvi. combines two widely different accounts of the rest of his career. According to one of these, Israel lay for twenty years under the Philistine yoke; at the end of this period a national convocation was summoned to Mizpah by Samuel, who, for a still longer time, had been known and recognised from Dan to Beersheba as a prophet of the Lord. While prophet and people were engaged in religious exercises the Philistines came upon them, but only to sustain a decisive repulse which drove them within their own borders, where they remained during all the days of Samuel. The prophet thenceforward enjoyed a profoundly peaceful and prosperous rule as judge over all Israel, till his advancing years compelled him to associate his sons with him in the government. Dissatisfaction with their ways gave the elders of Israel a pretext for coming to Samuel and asking him to give them a king such as every other nation had. Although clearly seeing the folly of this and well aware that it was equivalent to a rejection of Jehovah, he, after some remonstrance, granted their prayer (1 Sam. viii.) and held a national convocation at Mizpah (x. 17-27), at which Saul, son of Kish, was chosen by lot to the sovereignty over Israel.

Saul's exploit against the Ammonites shortly afterwards led to another convocation at Gilgal, where the kingdom was 'renewed' (xi. 14) in what was, presumably, one of the last acts of the public life of Samuel. The other account, which is also the older, gives a wholly different impression of the prophet's career. There is quite another attitude to the institution of the monarchy; and, besides, the historical conditions are quite different. He comes before us as 'a man of God,' a man 'held in honour,' and a seer whose every word 'cometh surely to pass,' but occupying a position hardly so prominent as that of judge of all Israel. Saul is divinely made known to him as the instrument chosen by God in his mercy to deliver Israel out of the hands of the Philistines, under whose oppression they are (and long have been) groaning. The seer secretly anoints the young Benjamite and gives him certain signs, with the injunction, 'let it be, when these signs are come unto thee, that thou do as occasion serve thee, for God is with thee' (ix. 1-x. 16). The 'occasion' arose about a month afterwards (x. 27; R.V. marg.), when the 'spirit of God came mightily upon Saul,' and his magnificent relief of Jabesh-Gilead resulted in his being immediately afterwards chosen and recognised as king. The accounts of Samuel's conduct during Saul's reign are also discrepant, and neither version of Saul's rejection by Samuel appears in the oldest narrative, which is also silent about the anointing of David.

Samuel, BOOKS OF. The Book of Samuel (for it is in reality but one) forms the third in the series of the four 'former prophets,' being preceded by Joshua and Judges, and followed by the (also undivided) Book of Kings. In the LXX. it appears as two books, entitled respectively A and B 'of kings,' or rather 'of kingdoms' (*basileiôn*); this, through the Vulgate (Jerome preferred 'Regum' to 'Regnorum'), is the source of the corresponding division in the authorised version, and of the alternative titles, 'otherwise called the first (or second) Book of Kings.' In Coverdale's version the title of 1 Sam. runs: 'the first boke of kynges, otherwise called the first boke of Samuel.' In the Revised Version the alternative title is dropped. In printed editions of the Hebrew Bible since Bomberg's time the Hebrew text has also shown the division of Samuel into two books, the first covering the period of Samuel and Saul, the second that of David. A more natural division would have been into three, the partitions being marked by 1 Sam. xiv. 52, 2 Sam. viii. 18, and 2 Sam. xxiv. 25, or rather by 1 Kings, ii. 46, respectively. Of the sections thus indicated the third is the most closely knit together. It is held to extend from 2 Sam. ix. 1 to 1 Kings, ii. 46, and —apart from 2 Sam. xxi.-xxiv., which constitutes an appendix to the main narrative, of miscellaneous contents—it is a quite continuous piece of history, showing in a singularly vivid way how it was that Amnon, Absalom, and Adonijah, failing in turn to secure the succession, cleared the way for Solomon. Its marked vividness and freshness have impressed nearly all critics who assign it a very early date; thus Thenius attributed it to a quite contemporary writer, and Klostermann even named Ahimaaz, the son of Zadok, as the probable author. The second section (1 Sam. xv. 1-2 Sam. viii. 18), containing the history of David from the time when he was first brought to court down to that of his elevation to the throne of all Israel, and his victory over all external foes, is somewhat more complex in its structure. A clue to its analysis is sought by most recent critics in the twofold account of the manner in which David was first brought into close personal relations with Saul. The first and earlier (xvi. 14-23) represents him

as already of mature age, a mighty man of valour, and practised in affairs, as well as a gifted musician, when, on account of his skill with the harp, he is introduced into Saul's service after his malady had begun to show itself; here he soon becomes the king's armour-bearer. In the second and later account (xvii. 1-xviii. 5), which appears in a considerably shorter form in the LXX (see R.V. marg.), he is a shepherd lad, inexperienced either in war or in affairs, who first attracts the king's attention by his heroic encounter with Goliath. The earlier of the two narratives—of Saul's growing fear and jealousy of David, the flight of the latter, his wanderings to Adullam, Keilah, the Negeb, and the Wilderness of Judah, Saul's last struggle with the Philistines, David's elevation to the throne, first of Judah and then of all Israel, the transference of his capital to Jerusalem, his victories over the Philistines, Moabites, Aramæans, Ammonites, and Edomites—finds its continuation (approximately) in xviii. 6-8, 12a-16, 20-29a, xix. 8-10, 11-17, xxi. 2-7, xxii., xxiii. 1-18, xxv., xxvii. 1-6, xxviii. 1-2, xxix., xxx.; 2 Sam. ii.-v., viii. The analysis of the first section (1 Sam. i. 1-xiv. 52) begins with the narration (again twofold) of the steps which led to Saul's elevation to the throne (see SAMUEL). The earlier account is contained in ix. 1-x. 16, x. 27b (LXX), xi. 1-11, 15, xiii. 2-xiv. 51; the later (substantially) in 1 Sam. vii. 2-viii. 22, x. 17-27a, xi. 12-14, xii. 1-25. Closely related to the former (and in any case earlier than the latter) are 1 Sam. i.-iii. (with the exception of ii. 27-36 and Hannah's song) and 1 Sam. iv. 1-vii. 1.

According to the Talmud, 'Samuel wrote his own book'; Abrabanel attributes it to Jeremiah; but the Christian church has no definite tradition on the subject. The attempt systematically to analyse the composition of Samuel was first made by Gramberg (1830), who saw in it two parallel narratives editorially combined. Similar essays were afterwards made by Stähelin, Schrader, and Bruston. The criticism, both 'lower' or textual, and 'higher' or literary-historical, of the Book of Samuel was raised to a new level of scientific precision and accuracy by Wellhausen. He pointed out the literary unity of the narratives in 2 Sam. ix.—1 Kings ii. (apart from 2 Sam. xxi.-xxiv.) and its early date, and also disentangled the main thread of 1 Sam. xiv. 52—2 Sam. viii. 18, which represents a form of the tradition that must have been committed to writing comparatively soon. The older narrative in the first section he also regarded as early. In some early form, which almost certainly included some matters which have since been dropped, but of course did not contain the additions of a later age, these three sections were brought together into one great continuous historical work, corresponding to the present series, Judges, Samuel, Kings, before the reign of Josiah. The whole work afterwards underwent a Deuteronomistic redaction, which, however, from the nature of the material, was not so systematic and thorough in the case of Samuel as it was in those of Judges and Kings. The division into these three books was made by the Deuteronomist; and it was not till after this had taken place that the miscellaneous collection of passages (some of them very ancient) which now forms the last four chapters of Samuel, and breaks the original continuity, was introduced. Among the passages that help to fix the date of the final redaction of Samuel are 1 Sam. ii. 27-36, which Wellhausen considers to be pre-exilic, but not earlier than Josiah's reign, and the whole of the later form of the history of Saul's elevation to the throne (see SAMUEL), which in his opinion cannot have been written before the fall of the Judean monarchy. Budde's work on

the structure and sources of Judges and Samuel (1890) is in substantial agreement with the conclusions of Wellhausen; Budde, however, is inclined to assign an earlier date for the 'Mizpah' passages (1 Sam. vii. 2 *et seq.*, &c.), and to put them on a level with the E of the Pentateuch.

S. A. Cook (*Ency. Brit.* vol. xxiv.) lays most emphasis upon internal historical difficulties and inconsistencies which point to late editing and bring the books much closer, as regards their date, to the books of Chronicles. For the literature see his article; also the commentaries of H. P. Smith (*Internat. Crit. Comm.* 1899); A. R. S. Kennedy (*Century Bible*; small but full), and Dhorme (French, 1910); and, especially for textual criticism, the very excellent work of Driver, *Notes on the Hebrew Text of the Books of Samuel* (1913). See also PENTATEUCH.

San. See TANIS.

Sanaa', or SAN'A, the capital of the Imámate of Yemen, is situated 200 miles N. by W. of Aden, in a broad grassy valley, sheltered by hills 1200 and 1500 feet high, and is itself 4000 feet above the sea. The population of the city was estimated at 40,000, and of the valley at about 70,000, in 1836; the former is now probably about 20,000. The city and its suburbs are surrounded by walls, and overlooked by a couple of ruined fortresses. Few of the buildings are older than the 16th century, although the city has been in existence from the remotest ages. It was long the capital of the independent Imáms of Yemen, and during that period was noted for its handsome buildings, and gardens, its palaces, mosques, baths, &c. In 1872 it submitted to Turkish rule, and declined in importance. In 1905 it was taken by Arab rebels against the Turks and held for a time. The Great War restored the independence of Yemen.

San Antonio, capital of Bexar county, Texas, and after Dallas the largest city in the state, is on the San Antonio River, 210 miles by rail W. of Houston. It carries on a large trade in the produce—wool, hides, and live-stock—of the fertile country around. It contains a Roman Catholic cathedral, West Moreland College, an arsenal and a United States government building, and still retains some picturesque traces of its Spanish origin. Fort Álamo, just across the river, was the scene of a ruthless slaughter, by Santa Ana, of the American garrison of 188 men, including 'Jim' Bowie, in 1836. In 1921 a large part of the city was devastated by a flood-wave, while enormous damage was done to property and crops round about. Pop. (1880) 20,550; (1900) 53,231; (1920) 161,379.

Sanbenito. See AUTO DA FÉ.

San Carlos, a well-built inland town in the west of Venezuela, 125 miles SW. of Carácas. The town, founded in 1678, lies in a fertile plain, given up to agriculture and the rearing of cattle. Pop. 10,000.

San Cataldo, a town of Sicily, 10 miles W. of Caltanissetta. Pop. (1921) 21,540.

Sanchez, THOMAS, a Jesuit moralist and casuist, was born at Córdoba in 1550, and became director of the school at Granada, where he died 19th May 1610. His best-known work, in virtue of which he ranks as an *Auctor Classicus*, is the treatise *De Sacramento Matrimonii* (3 vols. Genoa, 1592). In this notorious work, parts of which Pascal and Voltaire treated with scathing sarcasm, the legal, moral, and religious questions that arise out of the sacrament of marriage, and the relations, regular and irregular, of the sexes, are treated in portentous detail. Yet the author was throughout his life esteemed a devout, pure-minded, and holy man.

Sanchi. See TOPE.

Sanchuniathon (SANCHONIATHON, SOUNIATHON), the supposed author of a Phœnician history of Phœnicia and Egypt, called *Phoinikika*. The name is a Greek form of a Phœnician compound and means 'Sakkun giveth' (*Sakkun yathon*). Somewhat similar theophorous names occur on inscriptions, and there is no possible reason for suspecting the genuineness of *Sanchuniathon*. Thus there are *Abd Sakkun* or Servant of *Sakkun* (M. Lidzbarski, *Handbuch d. nordsem. Epigr.*, 1898, I. 329), *Ger Sakkun*, i.e. Neighbour or Client of *Sakkun* (G. A. Cooke, *Text-book of N. Sem. Inscr.*, Oxf. 1903, p. 130), and *Askun Adar* or *Sakkun* is glorious (*ib.* p. 100). The name *Sakkun* alone originally denoted 'Governor' or 'Lord,' and it occurs twice in that sense on a Cypriote-Phœnician inscription of the 8th century B.C. (*ib.* p. 52) which refers to the *Sakkun* of *Qarth-hadasht* or governor of 'new town,' i.e. Carthage, in Cyprus. Thus *Sakkun* is akin in usage to Ba'al and means 'one who cares for' (cf. Assyrian *Sakānu*, Tell el Amarna, 179, 38), or 'friend,' just as the Hebrew root, which signifies 'to profit, be of use' (Numbers, xxii. 20, 30; Job, xxii. 21; Psalms, cxxxix. 3), designates a governor or official in Isaiah, xxii. 15. By a process of syncretism the god *Sakkun* became equated with *Hermes*.

Sanchuniathon is supposed to have been a native of Berytus; and the accounts which speak of him as born at Sidon or Tyre probably take these cities in their wider sense for Phœnicia itself. Our principal information about him is derived from Philo of Byblus, a Greek writer of the beginning of the 2d century A.D., who translated Sanchuniathon's history into his own tongue; but both the original and the translation are lost, save a few small portions of the latter, preserved by Eusebius, who uses them as arguments in a theological dispute against Porphyry. According to Philo, Sanchuniathon lived during the reign of Semiramis, queen of Assyria, and dedicated his book to Abibalus, king of Berytus. Athenæus, Porphyry, and Suidas speak of him as an ancient Phœnician, who lived 'before the Trojan war.' There is also a discrepancy between the various ancient writers respecting the number of books contained in the *Phoinikika*. Orelli (1826), and after him C. Müller (1849), published the remaining fragments of Sanchuniathon, and the discussion raised on their genuineness and value can hardly be said to be yet at rest. Several critics went so far as to deny the fact of the existence of a Sanchuniathon point blank. According to some (Lobeck, *Aglaophamus*, &c.) it was Eusebius, according to others (Movers, Baudissin, &c.) Philo, who fathered his own speculations upon an ancient authority. The latter was actuated, Movers thinks, partly by the desire of proving that the whole Hellenistic worship and religion was simply a faint imitation of the Phœnician; partly by the desire of lowering the value of the Old Testament, by showing the higher authority of the Phœnician writer; and partly, as was the fashion among the unbelieving philosophers of his age, to bring the popular creed into a bad reputation, by proclaiming his own views under the guise of an ancient sage. Yet even those who deny the authenticity of Sanchuniathon agree in allowing the fragments current under his name a certain intrinsic value, they being founded on real ancient myths. This, in fact, is now, with more or less modification on the part of the different investigators, Ewald, Bunsen, Renan, &c., the prevalent opinion. Ewald contends for the real existence of a Sanchuniathon, in which he is supported by Renan. But Ewald holds that Sanchuniathon is a translation of an early Phœnician text, while Renan would assign this to the Seleucid

era. Gruppe mainly supports Ewald. Lagrange goes furthest of all in denying the originality of a Phœnician source. In his view there may well have been an early epic dealing with Phœnician gods and cosmology, but probably this was not in the Phœnician language. Even if there never was a Sanchuniathon it was not Philo who forged him. There seems no doubt that we have but a very dim and confused reproduction of what, after many modifications, misunderstandings, and corruptions, finally passed the hands of Philo and Eusebius, and was by the Church Father, as has been said, quoted in a theological disputation. Yet, even assuming the person of a Sanchuniathon, his age—and Eusebius insists upon a very remote one indeed—must be placed much lower: into the last centuries before Christ, at the earliest. He would then, it seems, have endeavoured to stem the tide of Greek superiority in all things, by collecting, grouping, and remodelling the ancient and important traditions of his own country, and thus proving both to his countrymen and the Greeks their high importance, in comparison with the Greek productions, in the field of religion and philosophy.

The *Phoinikika* deals with the cosmogony of the Phœnicians, beginning from a dark ἀήρ, or πρῶη ἀέρος, and Chaos, without measure or limit: hence came μῶς, spongy-watery matter, and, finally, ἔφα. From this developed culture, divine and human. We get the stories of Uranus and Chronos and a description of Phœnician antiquities. Therefore the work of Sanchuniathon was not only a cosmogony, it would appear, but a history of his own and the surrounding nations; and, like similar ancient histories, it probably began with the creation of the world, and contained an account of the Jews. All the historical parts, however, are lost, and nothing remains but a fragmentary cosmogony, or rather two or three different systems of cosmogony, or, according to Movers, merely an Egyptian and Phœnician patchwork. One of the chief difficulties for us consists in the Phœnician words of Sanchuniathon, which Philo either translated too freely or merely transcribed so faultily in Greek characters as to leave them a puzzle. Gruppe and Grimme uphold the theory of a translation from a Phœnician source. As evidence Grimme adduces the form in which certain proper names figure. This form must clearly imply a transcription in Greek characters of foreign words. Such examples are the mountains *Kassios*, *Libanos*, and *Brathy*, which would stand for cassia (*Qeci'ah*, Job, xlii. 14; Psalms, xlv. 9), *Lebhonah*, frankincense (Ex. xxx. 24, &c.), and *Beroth* (Heb. *Berosh*, Hosea, xiv. 9, &c.; Gr. βράθυ, Lat. *bratum*), cypress, these being articles of cult. Grimme's proposal to derive *Brathy* from Heb. *Borith* is unlikely, since *Borith* is lye or alkali and not aloes-salt, as Grimme suggests. Other equations are:

βααν = νύξ = Heb. *Bohu* (Gen. i. 2; Is. xli. 11).

Σαμημουμος = lofty heavens, *Shamayim ramim* or *romim*.

Συδουκ = δίκαιος = *Qaddiq*.

Ζεὺς Μείλιχος = *Mallah* or sailor.

Eusebius further contains a fragment of a treatise by Sanchuniathon, *Peri Ioudaion*, but it is doubtful whether this is the work of Philo of Byblus or of Sanchuniathon; and if it be that of the latter, whether it is a separate work, or merely a separate chapter out of his larger work. A forgery, said to contain the whole nine books of Sanchuniathon, and to have been found by a Portuguese, Colonel Pereira, at the convent of St Maria de Merinhão, and to have been by him entrusted to a German corporal in Portuguese service, named Christoph Meyer, was published by Wagenfield (Bremen, 1837), and translated into German (Lübeck, 1837),

but was very soon consigned to disgrace and oblivion by Movers, K. O. Müller, and Grotefend, the last of whom at first believed and even wrote a preface to the *editio princeps*. There never was such a convent, nor such a colonel; but the facsimile taken by 'Pereira' in the convent in Portugal was found to have been written on paper showing the water-marks of an Osnabrück paper-mill.

See Ewald, *Abhandlungen d. Göttinger Gesellschaft der Wissenschaften* (vol. v. 1851); Renan, *Mémoire sur Sanchoniathon* (1858); and Baudissin, *Studien zur Semitischen Religionsgeschichte* (vol. i. 1876); also chap. 6, vol. i. (1877) of Abbott's trans. of Duncker's *History of Antiquity*; F. C. Movers, *Die Phönizier* (Berlin, 1849); P. M. J. Lagrange, *Études sur les Religions Sémitiques* (1905, II. 396-437); Grimme in Pauly's *Real Encyclopædie* (Stuttgart, 1920, cols. 2232 foll.).

San Cristóbal (1) a town of Chiapas state in Mexico, has a handsome capitol, a cathedral, a secondary school, and 12,000 inhabitants.—(2) A town of Venezuela founded in 1560 on a plateau near the Colombian frontier with an important trade (especially in coffee), mainly in the hands of Germans and Danes; deposits of coal beside the town, and near by copper-mines and petroleum wells. Pop. 17,000.

Sancroft, WILLIAM, Archbishop of Canterbury, was born at Fressingfield in Suffolk on 30th January 1616-17, and from Bury St Edmunds grammar-school passed in 1634 to Emmanuel College, Cambridge, of which in 1642 he was elected a Fellow. In 1651 he was expelled from his fellowship for refusing to take the 'Engagement'; and in 1657 he crossed over to Holland, whence, after a year and a half at Utrecht, he visited Geneva, Venice, and Rome. In 1660, the Restoration accomplished, his friend Bishop Cosin of Durham appointed him his chaplain, and his subsequent advancement was rapid, to be a king's chaplain and rector of Houghton-le-Spring (1661); prebendary of Durham and master of Emmanuel (1662); Dean first of York and next of St Paul's (1664), as such having a principal hand in the rebuilding of the burnt cathedral; Archdeacon of Canterbury (1668); and Archbishop (1678). A Tory and High Churchman, he is of course belittled by Burnet and Macaulay; but the manner in which he discharged his high duties deserves the warmest commendation—the one flaw, perhaps, in his conduct that he employed an Italian spy in Holland who dared propose to him the assassination of Sir William Waller. Sancroft attended Charles II. on his deathbed, and used great freedom of speech to him on the nature of his past life. He refused to sit in James II.'s Ecclesiastical Commission (1686); and in 1688 was sent to the Tower for presenting the petition of the Seven Bishops (q.v.) against the reading of the second Declaration of Indulgence, but on their trial in Westminster Hall he and his six brethren were acquitted. In the events that immediately preceded and attended the Revolution he preserved on the whole a position of non-intervention; still, having taken the oath of allegiance to James, he would not take it to William and Mary. Accordingly, he was suspended by act of parliament (1st August 1689), though he did not quit Lambeth until his ejection on 23d June 1691. He then retired to his native village, where he died on 24th November 1693. Of eight works ascribed to him one only retains much interest. *Fur Prædestinatus* (1651), a dialogue between a Calvinist minister and a thief condemned to the gallows; and this seems to be really a translation from a Dutch pamphlet.

See NONJURORS, with works there cited; Dr D'Oyly's *Life of Archbishop Sancroft* (1821); and the *Political History of England*, vol. viii., by Sir R. Lodge (1910).

Sanctis, FRANCESCO DE. See DE SANCTIS.

Sanctuary, a consecrated place which gives protection to a criminal taking refuge there; or the privilege of taking refuge in such a consecrated place. Among the Jews there were cities of refuge to which the slayer might flee who killed a man unawares (see CITY), and something analogous to a right of sanctuary may also be traced in pagan communities. In the ancient Greek states certain temples afforded protection to criminals, whom it was unlawful to drag from them, although the supply of food might be intercepted. As early as the 7th century the protection of sanctuary was afforded to persons fleeing to a church or certain boundaries surrounding it. The canon law recognises this protection to criminals as continuing for a limited period, sufficient to admit of a composition for the offence; or, at all events, to give time for the first heat of resentment to pass before the injured party could seek redress. In several English churches there was a stone seat beside the altar where those fleeing to the peace of the church were held to be guarded by its sanctity. One of these *frith-stools* ('peace-stools') still remains at Beverley and another at Hexham; while the sanctuary knocker is still visible at Durham. The privilege of sanctuary did not extend to ordained clerks or to persons accused of committing felonies in churches. Connected in England with the privilege of sanctuary was the practice of *abjuration of the realm*. By the ancient common law, if a person guilty of felony took the benefit of sanctuary, he might afterwards go before the coroner, confess his guilt, and take an oath to quit the realm and not return without the king's license. On taking this oath he was allowed to proceed in safety to a port assigned to him. He must reach this port and embark from it within a certain number of days. In the reign of Henry VIII. the privilege of sanctuary was regulated and restricted by legislation. Finally, in 1623-24, the privilege of sanctuary and abjuration, as a legal institution, was abolished by the statute 21 James I. chap. 28.

From an early period the privilege of sanctuary was made use of by debtors in England for the purpose of evading payment of their debts; and after sanctuary had been abolished as a legal institution there continued to exist certain so-called sanctuaries which gave practical immunity to fraudulent debtors, and even to criminals. An act of 1696-1697 (8 and 9 Will. III. chap. 37) compelled sheriffs to arrest debtors though they had fled to certain 'pretended privileged places' enumerated in the act, including the districts of Whitefriars and the Savoy, which had for centuries claimed the privilege of sheltering debtors against their creditors. A similar privilege claimed for the Mint in Southwark was successfully maintained until 1723 when an act (9 Geo. I. chap. 28) was passed, making it a felony to obstruct the execution of a writ within the Mint and enabling the sheriff of Surrey to raise a *posse comitatus* for taking by force debtors from the Mint. That statute put an end to the quasi-sanctuaries which, in defiance of the law, had continued in existence after the act 21 James I. chap. 28.

In Scotland the privilege of sanctuary conferred by the canon law on churches and religious houses was finally abolished at the Reformation. But the privilege continued in the case of the Abbey of Holyrood House, not as a religious establishment, but as a royal residence. The precincts of the palace, to which the privilege belongs, are extensive, including Arthur's Seat and the King's Park; and the whole are placed under the protection of a bailie appointed by the Duke of Hamilton, the heritable keeper of Holyrood House. This time-

honoured sanctuary afforded protection against imprisonment for debt only; to a criminal it gave no protection. For twenty-four hours after passing the confines the debtor was protected against personal diligence; but in order to enjoy protection for a longer period he must enter his name in the books kept by the bailie of the abbey. On his name being entered in these books a certificate of protection was given him. Neither crown debtors nor fraudulent bankrupts nor persons under an obligation to perform an act within their power could claim protection; while within the precincts there was a prison for debtors against whom diligence had been brought for debts contracted within the sanctuary. To retire to the abbey was by the act of 1696, chap. 5, made one of the circumstances which, combined with insolvency, constituted legal bankruptcy. The Debtor's Act, 1880, which abolished imprisonment for debt, except as a mode of execution for taxes, fines, crown penalties, assessments, and sums decreed for aliment, rendered the privilege of sanctuary practically obsolete.

See Stephen, *History of Criminal Law of England*, vol. i.; Holdsworth, *History of English Law*, vols. iii. and vi.

Sanctus. See LITURGY, BELL.

Sand, one of the products of the disintegration of rocks, is composed mainly of grains of quartz—some sands being more purely quartzose than others. Speaking broadly, we may say that all rocks undergoing disintegration are eventually resolved into two kinds of sediment—viz. sand and clay or silt—the former representing the practically insoluble quartz of the original rock, the latter the insoluble constituents of the other minerals. Sand is formed in various ways. It is, as every one knows, one of the most common sediments of rivers, lakes, and seas. Sea-sand exactly resembles river-sand—one cannot be distinguished from the other except by means of included organic remains. As a rule the grains of aqueous sands are angular and subangular in form, especially in the case of fine-grained deposits. When the grains are large they may be more or less well rounded. These last have been rolled over each other and pushed forward in the bed of stream or sea, while the smaller particles, carried in suspension, have in some measure escaped trituration. Aqueous sands are very widely distributed. They are commonly met with forming terraces along the courses of streams and rivers—not infrequently they occupy the sites of ancient lakes and estuaries—and now and again they form what are known as raised beaches in maritime districts. Most of these sands are of recent geological age; others, however, such as the sands of the Tertiary basins of England, France, Belgium, Austria, &c., represent the sea-floors of much more remote times. Sands of wind-blown origin occur frequently in maritime regions and in dry desiccated desert countries. In coastlands the material of the dunes is obviously washed up by the sea; while in certain inland tracts, as in Poland, the sand which is there blown about by the wind is derived from wide-spread fluvio-glacial deposits—relics of the ice age. But in other countries, as in the Libyan Desert, the sand has resulted from the subaerial degradation of granites, schists, sandstones, and other rocks. As the rock-ingredients are swept forward over the ground they are subjected to much attrition, so that eventually even the smallest grains become well rounded, and when seen under a magnifying glass resemble little pebbles. Sand-deposits are also the result of volcanic action. These consist of the very finely comminuted debris of volcanic rocks, and are readily distinguished from sedimentary and æolian sands.

Now and again, however, volcanic sands are sifted by the winds and heaped up into dunes.

Sand varies in texture from extremely fine-grained, almost dust-like material, up to coarse granular grit. Indeed all gradations occur from sand through coarse grit into fine gravel. Pure white sands are not uncommon, but shades of yellow, brown, and red predominate, especially in the case of æolian and aqueous sands. The colour is generally due to the presence of iron. Gray, dark-brown, green, and black sands are also met with. The latter are often largely composed of magnetite, and have been derived from the disintegration of certain igneous rocks such as basalt. Green sands usually owe their colour to glauconite. Volcanic sands are generally dingy—chiefly dull gray or black. Some sands are rich in gold, others in precious stones and gems. These are alluvial deposits which have been derived from the disintegration of crystalline igneous rocks, schists, &c. Pure white sands are in demand for the manufacture of glass, while others are employed as abrasives in sawing marble, &c., and in smoothing the surfaces of that and other ornamental stones. Sharp sand, again, is largely used for mixing with mortar. See DRIFT, GRAVEL, PLIOCENE SYSTEM, QUICKSAND, SAHARA, SANDSTONE.

MUSICAL SAND.—Some kinds of sand, which consist of well-rounded and polished grains of tolerably uniform size, and which are clear or free from dust and small particles, exhibit remarkable sonorous qualities when struck or subjected to friction. The well-known 'musical sand' of the island of Eigg (Inner Hebrides) is a good example, and was at one time believed to be almost unique; but, as Professor Bolton of Hartford, Connecticut, and Dr A. Julien of New York have shown, sonorous sands are widely distributed in Europe and America. The sounds emitted are often decidedly musical, and distinct notes can be produced, high or low, according to the nature of the friction and the quantity of sand operated upon. When one walks over a bed of strongly sonorous sand a tingling sensation is perceived even through the boots. After being subjected to friction for some little time musical sand gradually loses its peculiar qualities, and the same result is produced when the sand is wetted. There is nothing in the appearance of musical sand to distinguish it from mute sand—sonorous and non-sonorous sand of precisely similar aspect lying side by side on the same beach. Carus-Wilson holds that the sounds are 'due to the rubbing together of millions of clean and incoherent grains of quartz, with no angularities, roughness, or adherent matter investing the grains.'

SANDBANKS in rivers, usually lengthwise with the current, are liable to constant changes as the force and direction of the current become modified. Opposite the mouths of rivers sandbanks tend to accumulate. Much of the material of which these bars are composed is brought down by the rivers, but a large proportion is also swept up by the sea itself. Such banks are constantly changing their form, and oscillating to and fro, according as the sea or the river is the more active. The sea also tends to form sandbanks across the mouths of shallow inlets and other indentations of a coast-line, so that eventually a secondary coast-line may come to be formed in this way—shallow lagoons separating the new from the old coast-line. Islands are in like manner converted into peninsulas by the heaping up of sandbanks by tidal currents between them and the mainland. The Eye peninsula in the Island of Lewis is an example, and there are many islets off British coasts which in time will be converted into similar peninsulas by the growth of sandbanks, which in some cases has proceeded so far that the islets become peninsulas

at low tide. In the shallow seas that surround the British Islands sandbanks are of common occurrence. Some of these are doubtless due to tidal action, as is the case with the sandbanks of similar shallow seas all the world over. Others again probably mark the sites of undulating land-surfaces submerged during a recent geological period. It is thought by some that the Dogger Banks of the North Sea may consist largely of the morainic debris laid down by the great Scandinavian ice-sheet of the glacial period, now more or less modified by current-action.

SAND, GEORGE, the *nom de guerre* of Armandine (or Amantine) Lucile Aurore Dupin, 'Baronne' Dudevant, was born in Paris on the 5th July 1804, and died at Nohant in Berri on the 7th June 1876. Her father Maurice Dupin was the son of M. Dupin de Francueil (well known in the writings of Rousseau and his circle) by a natural daughter of the Marshal de Saxe and of Mdle. Verrière, also well known in the 18th century. Aurore's own mother was a Parisian milliner. Her father died when she was very young, and she was the subject of continual disputes between her mother and her grandmother, Madame Dupin (by her first marriage Comtesse de Horn). Aurore lived with both in turn, but principally at Nohant with her grandmother, on whose death the property descended to her. She was educated partly at home, partly at the English convent in Paris, and represents herself in her voluminous *Histoire de ma Vie* (which contains little fact and much fancy) as a child full of reverie of all kinds. An heiress as has been said, though in no great way, and with no near relations except her mother, she was married at the age of eighteen to a certain M. Dudevant, the natural son of a colonel and baron of the empire, who also had some small fortune. The marriage was quite of the ordinary French kind, with no love, but also no particular dislike, between the parties. Two children were born of it—a boy, Maurice (1825–89), who afterwards took his mother's assumed surname and became a man of letters of some little accomplishment, and a girl, Solange, who married the sculptor Clésinger. Very little is known of M. Dudevant, who seems, however, to have been by no means especially tyrannical or offensive, but merely an ordinary squireen, devoted to sport, not actively sympathising with, but also not violently opposing his wife's bookish tastes, and probably, as her letters show, a good deal tried by the increasing number of her doubtless Platonic friendships. After nine years of married life, towards the end of which the situation became very much strained, she 'threw her cap over the mills,' and at first resigning her property to her husband as the price of an amicable separation, went to Paris to make her living by literature, to associate (often in men's clothes) with the Bohemian society of the time (1831), and in short to 'see life' generally in a very full sense. Nevertheless after some years the local tribunals found sufficient cause in her husband's behaviour to turn the amicable into a legal separation, and to give her the complete enjoyment of her own property. For the best part of twenty years her life (apart from its literary features, to which we shall come presently) was spent in the company and partly under the influence of divers more or less distinguished men, with some of whom she certainly, and with others probably, was on the terms which might be expected in such circumstances. But George Sand's was a very peculiar temperament, and it is not safe to take too much for granted in respect to her. During the first few years her interests were chiefly directed towards poets and artists, the most famous being Alfred de Musset

and Chopin, with the former of whom she took a journey to Italy notable in the lives of both; while the second was more or less her companion for several years, including a dismal winter which they spent together at Majorca, and which she has recorded in a noteworthy book. In the second decade her attention shifted to the wilder sort of philosophers and politicians, such as Lamennais, Pierre Leroux, and Michel (de Bourges). But the advance of years and the revolution of 1848 with its consequences put an unexpected end to her rather protracted *Sturm-und-Drang* period. By a revolution not by any means universal among men and almost unexampled among women, she settled down as the quiet 'châtelaine of Nohant,' and spent her life for more than a quarter of a century thus, occupying it with wonderful literary activity, varied only by foreign travel now and then, and by occasional visits to Paris. She was exceedingly hospitable: almost all French and many foreign men of letters of eminence visited at Nohant, which was an unostentatious but pleasant Liberty Hall, the especial diversion being a marionette theatre. No private event of any importance disturbed this long and quiet period, which only closed by her death with the words '*Laissez la verdure*' on or almost on her lips.

We must now pass from this curious existence—a youth of dream, a womanhood of racket and license, an old age of laborious calm—to her work. In this some have marked three, others four periods, the last two of which do not seem to be separated by any very real gap. The threefold division corresponds almost exactly to her life experiences as above sketched. When she first went to Paris, and with her companion Jules Sandeau, from the first half of whose name her pseudonym was taken, settled, partly under the guidance of Henri de Latouche, to novel-writing, her books partook of the Romantic extravagance of the time, specially informed and directed by a polemic against marriage and by the invention and glorification of the *femme incomprise*. *Indiana*, *Valentine*, *Lélia* (the most remarkable of all), and *Jacques* are the chief works of this period. In the next her philosophical, political, and (if they can be so called) religious teachers got the upper hand, and in a fashion fathered the rhapsodies of *Spiridion*, *Consuelo* (one of her best books, however), and the *Comtesse de Rudolstadt*. Between the two groups should be placed in time the fine novel of *Mauprat*. Towards the middle of the century appeared the extraordinary study called *Lucrezia Floriani*, the chief characters of which are undoubtedly in part drawn from herself and Chopin; while she also now began to turn towards the studies of rustic life, of which *La Petite Fadette*, *François le Champi*, and *La Mare au Diable* are the chief, and which some of her admirers regard as her greatest works. Some critics (the chief of whom is M. Caro) would make these rustic novels a third division by themselves, and construct a fourth for the miscellaneous and less spontaneous works of the last twenty years of her life. Some of those last, such as *Les Beaux Messieurs de Bois Doré*, *Le Marquis de Villemer*, *Mlle. la Quintinie* (a duel with Feuillet), and others, are of high merit. Not a tithe of her enormous list of novels can be mentioned here, while there has to be added to it a considerable *Théâtre*, the bulky *Histoire de ma Vie* already referred to, some nondescript work, such as the *Hiver à Majorque* referred to above, and *Elle et Lui* (a sort of vindication of her relations with Musset (q.v.), written after his death), and a delightful and extensive collection of letters published posthumously. One division of this last—those to Flaubert—is of the very first literary and personal

interest, and the whole exhibits the personal and literary character of the writer in such a light as to have conciliated to her the affection of some who had previously been rather recalcitrant.

The popularity of George Sand, like that of most very voluminous authors, has sunk considerably since her death. Nor have critical estimates invariably agreed about her. The one thing which both friends and foes accord her is the possession of a most remarkable style, somewhat too fluent and facile, but never slipshod or commonplace, if never exquisite or distinguished. To this gift may be added the still more important one of a faculty of imagination which always idealised the subject and treatment to the point necessary to fix the work as literature. A third, though a more disputable gift, was a singular faculty of receptivity which enabled her to catch and render not merely the aspects of scenery and the outline of personages, but the fleeting ideas of the day on all manner of subjects. She had no great or deep originality; despite her fertility, she scarcely ever (the sole great exception is the wonderful study of insatiable jealousy and outwearied love in *Lucrezia Floriani*) achieved the analysis which results in synthesis and fixes a character for ever. She wrote with something like the business-like regularity of Anthony Trollope in England; and her work cost her so little that in a very few years she as regularly forgot all about it, and read her own novels as if they were those of others. It is scarcely paradoxical to doubt whether—though her books are unceasingly occupied with love, and a good portion of her life was at least not closed to it—she ever felt in her own person a passionate affection. In conversation, it is said, she was awkward and dull, and there is hardly any wit or humour even in her books. They are also notoriously destitute of plot or composition. It seems to have been her portion to produce or reproduce with a certain passivity, but in never-failing yield, novels as the earth produces crops. All this sounds like unfavourable criticism, and so to a certain extent it is and must be. It is a commonplace of criticism on her to say that George Sand's novels are seldom read a second time. Story they have as a rule not much to tell, and their characters, though never exactly unreal, are too slightly provided with life to exercise an absorbing fascination. Yet after all exceptions are made, and after allowing the utmost that criticism can demand, it is difficult to speak with anything but admiration of this enormous work, the very bulk of which perhaps does it harm, because the same defects recurring almost throughout become more obvious than they would be in a smaller total. The charm—not strange or deep, but constant—of the style, the vast variety and volume of the creations, the constant faithfulness to the one law of art, 'idealise, always idealise,' stand in lieu of many ornaments which are not there. If George Sand had written nothing but *Lucrezia Floriani* and the Letters to Flaubert men would have gone about saying what a marvellous novelist, what an acute critic of life and letters had given but glimpses of herself. As it is we have a whole Sandian panorama, and we find fault with it.

The *Œuvres Complètes* amount to about a hundred and twenty volumes in their compactest form. Critical and biographical writings on her (these latter rather meagre, but supplemented by the Letters) are numerous. That in the *Grands Écrivains* series by Caro (Paris, 1888) was translated by Masson. See also books by Bertha Thomas (1889), Revon (1896), Rocheblave (1905), Gribble (1907), Sêché and Bertaut (1909), René Doumic (trans. 1910), Karénine (1899–1912), and Maurras, *Les Amants de Venise* (new ed. 1917); her own *Correspondance* (6 vols. Paris, 1882–84); correspondence with Alfred de Musset (1897 and 1904).

Sand, KARL LUDWIG, the Jena theological student and member of the Burschenschaft (q.v.), who assassinated Kotzebue (q.v.) as a traitor to his country. Born in 1795, he was executed by the sword, 20th May 1820.

Sandakan, a port and capital of the territory of the British North Borneo Company. Founded about 1880, it has now a pop. of some 12,000, one-half being Chinese, with a few Europeans, and the rest Sulus, Malays, and Javanese.

Sandal Magna is now part of Wakefield.

Sandals. See **BOOTS**.

Sandalwood (a name corrupted from *Santal* wood), the wood of several species of the genera *Santalum* and *Fusanus*, of the family *Santalaceæ* (q.v.), natives of the East Indies, islands of the Pacific Ocean, and Australia. They are trees or shrubs parasitic upon roots. Sandalwood is compact and fine grained, very suitable for making work-boxes, desks, and small ornamental articles, and is remarkable for its fragrance, which is fatal to insects; so that cabinets of sandalwood are extremely suitable for the preservation of specimens in natural history, though much too expensive for general use. White Sandalwood, the most common kind, is the produce of a small tree (*Santalum album*), a native of mountains in the south of India and the Indian Archipelago, much branched, resembling myrtle in its foliage and privet in its flowers. The girth of a mature tree varies from 18 to 36 inches.

Other species of sandalwood are now brought into commerce, among which may be named *S. Freycinetianum*, which has a peculiarly rich perfume, from the mountains of Hawaii, *S. Yasi* of Fiji, *S. austro-caledonicum* from New Caledonia, *Fusanus acuminatus* from South Australia, and *F. spicatus* of Western Australia. The precious oil is obtained by slow distillation from the heartwood and root. The bark and sapwood have no smell, but the heartwood and roots are highly scented, the billet nearest the root being most esteemed. The average yield is about $2\frac{1}{2}$ per cent. or more of oil. As imported from India it is very dense, of a pale straw colour and of a mild but lasting odour. The best is that prepared in Europe, principally in France and England. From its high price sandalwood-oil is especially liable to adulteration.

The oil forms the basis of many perfumes, and is sometimes used for disguising with its scent articles which, really carved from common wood, are passed off for true sandal; and Hindus can afford to show their wealth and respect for their departed relatives by adding sticks of sandalwood to the funeral pile. The wood, either in powder or rubbed up into a paste, is used by all Brahmins in the pigments for their distinguishing caste-marks. In China the wood is used for carving, for incense, and for perfume.

Red Sanderswood, sometimes called Sandalwood, redwood, or caliatree wood, is the produce of *Pterocarpus santalinus*, of the family *Leguminosæ*, sub-family *Papilionaceæ*, a native of the tropical parts of Asia, particularly of the mountains of the south of India. The tree is about 40 feet high, with pinnate leaves, having generally three leaflets, and axillary racemes of flowers. The heartwood is dark red, with black veins, and so heavy as to sink in water. It is used as a dye-stuff, imparting a pale pink colour to Joth, and also by apothecaries to colour certain preparations. In India it is chiefly employed to mark idols and the forehead in ceremonies. The Arabs use it as an astringent, and it is the basis of some of our tooth-powders.

Sandalwood Island, called also Tjindana and Sumba, one of the Sunda group belonging to the Dutch East Indies, has an area of 4385 sq. m. The produce consists chiefly in sandalwood and cotton, horses and poultry.

Sandarac, or SANDARACH RESIN, is a friable, dry, almost transparent, tasteless, yellowish-white resin, completely soluble in oil of turpentine, but not completely soluble in alcohol. When heated, or sprinkled on burning coals, it emits an agreeable balsamic smell. It exudes from the bark of the Sandarac tree (*Callitris quadrivalvis*), a north African conifer. The quantity of sandarac used is not great; it is employed in making varnish, and generally speaking for the same purposes as Mastic (q.v.). The Australian species also exude sandarac. The finely-powdered resin is rubbed, as *Pounce*, on the erasures of writing-paper, after which they may be written upon again without the ink spreading. The mottled butt-wood of the sandarac tree is highly balsamic and odoriferous, extremely durable and valuable for cabinet-makers. It fetched fabulous prices in Pliny's time. A current error is that the gum of the Juniper is identical with sandarac.

Sanday. See ORKNEY ISLANDS.

Sandbach, a market-town of Cheshire, near the right bank of the Wheelock, 5 miles NE. of Crewe. It has a good parish church, public rooms (1859), a grammar-school (1594), and manufactures of boots and shoes, fustian, iron, &c. Population 5800.

Sandbags, in military works, are canvas bags (sometimes tarred), partially filled with sand or earth, and forming a ready means of giving cover against the enemy's fire, or tamping the charge in a mine. See MINES (MILITARY). They are also very useful in forming revetments to parapets, loopholes for rifle pits, and lining for embrasures. Sandbags adapt themselves to all shapes of loopholes better than anything else.

Sand-blast, a method of engraving figures on glass or metal. See GLASS.

Sandburg, CARL, American poet, was born of Swedish stock at Galesburg, Ill., in 1878, and at the age of thirteen began an astonishingly varied career as scene-shifter, harvest hand, army volunteer in the war with Spain, salesman, and much else besides. He entered Lombard College, Galesburg, and later drifted into journalism. His poems—*Chicago Poems* (1916), *Cornhuskers* (1918), *Smoke and Steel* (1920)—reflect the whirling machinery and terrific vigour of industrial America. His style, dispensing with rhyme and at times employing slang, is angular and arresting, but there are moments of quiet beauty and romantic mysticism. The first volumes of a colossal life of Abraham Lincoln appeared in 1926.

Sandby, PAUL, 'the father of the water-colour school,' was born in 1725 at Nottingham, where he and his brother Thomas, afterwards an architect and R.A., kept a school for some years. In 1741 Paul obtained a post in the military drawing department at the Tower of London; and in 1746-52 he was draftsman of the survey of the Scottish Highlands, which was one result of the rebellion of 1745. Settling at Windsor, he made some seventy-six drawings of Windsor and Eton; and he subsequently made a series of drawings of castles in Wales. He was a member of the St Martin's Lane Academy, of the Incorporated Society of British Artists, and an original member of the Royal Academy, to whose exhibitions he regularly contributed water-colour landscapes. Appointed drawing-master to the Woolwich Military School, he became famous as a fashionable teacher of paint-

ing. His drawings of Scottish scenery were published as etchings by himself, his Welsh views in aquatint; and he was known also as a caricaturist. His water-colours are outlined with the pen, and only finished with colour; his perspective is good, and his architectural drawings admirable. But his landscapes are 'tinted imitations of nature.' He died 9th November 1809. Thomas, born 1721, died 1798. See W. Sandby, *Thomas and Paul Sandby* (1892).

Sand-crack. See HOOFS, CRACKED HEELS.

Sandean, LÉONARD SYLVAIN JULES, French novelist and playwright, was born at Aubusson in Creuse, February 19, 1811, and went at an early age to Paris to study law, but soon gave himself entirely to letters. His short-lived intimacy with George Sand produced one joint-novel, *Rose et Blanche* (1831), and suggested to the more famous of the pair her literary name. Sandean's first independent novel was *Madame de Sommerville* (1834), his first hit *Mariana* (1839). These were followed by a long series of novels, many of which first appeared in the *Revue de Deux Mondes*; the best *La Maison de Penarvan*, *Mademoiselle de Kérouare*, *Mademoiselle de la Seiglière*, *Le Docteur Herbeau*, *Catherine*, *Madeleine*, *Jean de Thommeray*, and among shorter stories, perfect in their kind, *Le Château de Montabrey*, *Le Jour sans Lendemain*, and *Un Début dans la Magistrature*. As a dramatist Sandean collaborated much with Émile Augier, his most celebrated plays being *Le Gendre de M. Poirier*, *La Pierre de Touche*, and *La Ceinture dorée*. Sandean became keeper of the Mazarin Library in 1853, was elected to the Academy in 1858, and appointed librarian at St Cloud in 1859. He died at Paris, 21st April 1883. As a novelist he never attained the popularity of some of his contemporaries, most probably because he steadily refused to make illicit love the staple of his plots. A pleasing style of reflection and an honest interest in the past are characteristic notes; his range of subjects is small and mostly confined to provincial life, but the work is fine, the characters distinct. See Saintsbury's *Essays on French Novelists* (1891).

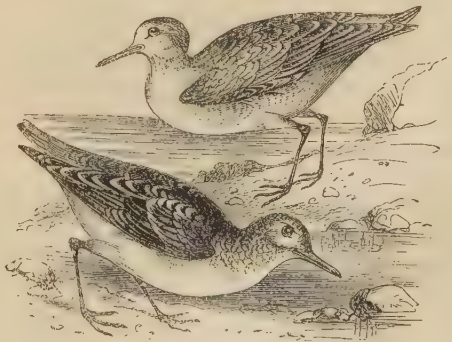
Sandec, NEU (Polish *Nowy Sącz*), a town of Galicia, on the Dunajec, 45 miles SE. of Cracow. It was the scene of a great fire in 1890. Pop. 26,000, half of them Jews.

Sand-eel. See EEL.

Sandefjord, a watering-place of Norway, 86 miles by rail SSW. of Oslo.

Sandemanians. See GLASSITES.

Sanderling (*Calidris*), a genus of birds of the Snipe family, Scolopacidae, sub-family Tringinae,



Sanderling, Male and Female (*Calidris arenaria*).

characterised by the absence of a hind-toe. There is only one species, the Common Sanderling (*C. arenaria*), which is widely distributed, breeding in

the Arctic regions, and ranging from Iceland and east Greenland in the north to the Cape and Natal and to Chile and Patagonia in the south, and from north Alaska in the west to Ceylon, Borneo, Java, China, Japan, and the Hawaiian Islands in the east. It visits the British Isles in winter, coming about the middle of August, and beginning to depart in April, but found even till June. It is common on the coast, and is occasionally found near inland lakes. It is about 8 inches long, and it is very fat. The winter plumage is ash gray; the under parts are all white. The summer dress has the feathers of the upper surface of a reddish tinge with black markings. The sanderling in its breeding-places feeds on the buds of saxifrages and on insects, but in Britain its food is chiefly marine worms, small crustaceans, and bivalve molluscs. Its note is a shrill *wick*. It is often found in company with small plovers, and occasionally with dunlins.

Sanders, DANIEL (1819-97), German lexicographer, was born at Alt-Strelitz in Mecklenburg. Educated at Berlin and Halle, he was head of the school in his native town from 1843 to 1852, and thenceforth devoted his energies to the making of dictionaries of the German language, books that enjoy a high reputation amongst his own countrymen. The most important and most popular are a *Wörterbuch* (3 vols. 1859-63), *Katechismus der deutschen Orthographie, Handwörterbuch, Fremdwörterbuch, Wörterbuch der Hauptschwierigkeiten in der deutschen Sprache, Deutsche Sprachbriefe, und Geschichte der deutschen Sprache und Litteratur*, most of which have gone through numerous editions—some of them as many as twenty. He helped to edit, with Rangabé, a *Geschichte der neugriechischen Litteratur* (1884).

Sanders, NICHOLAS, polemical writer, was born in 1527 of a good old Surrey family at Charlwood Place, near Reigate, and from Winchester passed to New College, Oxford, being admitted scholar in 1546, and fellow in 1548. Regius professor of Common Law (1558), in 1561 he resigned his fellowship and quitted England, at Rome was created D.D. and ordained priest, and thereafter accompanied Cardinal Hosius to the Council of Trent, 'where he showed himself to be a man of great parts by his several disputations and arguments.' He had lived at Louvain for some thirteen years as professor of Theology, and had paid two visits to Spain (1573-77), when in 1579 he landed in Ireland; and here in 1580, 1582, or 1583 (all three dates are given) he 'died,' says Lord Burghley, 'wandering in the mountains, and raving in a phrensy.' Sanders, who is to Protestants what Fox is to Catholics, was the author of fourteen works (1565-1610), of which the best known are *De Visibili Monarchia Ecclesie* (1571) and *De Origine ac Progressu Schismatis Anglicani*, edited and completed by Edward Rishton (Cologne, 1585). See the translation of the latter by D. Lewis (1877).

Sanderson, JOHN BURDON. See BURDON-SANDERSON.

Sanderson, ROBERT, Bishop of Lincoln, the greatest of English casuists, was born on 19th September 1587, either at Sheffield or at his father's seat, Giltwhaite Hall, near Rotherham. From Rotherham grammar-school he passed in his thirteenth year to Lincoln College, Oxford, of which he became a Fellow (1606), reader of logic (1608), and thrice sub-rector (1613-16), in the last year being also chosen senior proctor. He had taken orders in 1611, and in 1618 was presented to the rectory of Wyberton in Lincolnshire, in 1619 to that of Boothby-Pagnell, near Grantham, in the same county. In 1631 he

was appointed a king's chaplain: 'I carry,' said Charles I., 'my ears to hear other preachers, but I carry my conscience to hear Mr Sanderson, and to act accordingly.' He was created D.D. in 1636; from 1646 to 1648 filled the regius chair of divinity at Oxford; and continued parson of Boothby-Pagnell for upwards of forty years, even (in spite of one imprisonment and frequent plunderings) through all the Great Rebellion. In October 1660 he was consecrated Bishop of Lincoln, and in 1661 he was moderator of the Savoy Conference; to him are due the second preface to the Prayer-book and perhaps the General Thanksgiving. He died at his palace of Buckden, Hunts, 29th January 1663. His works, collected and edited by Professor Jacobson (6 vols. Oxford, 1854), comprise, besides sermons, the *Logica Artis Compendium* (1615), *De Obligatione Scientiæ Prelectiones* (1647; new ed. by Whewell, 1851), *Nine Cases of Conscience resolved* (1628-78), and *Episcopacy not Prejudicial to the Regal Power* (1661). See the Life by Izaak Walton, reprinted in vol. iv. of Wordsworth's *Ecclesiastical Biography* (1853).

Sandgate, a small watering-place on the south coast of Kent, within the parliamentary limits of Hythe, from which it is, however, nearly 3 miles E. by rail. In March 1893 two hundred houses were destroyed by a subsidence of the land. Sandgate Castle dates from 1539; near by is Shorncliffe Camp. Pop. 2300.

Sand-glass. See HOUR-GLASS.

Sand-grouse (*Pterocletes*), a small order of birds, quite distinct from the true grouse. There are two genera, *Pterocles* and *Syrnhaptes*—the former, including over a dozen species, frequenting sandy tracts in Asia, India, and especially in Africa, the latter represented by two species, both Asiatic. The sand-grouse are birds of beautiful plumage, with heavy body, long and pointed wings, very short legs and toes. They are awkward on the ground, but swift and graceful in flight. They seem to feed chiefly on seeds. *Pterocles alchata* is sometimes called Ganga.

Pallas's Sand-grouse (*Syrnhaptes paradoxus*), named after the traveller Pallas (q.v.), is at home on the sandy steppes of central Asia, migrating northwards in winter, but at intervals since 1859 this bird has wandered westwards over Europe; in 1863, 1872, 1876, 1888, and 1889 flocks reached British shores; flocks have been seen in Ireland also, and hundreds, 'following their instinctive desire to explore the extreme west,' have found an end in the waves of the Atlantic. The predominant colour is buff, barred with black; the total length of the bird is about 15 inches. The eggs, usually three in number, are buff-coloured with purple-brown blotches, and are laid in a slight hollow in the sand. On the plateaus of Tibet *S. tibetanus*, the other species of this genus, has its home. See Macpherson, *The Visitation of Pallas's Sand-grouse to Scotland* (1889).

Sand-hopper, a name applied to various small Amphipod crustaceans in the family Talitridæ, abundant on sandy shores between tide-marks. A common species is *Talitrus locusta*, which usually burrows during the day just above high-water level. It is not suited for prolonged submersion, for at high spring-tides large numbers become very active, jumping high in the air, and often passing to the fields. A related form, *Orchestia gammarellus*, is sometimes found in gardens several miles from the sea; in fact sand-hoppers are tending to become less aquatic and more terrestrial. One species of *Talitrus*, *T. sylvaticus*, occurs in South Australian forests at high levels. On the beach at a lower level than *T. locusta* swarms of *Orchestia littorina*

occur under stones and heaps of seaweed. Sandhoppers are scavengers of the shore, fond of decaying matter. The jump is due to a sudden flexing and straightening of the body. Some forms readily assume a 'death-feigning' rigidity.

Sandhurst, a village 5 miles SE. of Wokingham, with an early English church and the remains of a Roman camp, is the seat of a great military college (see MILITARY SCHOOLS), and near it is Wellington College (q.v.).—Sandhurst was at one time a name given to Bendigo (q.v.) in Victoria.

San Diego, the principal port of southern California, and capital of San Diego county, stands on the beautiful bay of the same name, 124 miles by rail SSE. of Los Angeles. The bay, 6 miles long, forms an excellent harbour, and the port is a very busy one. There are here a military post, a quarantine station, government works and fortifications. The equable temperature and genial air have made the place a notable health resort. Oranges, figs, and olives thrive, and they and other produce, including olive, orange, and lemon oils and citric acid, are exported, as well as other fruits and fertilisers. Pop. (1880) 2637; (1910) 39,578; (1920) 76,683. The old mission of San Diego (1769), the first white settlement in California, is 8 miles north of the present city.

Sandilands, the name, taken from the estate at Sandilands in Lanarkshire, of a family which distinguished itself in the wars against the English. Sir James Sandilands, killed at Halidon Hill in 1333, obtained by marriage the estate of Calder in Midlothian. A later Sir James Sandilands of Calder was a notable reformer; this son, head of the order of knights hospitallers of St John of Jerusalem in Scotland, received a grant of the lands of the order at Torphichen and elsewhere as a temporal lordship and was the first Lord Torphichen.

San'diver (Fr. *suint de verre*, 'scum of glass'), a product of the glass furnaces. When the materials used in the manufacture of glass are melted a scum arises which has to be removed: this is called sandiver, and is, when powdered, used as a polishing material.

Sand-martin. See SWALLOW.

San (or **Santo**) **Domingo**, capital of the Dominican Republic, stands on the south coast of the island of Hayti, at the mouth of the Ozama. It was founded by Bartholomew Columbus as early as 1494. The principal buildings are the Gothic cathedral (1514-40), where the ashes of Christopher Columbus found a rest from 1536 till 1796, a college, a museum, a hospital, an arsenal, and the government buildings. The streets are broad and straight, the houses mostly of wood, and the town is surrounded by a wall. The harbour is defended by forts and batteries. Pop. 30,000. See also HAYTI, and DOMINICAN REPUBLIC.

Sandomierz, or **SANDOMIR**, in Poland, on the Vistula, 50 miles SW. of Lublin, was long the residence of the kings of Poland.

Sandoway, a district in the south of Arakan (q.v.) in Burma, named after its chief town (pop. 3762), 15 miles from the mouth of a small river of the same name, and 150 miles NW. of Rangoon.

Sandown, a watering-place on the south-east coast of the Isle of Wight, 6 miles by rail S. of Ryde. Pop. 7600.

Sandown Park, a well-known race-course (130 acres) in Surrey, near Esher, 15 miles SW. of London. All the inmates of an old hospital here were swept off by plague in 1348. See HORSE-RACING.—For Sandown Castle, see DEAL.

Sand-paper is made like Glass Paper (q.v.), but with sand in place of glass particles.

Sandpiper, the common English name for a group of birds of the Snipe family, Scolopacidae. The name as now used is applied to all the birds in three sub-families, Totaninae, Tringinae, and Phalaropodinae. In characters and habits they are all very similar. Their size is not large; their movements are active and graceful; their plumage is not gay, but pleasing and finely diversified in colour; legs rather long; lower part of the tibia naked; tail very short; wings moderately long; bill rather long and slender, grooved throughout the whole or a considerable part of its length, straight in some, a little arched in others. The feet have three long toes before, and one short toe behind, either partially webbed at the base or completely separate. They swim well, but are not often seen swimming; they frequent sandy seashores, some of them congregating in numerous flocks in autumn and winter, and seek their food by probing the sand with their bills, and by catching small crustaceans in pools or within the margin of the sea itself. Many are birds of passage, visiting high northern latitudes in summer, and spending the winter in the south. The flesh of all the species is good, and some of them are in much request for the table. The following is a summary of the British species. (1) Of the Totaninae: bill stiff and acute, no change to summer plumage. The Common Sandpiper or Summer Snipe (*Totanus hypoleucus*) is a regular summer visitor to the British Isles, especially to Scotland, Ireland, Wales,



Common Sandpiper (*Totanus hypoleucus*).

and the south-east of England. In summer it ranges from the Arctic circle to the south of Europe; in winter it frequents the Mediterranean



Redshank (*Totanus calidris*).

basin, and reaches Abyssinia and Madagascar and ranges through the oriental region to Australia and Tasmania. The Wood Sandpiper (*T. glareola*)

is a much less common visitor to the British Isles, and is much more restricted in its range northwards than the common sandpiper. In winter it reaches the Cape. The Green Sandpiper (*T. ochropus*) differs in nesting habits from all other waders. It lays its eggs in the nests of other birds, such as thrushes, blackbirds, jays, wood-pigeons, and in old squirrels' dreys, and occasionally on stumps and broken-down trees, but always near pools. The Solitary Sandpiper (*T. solitarius*) and the Yellowshank (*T. flavipes*) are American species which are found extremely rarely as stragglers to Britain. The Common Redshank (*T. calidris*), resident in Britain, is a summer bird of passage to the most northern parts of Europe and Asia, and occurs in winter in Morocco and the Cape and in Abyssinia and Natal; also in Japan, China, Borneo, and Java. The Spotted Redshank (*T. fuscus*) and the Greenshank (q.v.) are the only other species found in Britain.

(2) Of the Tringinae: bill flexible and blunt; the plumage usually assumes a chestnut or reddish-brown tint in summer; more frequently found on the shore. The Dunlin, the Curlew Sandpiper, the Knot, the Sanderling, and the Ruff are described in other articles. The Broad-billed Sandpiper (*Tringa* or *Limicola platyrhyncha*) is a straggler to the British Isles. The Pectoral Sandpiper (*T. maculata*), Bonaparte's Sandpiper (*T. fuscolliis*), the American Stint (*T. minutilla*), the Buff-breasted Sandpiper (*Tryngites rufescens*), and Bartram's Sandpiper (*Bartramia longicauda*) are all stragglers from America, some being fairly common, others extremely rare. The other species are the Little Stint (*Tringa minuta*), Temminck's Stint (*T. temminckii*), and the Purple Sandpiper (*T. striata*).

(3) Of the Phalaropinae: swimming sandpipers; toes lobed and webbed at the base; lower plumage as close as that of a duck. The Gray Phalarope (*Phalaropus fulicarius*), an irregular visitor, breeding in the northern regions, the courtship being conducted by the larger and handsomer female, while incubation is performed chiefly by the male; the southern range of this bird extends to Chile, North Africa, and New Zealand. The Red-necked Phalarope (*P. hyperboreus*), also an irregular visitor. The only other and largest species of this sub-family, Wilson's Phalarope (*P. wilsoni*), is confined to America.

Sandpipes are cylindrical hollows existing in chalk deposits. They descend perpendicularly into the chalk at right angles to the surface, tapering downwards, and ending in a point; they reach occasionally a depth of 60 feet, and have a diameter varying from 1 to 12 feet. They are most probably produced by the chemical action of water, charged with carbonic acid, which exists more or less in all rain-water, and is especially abundant in water that has been in contact with decaying organic matter. The pipes are filled with sand, clay, or gravel from the overlying deposit.

Sandringham, a Norfolk estate, 3 miles from the sea and $7\frac{1}{2}$ miles NNE. of Lynn. Comprising over 7000 acres, it was purchased in 1861 by King Edward VII. when Prince of Wales. The present hall was built in 1869-72, a red-brick Elizabethan country-house, repaired after damage by fire in 1891. Queen Alexandra lived mostly at Sandringham during her widowhood, and died there in 1925.

Sandrocottus, or CHANDRAGUPTA, the Hindu king of Pataliputra or Palibothra, to whom in 306 B.C. Megasthenes (q.v.) was sent by Seleucus Nicator.

Sandstone is a rock formed of compacted, and more or less indurated sand. The grains generally consist of quartz, though other mineral substances are often mixed with this; they are colourless, or of a dull white, yellow, brown, red, or green colour.

The grains vary in size, forming, as the case may be, a fine or coarse grained stone. The loose sand becomes solidified by pressure simply, but generally there is some binding material present, as argillaceous matter; or the grains may have become cemented by infiltrating water, carrying with it carbonate of lime, or silica, or ferric oxide. The colour of the rock is often due to the cement. Highly indurated sandstones often pass into Quartzite. See the classification at PETROGRAPHY; also OLD RED SANDSTONE; the New Red Sandstone falls into the Permian and Triassic systems.

Sandstorm. See SIMOOM.

Sandusky, a city and port of Ohio, and capital of Erie county, on the south shore of Sandusky Bay, an arm of Lake Erie, which, 15 miles long and 5 wide, forms an excellent harbour. The city is built upon a bed of limestone, on a site rising gradually from the shore. It has manufactories of cutlery and edge-tools, carved and turned woodwork, iron, steel, &c. From its busy wharves are shipped large quantities of fish, lime, limestone, lumber, coal, fruit, wool, wheat, and flour. Pop. 23,000.

Sand-wasp. See WASP.

Sandwich, a decayed seaport of Kent, on the right bank of the Stour, 12 miles E. of Canterbury and 68 ESE. of London. It now stands 2 miles from the sea, or 4 if one follows the windings of the river; but in the 11th century, when Edward the Confessor made it one of the Cinque Ports (q.v.), it was the 'most famous of all the English harbours.' It was the place of landing or embarkation of St Wilfrid, Cnut, Becket, Cœur-de-Lion, &c.; under Edward IV. had 95 ships and 1500 mariners; but has never recovered the silting up of its harbour in the 16th century, in spite of the settlement at it of Protestant refugees (c. 1561), and of some harbour improvements since 1847. Today its chief fame is as a headquarters of golf. The old walls have been converted into a pleasant promenade, but it retains the Fisher Gate and Barbican, and offers a great deal of interest in its churches—St Clement (Early English), St Peter, and St Mary (15th century), hospitals—St Bartholemew (12th century) and St Thomas (14th century)—town-hall (1579), and grammar-school (1564). Made a borough by Edward III., with Deal and Walmer it returned two members, but was disenfranchised in 1885. Pop. 3000. Richborough, $1\frac{1}{2}$ mile N., was the Roman *Rutupiae*, the predecessor of Sandwich, like which it declined as the sea receded from its port. A new port, however, was constructed (1916) for war purposes, and sold to a coal-mining company in 1924. A great fortress, 460 feet square, Richborough still has a wealth of Roman remains—walls, towers, the base of a pharos, and a caestrenian amphitheatre.

Sandwich, EDWARD MONTAGUE, EARL OF, born 27th July 1625, fought for the parliament at Marston Moor, sat in the House of Commons 1645-48, divided the command of the fleet with Blake from 1653, and used his position to forward the Restoration: hence his earldom. He commanded in several battles against the Dutch, was ambassador to Spain in 1666-69, and lost his life in a naval engagement with the Dutch, 28th May 1672. See Life by Harris (1912).—The fourth earl (1718-92) is famous as the inventor of *sandwiches*, which he could eat without having to rise from the gaming-table.

Sandwich Group, or SOUTH SANDWICH GROUP, an Antarctic group of islands SE. of the South Orkneys, in about 26° W. long., 27° S. lat., on the 'rise' linking South America with Antarctica. They form a dependency of the Falkland Islands.

Sandwich Islands. See HAWAII.

Sand-worm, a general name for any of the numerous worms living in the sand of the shore. Most of them are Chaetopods, with setae on their feet, but the title might also include forms without setae, such as the Nemerteans and the Sipunculids. The fisherman's Lobworm (q.v.) is one of the most important of the more sedentary sand-worms; the tubes of *Terebella conchilega*—mostly composed of fragments of shell—are familiar on the flat beach; while hidden under stones or burrowing deeply in the sand there are numerous species of errant Chaetopods, belonging to the genera Nereis, Nephtys, Polynoe, Syllis, &c.

Sandwort (*Arenaria*), a numerous genus of plants belonging to the family Caryophyllaceae. The species are small, much-branched annuals, or tufted or prostrate perennials, usually glabrous and having small white flowers like those of the common chickweed, to which they are closely related. The Sea Sandwort (*Spergularia marina*) has sprouts so succulent that in Cornwall and the Isle of Wight they are pickled and sold as samphire.

Sandy Hook, a narrow sandy peninsula of New Jersey, between the Atlantic and Sandy Hook Bay, 16 miles S. of New York. It extends some 6 miles northwards into New York Lower Bay. Near the north point are a fort, a fixed electric (1894) light 90 feet high, and a life-saving station.

Sandy Point. See PATAGONIA.

San Felipe, (1) capital of the Chilean province of Aconcagua, in the fertile valley of the Aconcagua, 60 miles ENE. of Valparaiso. Pop. 12,000.—(2) A town of Venezuela, 140 miles W. by S. of Caracás, in a district producing much coffee, cacao, and cotton. Pop. 11,000.—(3) See JÁTIVA.

San Fernando, a Spanish town on the Isle of León, 9 miles by rail SE. of Cadiz. Its port has a naval arsenal. Much salt is manufactured from sea-water. Pop. 27,000.

San Francisco (often abbreviated into Frisco), one of the largest cities of the Pacific coast, is the commercial emporium of California; it is situated in 37° 47' N. lat. and 122° 30' W. long. The city occupies the end of a peninsula or tongue of land, having the Pacific Ocean on one side and the Bay of San Francisco on the other. The site is uneven, two hills within the city rising to the height of 360 feet and 294 feet respectively; from these heights and other smaller elevations the land inclines gently towards the bay. The entrance to this landlocked bay is through the Golden Gate, a worn waterway about 5 miles long and about 1 mile wide, with a minimum depth of 105 feet. The Bay of San Francisco gives the city much of its commercial importance, and extends from Fort Point past the city in a southerly direction for about 40 miles, varying in width from 6 to 12 miles. Northwards, this bay connects by a strait, with San Pablo Bay, 10 miles in length, having at its northerly end Mare Island and the Navy Yard. This bay is again connected with Suisun Bay, 8 miles long. The total length of these bays and connecting straits is 65 miles and the area 420 sq. miles. The Sacramento and San Joaquin rivers debouch near the head of Suisun Bay. Nearly in front of the city are three important islands—Alcatraz, Angel Island, and Yerba Buena or Goat Island.

The first Spanish expedition from Mexico to reach the Golden Gate in 1769 was quickly followed by others, but it was not until 1834 that a small settlement was established. In 1848 San Francisco

was ceded to the United States, and the next year the population increased from 2000 to 20,000, the town being used as a point of supplies and departure for the gold mines in the interior. Most of the houses were originally built of wood, but were largely destroyed in the fires of 1850. This was followed by a period of lawlessness, which was only stopped by the self-constituted Vigilance Committee (see CALIFORNIA), while the sixties witnessed another gold rush, this time accompanied by violent speculation on the stock exchange. Immigration of large numbers of Chinese during the last quarter of the 19th century and of Japanese during the first quarter of the 20th led to serious complications, only warded off by conciliatory diplomatic intervention. The terrible earthquake and fire of 1906, laid waste 4 square miles of San Francisco, comprising some 28,000 buildings, the damage being assessed at between \$350,000,000 and \$500,000,000. In spite of certain municipal scandals (1907), the town was rebuilt in about three years, and in 1915 the great International Exhibition was held there to celebrate the opening of the Panamá Canal.

Most of the buildings are now being set up with reinforced concrete, or, in the case of dwelling-houses, with some kind of steel frame so as to lessen as far as possible the danger from earthquakes. All extensions to the city have followed the checker-board plan first adopted by O'Farrell in 1845, with little reference to the conformation of the surface. The chief points of interest are Portsmouth Square, the site of many events in the early days; the Chinese telephone exchange and other buildings in Chinatown (rebuilt after 1906 and considerably westernised); the city hall (1907-9); the gigantic Palace Hotel (1910); the public library (1917); the old church of the (Spanish) mission Dolores (1778); the Spanish Commandant's headquarters (1776); and the Golden Gate Park of 1013 acres, beautifully laid out with the ocean as west boundary, and containing the de Young Memorial Museum of Fine Art, considerably enlarged since its opening in 1894. There are about 275 churches in the city, representing nearly every religious denomination in the world, oriental and occidental; there are few church edifices of the first class, but the Protestant Episcopal Grace Cathedral is notable. San Francisco is distinguished for the number and excellence of its free schools and other institutions of learning, and certain departments of the state university at Berkeley, including the medical school, are located here. There are also polytechnic and scientific schools, and several important and extensive libraries.

San Francisco is primarily a commercial and industrial town. It is the terminus of five trans-continental railway systems, the distance from New York being 3452 miles. The bay provides an excellent harbour, and there are steamship lines to South America, Australia, Asia, &c. The exports and imports exceed in value \$130,000,000 and \$100,000,000 respectively, while the tonnage entering the ports amounts to 1½ million tons; all the port facilities, comprising some 15 miles' berthing space and 5,000,000 square feet of cargo area, belong to the state. There are important fishing and whaling interests, while the chief manufactures are sugar, boots and shoes, clothing, and there are foundries and machine-shops, woollen-mills, sash and blind factories, and shipbuilding yards, the manufacturing plants employing about 70,000 persons. There is a branch United States mint, and an army corps is garrisoned here. As the population is exceedingly cosmopolitan, there are newspapers published in all languages. Pop. (1860) 56,802; (1870) 149,473; (1900)

342,782; (1920) 506,676. See the books cited at CALIFORNIA.

San Fratello, a town of northern Sicily, 53 miles WSW. of Messina. It was founded by a Lombard colony brought here by Adelaide, wife of Roger I. Here is the cave of San Teodoro, discovered in 1859, and containing prodigious quantities of bones of mammals mixed with flint implements. Pop. 10,000.

Sangaree' (Span. *sangría*), a West Indian beverage, consisting of wine, sugar or syrup, water, and nutmeg, drunk cold.

Sangerhausen, an old town of Prussian Saxony, on the SE. of the Harz Mountains, 22 miles E. of Nordhausen, with manufactures of machinery, iron, copper, and beet-root sugar.

San German, a town in the SW. of the West Indian island of Porto Rico, about 10 miles from the sea; pop. 22,500.

San Germano, now more generally called CASSINO, a town of Italy, standing 3 miles E. of the celebrated monastery of Monte Cassino (q.v.) and 69 miles NW. of Naples. It is built on the site and from the ruins of the Roman town which replaced the ancient Volscian town of *Casinum*. The latter must have stood on the hill now occupied by the monastery, where considerable remains of fortifications still exist. The principal ruins of the Roman town are a sepulchral monument and an amphitheatre. The first, now employed as a chapel, is built in the form of a Greek cross, constructed with enormous blocks of stone. Here, too, was Terentius Varro's villa, in which Antony lived for some time. Pop. (1921) 18,757.

San Gimignano, a town of Italy, 25 miles S. by W. of Florence, with several churches, two containing fine frescoes by Domenico Ghirlandajo and Benozzo Gozzoli. In the town hall are interesting frescoes and a small museum. The town is still surrounded by its ancient walls, and retains thirteen out of its original fifty towers; so that its appearance is thoroughly mediæval. Pop. 10,900.

San Giovanni a Teduccio, a suburb of Naples, 3 miles to the SE. by rail. Pop. 20,700.

San Giovanni in Fiore, a town of South Italy, 25 miles E. of Cosenza. It is the chief town in the forest district of the Sila. The costumes are picturesque. Pop. (1921) 12,249.

San Giovanni Rotondo, a town of South Italy, 27 miles NE. of Foggia, near Monte Garano. Pop. (1921) 11,538.

Sangir Islands, a group of fifty islands, lying between the Philippines and Celebes, measure in all 400 sq. m., the largest, Great Sangir, being 28 miles long by 9 broad. All the islands are mountainous, volcanic, and fertile. The volcano Abu on Great Sangir was the scene of an eruption in 1856 that cost 3000 lives, and of another terrible one in 1892. The people are Malays, and are ruled by their own chiefs under the Dutch government.

Sang-koi. See TONGKING.

Sangreal. See GRAIL.

Sanguinaria, a genus of plants of the family Papaveraceæ, having eight to twelve petals, two stigmas, an oblong, swollen, and many-seeded capsule with two deciduous valves. *S. canadensis*, the Blood-root or Puccoon of North America, has a fleshy root-stalk with much red juice, which abounds also in the leaf-stalks; and solitary radical leaves, which are roundish, deeply heart-shaped, with about seven toothed angles. The flowers

are solitary and spring from the root, on short stalks. The whole plant is acrid and narcotic, emetic and purgative in large doses; and in small doses stimulant, diaphoretic, and expectorant. From its use by the Indians for staining, it is also called 'red Indian paint.' It is supposed to owe its properties to an alkaloid called *Sanguinarin*. The large white flowers appear early in spring, and are a frequent ornament of flower-borders.

Sanguine, a term used in art for a drawing in red chalks. For another sense see TEMPERAMENT.

Sanguisorba. See BURNET.

San'hedrin, or SANHEDRIM (*Sanhedrin* being the Hebrew spelling of the Gr. *synedrion*, 'assembly,' 'council'), the supreme national tribunal of the Jews. The origin of the Sanhedrin has been the subject of much controversy. According to the Mishnah (*Aboth*, i.) the prophets were followed by the 'Men of the Great Synagogue,' and from this body the Sanhedrin developed. This tradition has been disputed: the existence of the 'Men of the Great Synagogue' as a definite assembly has been denied, and the Sanhedrin has been regarded as a new and late institution. On the one hand Bacher holds that some deliberative counsel must have existed during the Persian period, even though the Mishnaic account underestimates the duration of this period. Kraus, too, maintains this view and argues that during this early time there must have been lay teachers of the Talmudic type as well as priests. On the other hand Schürer is inclined to relegate the Sanhedrin to the Maccabæan age. The divergent views are well discussed by Abrahams: on this point and on Büchler's theory of two Sanhedrins, one religious and one political, see the bibliography below.

Ultimately the Great Sanhedrin consisted of seventy-one members, and was presided over by the Nasi ('prince'), at whose side stood the Ab-Beth-Din ('father of the tribunal'). Its members belonged to the different classes of society: there were priests (Gr. *archiereis*); elders, that is, heads of families, men of age and experience (Gr. *presbyteroi*); scribes, or doctors of the law (Gr. *grammateis*); and others, exalted by eminent learning—the sole condition for admission into this assembly. The presidentship was conferred on the high-priest in preference, if he happened to possess the requisite qualities of eminence; otherwise, 'he who excels all others in wisdom' was appointed, irrespective of his station. The limits of its jurisdiction are not known with certainty; but there is no doubt that the supreme decision over life and death, the ordeal of a suspected wife, and the like criminal matters were exclusively in its hands. Besides this, however, the regulation of the sacred times and seasons, and many matters connected with the *cultus* in general, except the sacerdotal part, which was regulated by a special court of priests, were vested in it. It fixed the beginnings



Blood-root
(*Sanguinaria canadensis*):
a, section of ovary; b, fruit.
(Bentley and Trimen.)

of the new moons; intercalated the years when necessary; watched over the purity of the priestly families, by carefully examining the pedigrees of those priests born out of Palestine, so that none born from a suspicious or ill-famed mother should be admitted to the sacred service; and the like. By degrees the whole internal administration of the commonwealth was vested in this body, and it became necessary to establish minor courts, similarly composed, all over the country, and Jerusalem itself. Thus we hear of two inferior tribunals at Jerusalem, each consisting of twenty-three men, and others consisting of three men only. These courts of twenty-three men (Lesser Synedion), however, as well as those of the three men, about both of which Josephus is silent, probably represent only smaller or larger committees chosen from the general body. Excluded from the office of judge were those born in adultery; men born of non-Israelitish parents; gamblers; usurers; those who sold fruit grown in the Sabbatical year; and, in individual cases, near relatives. All these were also not admitted as witnesses. Two scribes were always present, one registering the condemnatory, the other the exculpatory votes. The mode of procedure was exceedingly complicated; and such was the caution of the court, especially in matters of life and death, that capital punishment was pronounced in the rarest instances only. The Nasi had the supreme direction of the court, and convoked it when necessary. He sat at the head, and to his right hand was the seat of the Ab-Beth-Din; in front of them the rest of the members took their places according to their dignity, in a semicircle. The court met on extraordinary occasions in the house of the high-priest; its general place of assembly, however, was a certain hall (*Lishcath Hagazit*), probably situated at the south-west corner of one of the courts of the temple. With exception of Sabbath and feast days it met daily. The political troubles forced the Sanhedrin (70 B.C.) to change its meeting-place, which was first transferred to certain bazaars (*Hanuyoth*) at the foot of the Temple Mount. After the destruction of the temple and Jerusalem it finally established itself, after many further emigrations, in Babylon.

OLDER LIT.—See the histories of Ewald, Herzfeld, Jost, Graetz, Kuenen, and others; Hausrath's *Neutestamentliche Zeitgeschichte* (1868); Schürer's *History of the Jewish People in the Time of Jesus Christ* (Eng. trans. 1886-90). For the GENERAL HISTORY of the Sanhedrin, consult the fully itemised index on pp. 586-88 of vol. vi. of the American ed. of the Eng. trans. of Graetz's *History* (Philad. 1898); also index on p. 865 of vol. ii. of H. Strack and L. Billerbeck's *Kommentar z. N.T.* (Munich, 1922-26); R. Travers Herford, *Pharisaism*, ch. i. (Lond. 1912); C. H. Thomson in *Dict. of Christ and the Gospels*, ii. 566; Foakes Jackson and Lake's refs. in *Beginnings of Christianity* (Lond. 1920). On the GREAT SYNAGOGUE: C. Taylor, *Sayings of the Jew. Fathers*, p. 110 (Camb. 1897); H. Engländer in *Heb. Union Coll. Memorial Vol.* (Cincinnati, 1925: an important essay). For DATE AND ORIGIN, see I. Abrahams in Hastings's *E.R.E.*, xi. 184; S. Kraus, *Jew. Quart. Rev.*, x. 349; W. Bacher in *Jew. Enc.*, xi. 640, and in Hastings's *Dict. Bible* (1902), iv. 397; Hamburger, *Realencyclopædie*; R. Knopf, *Einführ. in d. N.T.*, pp. 181, 240; Giessen, (1919: a new edition is in the press). That there were two SANHEDRINS: A. Büchler, *Das Synhedr in Jer.* (Vienna, 1902); J. Z. Lauterbach in *Jew. Enc.*, xi. 41 ff.: this is criticised by G. A. Smith in *Jerusalem*, i. 419 (Lond. 1907). On the JURISDICTION of the Sanhedrin, (a) GEN.—W. Oosterley in Hastings's *D.B.* (1909), p. 827; H. Loewe in Hastings's *E.R.E.*, iv. 288 (and bibliog.). (b) IN REGARD TO DIVORCE: I. Abrahams, *Pharisaism*, i. ch. ix. (Camb. 1917). (c) IN REGARD TO TRIAL OF JESUS: H. Loewe (*cit. supra*); H. Danby, *Journ. Theol. Stud.*, xxi. pp. 51 ff. (1920), this article is discussed by I. Abrahams, *Pharisaism*, ii. ch. xv. (Camb. 1924); C. G. Montefiore, *Synopt. Gosp.*, 346-357 (Lond. 1909; new ed. in press); Jos. Jacobs, *As Others Saw Him*, ch. xv. (a new ed. of this important book, which gives the general Jewish

view of the Sanhedrin and trial of Jesus, appeared in New York, 1925); M. A. Canney and W. Robertson Smith in *Enc. Bibl.*, iv. 4840. On the HISTORY, COMPOSITION, PLACE OF MEETING AND FUNCTIONS, see Bacher in Hastings's *D.B.* (1902), iv. 397, and K. Kohler in Hastings's *Dict. of Apost. Ch.*, ii. 454 (he also criticises Büchler); H. L. Strack (in *New Schaff-Herzog*, x. 203; see also bibliog., p. 204) rejects the thesis of J. Levy and D. Hoffmann that the head of the Sanhedrin was a layman, and accepts the evidence of Josephus and N.T. that the High Priest presided; C. L. Souvay, *Catholic Ency.*, xiii. 444.

Sanicle. See WOOD-SANICLE.

Sanidine, a clear, glassy variety of orthoclase. See FELSPAR.

Sanitation, in the widest sense of the word, is the science of sanitary conditions and of preserving health, and is accordingly synonymous with Hygiene; but the term is usually restricted to the methods and apparatus for making and maintaining houses healthy, for removing waste and nuisance by means of drainage and otherwise, for securing abundance of fresh air, and for the excluding of poisonous gases, especially sewer gas—in short, the province of the sanitary engineer. Sanitary science falls under various heads in this work: a sketch of the progress of sanitary knowledge and legislation is sketched under HYGIENE. Other branches of the subject are treated in the articles on Food and Diet, on Infection, Disinfectants, Antiseptics, the Germ Theory of Disease, on Baths, Gymnastics, Hospitals, Nursing, and the Feeding of Infants, on the Factory Acts, and on Slaughter-houses. The relation of churchyards to health, and legislation in that regard, is dealt with in the article Burial, and in that on Cremation. The subjects of Building, Ventilation, Warming, and Water-supply are dealt with under their own heads, and one of the most important subjects in sanitary science—how to remove waste substances without offence to health by drainage, how, by trapping and other methods, to prevent the entrance of poisonous sewer gases into bath-rooms—is treated in the article on Sewerage. The diseases that arise from foul air and lack of precautions to secure cleanliness are dealt with in the articles on Disease, Typhoid and Typhus Fevers, Diphtheria, Pyæmia, &c.

Sanjak, a Turkish word signifying 'a standard,' is employed to denote a subdivision of a vilayet.

San Joaquin, a river of California, rises in the Sierra Nevada, and runs first SW., then NNW. to Suisun Bay, near the mouth of the Sacramento River. It receives numerous branches—the Merced, Tuolumne, Stanislaus, &c.—and has a course of 400 miles, mostly navigable for small steamboats.

San José, capital of the Santa Clara county, California, on the Guadalupe River, 8 miles from the Bay and 50 miles by rail SE. of the city of San Francisco. Besides a fine court-house, a hall of justice, a hall of records, and a city hall, it contains the state normal school, a Roman Catholic college (Notre Dame) for girls and the University of the Pacific (Methodist Episcopal; 1852). Lick Avenue extends from San José to the Lick Observatory (q.v.). The city has wide streets and several parks (including one of 600 acres), and is noted for its gardens and fruit. Its manufactures include a number of foundries, fruit-canneries, woollen and flour mills, and drug stores. It was first colonised by the Spaniards in 1777, and in 1906 suffered severely from the earthquake. Pop. 40,000.

San José, (1) the capital since 1823 of Costa Rica, stands in a fertile plain, 3816 feet above sea-level and 15 miles by rail WNW. of Cartago. It is on the transcontinental railway from Puntarenas, the Pacific port, to Limón, the Atlantic port. Its

streets are regular and well kept, with many squares and parks. The notable buildings are the presidential and national palaces, the cathedral and bishop's palace, the university, the national museum, the observatory, and the opera-house. The principal manufactures include distilleries, flour-mills, foundries, and tobacco factories. Pop. 54,000. The province has a pop. of 147,000.—(2) A southern department of Uruguay, with an area of 2688 sq. m. and a pop. of 66,800. Agriculture and cattle-rearing are carried on. The capital, San José, is a thriving inland town, 60 miles by rail NNW. of Montevideo, with a fine church; pop. 13,000.—(3) A small port of Guatemala, on the Pacific, 75 miles by rail from the capital. Pop. 1500.—(4) See CÚCUTA.

San Juan, (1) a frontier province of the Argentine Republic, bordering on Chile, with an area of 37,865 sq. m. and a population of 131,179. Half of the surface is occupied by mountains—Andean and pampa chains—and the province is rich in minerals, which have not yet all been fully developed. Agriculture—lucerne, corn, and vines—is the chief occupation. The capital town, San Juan, founded in 1561, on the river San Juan, is by rail 700 miles W. by N. of Buenos Aires and 98 N. of Mendoza, and has a local trade with Chile. Pop. 20,000.—(2) San Juan or St John's, the capital of Porto Rico, is situated on a small island, connected with the mainland by bridges, and has a good harbour. The chief points of interest are the Plaza with the governor's palace, the town-hall, the hall of the legislative assembly, and the old fortifications. There are clothing and tobacco factories, while the chief products are sugar-cane and different kinds of fruits. Pop. 72,000.—(3) A port of Mexico, on the river Tabasco, 70 miles from its mouth. There is an active trade in coffee, cocoa, tobacco, sugar. Pop. 12,500.—(4) For San Juan del Norte in Nicaragua, see GREYTOWN.—(5) For San Juan in Juan de Fuca Strait, see FUCA.

Śankara, or ŚANKARA ĀCHĀRYA ('the spiritual teacher Śankara'), is the name of one of the most renowned theologians in India. His date is disputed. Tradition places him about 200 B.C., but the best authorities assign him to the late 8th or early 9th century after Christ. Most accounts agree in making him a native of Malabar, and a member of the caste of Nambūri Brahmins. All accounts represent him as having led a wandering life, and engaged in successful controversies with other sects. He is said, on poor authority, to have died at 32 at Kedarnāth in the Himālayas. He may be regarded as having finally brought into its completed form the Vedānta philosophy or Mīmāṃsā. His principal works, which exercised a great influence on the religious history of India, are his commentary on the *Vedānta Sūtras* and his commentaries on the *Bhagavad-gītā* and the principal Upanishads. His learning and personal eminence were so great that he was looked upon as an incarnation of the god Śiva, and was fabled to have worked several astounding miracles. His success rested in part on the doctrine which he developed on the basis of a traditional view of the Upanishads, and of the Nihilistic tenets of Mahāyāna Buddhism. He distinguished two planes of thought and reality: on the one hand, the unchanging Absolute, which is pure being, pure thought without an object, and unqualified bliss; on the other, the illusion, self-imposed, on thought which presents that which is but one in all the illusory manifold of existence. From the latter standpoint he could accept, without criticism, belief in Hindu rites and popular theology, and he is credited with founding the sect of Smārta

Brahmins, and with the energetic propagation of orthodox Brahmanical views as against the unorthodoxy of Buddhism and Jainism.

Sankey, IRA DAVID. See MOODY.

Śāṅkhya is the name of one of the three great systems of orthodox Hindu philosophy. See SANSKRIT LITERATURE.

Sankt Gallen, or ST GALL, a Swiss canton lying between the Lake of Constance on the N. and the Grisons on the S., with Zürich on the W. The country is for the most part mountainous, rising to 10,660 feet in Ringelspitz, and to 8216 in Säntis, and consists of a series of valleys radiating outwards from the high canton of Appenzell, which Sankt Gallen entirely surrounds. The Rhine flows along the eastern border. Portions of the lakes of Constance, Zürich, and Wallen lie within its boundaries. Sandstone and slates are quarried. The mineral springs of Pfäfers and Ragatz are well known. But the chief source of wealth is the embroidery of cottons, muslins, laces, &c., with an important export trade. Rorschach, on the Lake of Constance, is a port of some trade. Area of canton, 779 sq. m.; pop. (1920) 295,543, of whom three-fifths are Roman Catholics, the rest Protestants of the Reformed Church. They speak German. The canton is governed by a Great Council, chosen by the communes for three years. The French republicans created a canton in 1799, and in 1803 the canton as it now exists was formed.

SANKT GALLEN, the capital of the above canton, stands on the Steinach, 2196 feet above sea-level (one of the highest towns in Europe), 53 miles by rail E. of Zürich, and 9 from Rorschach. The buildings of its famous Benedictine monastery are now used as cantonal offices and for housing the monastic library, founded in 830, containing many MSS. of great antiquity and value. Other buildings are the old abbey church, thoroughly restored in rococo style, and made a cathedral in 1846; the Protestant church of St Lawrence (restored 1851-53); the town library, founded in 1536, and containing many interesting Reformation MSS.; and the museum with collections of natural history, works of art, and antiquities. The city carries on a large trade in its staple commodity, embroidered textiles (cotton, muslin, &c.), and in agricultural products. Pop. (1888) 27,910; (1920) 70,437. The original nucleus of the place was the cell of St Gall (c. 550-645), an Irish follower of St Columban, who settled here in 614. Around this soon grew up a monastery of the Benedictine order, which was promoted by Charles Martel to the dignity of an abbey. The abbey gradually became one of the masterpieces of mediæval architecture; whilst the monks were indefatigable in the collection and transcription of MSS.—biblical, patristic, historical (sacred and profane), classical, liturgical, and legendary. Several of the classics, especially Quintilian, Silius Italicus, and Ammianus Marcellinus, have been preserved solely through the MSS. of Sankt Gallen. Amongst its more distinguished pupils were Notker and Ekkehard. They were noted also for the cultivation of music, the name of Notker Labeo being most outstanding in this respect. Its abbots became princes of the empire. About the 10th century a walled town began to grow up around the monastery, but in the 13th century the townsmen threw off its supremacy. In 1454 the town was admitted to the Swiss confederation, in 1528 embraced the Reformation, but in 1531 restored the Catholic religion. At the French Revolution the abbey was secularised (1798); in 1836 St Gall was erected into a bishopric. See J. M. Clark, *The Abbey of St Gall* (1926).

Sankt Pölten, a town of Lower Austria, on the river Traisen, 38 miles by rail W. of Vienna. The cathedral, founded in the 11th century and rebuilt in baroque style in the early 18th, has some good stained glass. There are iron-factories and cotton-mills. The history of the town begins in Roman times. Pop. 15,000.

Sanlúcar de Barrameda, a seaport of Spain, stands 15 miles N. by W. of Cadiz, on the left bank of the Guadalquivir, and at the mouth of that river; it exports wines and cereals; pop. 27,000.

San Luis, a west-central province of the Argentine Republic, with an area of 29,035 sq. m. and a population of 129,655. It is mountainous in the north, and a series of dry and sterile plains in the south. Its mineral wealth, though unquestionably great, has as yet scarcely been tapped, but cattle-breeding is carried on.—The capital, San Luis, founded in 1597, is on the transcontinental railway, 490 miles W. by N. of Buenos Aires, and has a national college and a normal school, and 15,000 inhabitants. Cattle-rearing, grain, and vine-growing are the industries of the region.

San Luis Potosí, capital of the Mexican state of the same name, stands on the edge of a plateau, 7400 feet above the sea, by rail 327 miles NNW. of Mexico city. It is well built, though with steep streets, and contains a handsome cathedral, a government palace, railway workshops, and smelting-works. There are rich silver-mines near by. Founded in 1586, the city has taken a prominent part in the country's civil wars, and in 1863 was the seat of Juárez's government. Pop. 68,000.—The inland state of San Luis Potosí, largely mountainous and so far healthy, has an area of 24,000 sq. m. and a population of 441,500. Some districts are very fertile, and much gold and silver is mined, besides salt and other minerals.

San Marino, a republic lying among the eastern spurs of the Apennines, 9 miles SW. of Rimini on the Adriatic. It has an area of 33 sq. m., and comprises a small town of the same name and some villages. The town is built on a mountain crag, and is accessible only by one road; the streets are steep and narrow. Agriculture and cattle-breeding are the principal occupations. Tradition states that it was founded under Diocletian, but its history begins with the 9th century. In the 13th century the little community of San Marino cast in its lot with the house of Urbino; but on the annexation of this duchy to the Papal States in 1631 its independence was recognised by the pope, and it has been maintained down to the present day. Its constitution is that of a republic; but it acknowledges the king of Italy as its friend and protector. The governing body is the Grand Council of sixty members, elected by popular vote. From this number are selected the Council of Twelve, who form the supreme court. The executive is committed to two captains-regent, chosen from the Grand Council. The militia of the republic numbers 950 men. San Marino issues postage stamps of its own, and makes a considerable profit by doing so. Many of them show the new Palazzo del Governo, in the Gothic style (1894), the principal building in the small town, and others the three summits of the mountain (Monte Titano) crowned by towers—the arms of the Republic. Total pop. 13,000.

San Martín, JOSÉ DE (1778–1850), South American soldier, was born in the Argentine, studied at Madrid, and took part in the Napoleonic wars. In 1812 he first associated himself with the Argentine patriots in their struggle against the royalists, and by his victories in 1817 and 1818 definitely secured the independence of Chile (q.v.),

which was placed under the dictatorship of his colleague, O'Higgins. In 1821 San Martín occupied Lima, at the same time proclaiming himself Protector of Peru. An able soldier and administrator, he fell a victim to political diversions and intrigues, and was forced to leave the next year for Europe, where he lived in retirement till his death.

San Miguel, (1) a town of Salvador, at the foot of the active volcano (7775 feet) of San Miguel, manufactures leather goods, and there is some mining, but the chief products are agricultural; pop. 34,000. The province has a pop. of 125,000.—(2) The principal island of the Azores (q.v.), with an area of 299 sq. m. and a pop. of 140,000.

San Miguel Allende, a town in the Mexican state of Guanajuato, built on the side of a high hill overlooking the Río de la Lara, 253 miles by rail NW. of Mexico city. It has a trade in cereals and fruit. Pop. 10,000.

San Miniato, a city of Central Italy, 22 miles W. by S. of Florence, has a cathedral with fine decorations in majolica and a castle of the Emperor Frederick I. The Bonaparte (more correctly Buonaparte) family, which settled in Florence before 1100, divided in the 13th century into two branches, one of which settled at San Miniato, the other at Sarzana. It was a member of the latter branch who emigrated to Corsica in the middle of the 16th century. Pop. 21,400.

Sannazaro, JACOPO, an Italian poet, of Spanish descent, was born at Naples, 28th July 1458. He attached himself closely to the court of Naples, and accompanied King Frederick III. when he took refuge in France (1501–4). It was during his absence that he published the *Arcadia*, a medley of prose and verse, which was greatly admired, and went through numerous editions. It has given its author the reputation of an Italian classic. Sannazaro died at Naples on 27th April 1530. Other works are *Sonetti e Canzoni* and *De Partu Virginis Libri III.*, mostly written in Latin verse. See Scherillo's edition of the *Arcadia*, with critical introduction (1888).

San Nicolás de los Arroyos, a city of Buenos Aires province, in Argentina, stands on the Paraná, 150 miles by rail NW. of Buenos Aires. It is a port with a busy river trade. Pop. 20,000.

San Pedro de Macoris, a port of the Dominican Republic, on the south of the island, with a trade in honey, rum, and hides; pop. 14,000. The province has a pop. of 44,000.

Sanpo. See BRAHMAPUTRA and TIBET.

Sanquhar, a town of Dumfriesshire, on the Nith, 26 miles NNW. of Dumfries. It has a ruined castle, was the birthplace of the 'Admirable' Crichton, and has many Covenanting memories—including the affixing to the cross of the two Sanquhar Declarations, by Richard Cameron in 1680 and by Renwick in 1685. The *Corda* of Ptolemy, Sanquhar was made a royal burgh in 1598, and with Dumfries, &c., returned one member till 1918. Pop. 3380.

San Remo, a city of Northern Italy, stands on a bay of the Gulf of Genoa, 26 miles by rail ENE. of Nice and 84 SW. of Genoa. It is built on rising ground, and is sheltered by hills behind. This, combined with its delightful climate, makes it one of the favourite winter-resorts of the Riviera (q.v.), especially for Englishmen. The visit of the Emperor Frederick of Germany in 1887–88 greatly increased its reputation among his subjects. It is also much frequented by Italians during the summer. There are two quarters, an old town of steep, narrow streets on the hill, and a new town of handsome streets and picturesque villas, hotels, and palaces near the coast. Its little harbour

serves a brisk trade in olive-oil, palms, and lemons. Pop. (1921) 23,547.

San Roque, a town of Spain, 8 miles N. by W. of Gibraltar; pop, 11,000.

San Salvador, the capital of the republic of Salvador (q.v.), stands in the midst of a fertile plateau 2000 feet above sea-level, among green hills, and at the foot of the volcano of San Salvador (8360 feet). Immense ravines, crossed for the most part only by narrow tracks, have been worn by streams in the surrounding plain, and serve as a protection to the city in time of war. The houses are mostly of one story, with walls built thick to resist the shocks of earthquake, and enclosing pleasant courts. The climate is semi-tropical. San Salvador has a cathedral, a university, polytechnic schools, a museum, a national library, an observatory, and handsome government buildings. The city, however, in spite of an excellent water-supply, is far from notable for its cleanliness. There is a busy trade in coffee, rice, sugar, while cotton goods and cigars are manufactured. San Salvador was founded in 1528. Violent shocks of earthquake have visited it in 1854, 1873, 1879, 1891, and 1917, a destructive flood in 1922. Pop. 81,000. —San Salvador is also one of the names for Bahia (q.v.), and for an island in the Bahamas (q.v.).

Sansanding, or SANSANDIG, a town of Africa, stands on the left bank of the Niger, some 370 miles SW. of Timbuktu, and is a place of some commercial importance.

Sansculottes, i.e. 'without breeches,' was the name given in scorn, at the beginning of the French Revolution, by the court party to the democratic party in Paris. The latter accepted the title with pride, and used it as the distinctive appellation of a 'good patriot.' According to the current interpretation in England (as in Carlyle's works), a *sansculotte* was a radical revolutionist who made a point of neglecting his apparel, and cultivating rough and cynical manners. But Littré makes no mention of breechlessness in the sense of raggedness in his definition of the word; on the contrary, he says that the *sansculottes* 'were so called because they gave up the knee-breeches in fashion during the *ancien régime* and took to wearing trousers or pantaloons.'

San Sebastián, the capital of Guipúzcoa province, Spain, on the Bay of Biscay, 402 miles by rail NNE. of Madrid, and 11 miles from the French frontier. It is built on a peninsula, stretching from the base of a conical hill, Urgull (400 feet), which is crowned with a strong fortress. Since its almost total destruction by the British, when they stormed it (1813) under Wellington during the Peninsular war, the town has been rebuilt on a regular plan. On the west is a magnificent roadstead, well protected, but difficult of access. It is bordered by a beautiful shore, which has made San Sebastián a fashionable watering-place. Large ships use the more easily accessible harbour of Pasajes, 2½ miles to the E. The exports consist chiefly of wine, minerals, textiles. Fishing and other industries are carried on. Since 1886 San Sebastián has been the summer residence of the court. The new town contains a casino, Miramar Palace, and many handsome buildings. An electric railway runs to Irún and across the frontier to Hendaye. San Sebastián suffered numerous sieges in the wars between France and Spain. Pop. 62,000.

San Severino, a small town in the Marches, Italy, 15 miles SW. of Macerata, has two cathedrals. Pop. (commune) 14,000.

San Severo, a city and episcopal see of Southern Italy, by rail 18 miles NW. of Foggia and

141 NE. of Naples, dates from the middle ages, but has twice been laid in ruins, for the second time by the French in 1799, and has also suffered damage by earthquakes. Pop. (1921) 34,606.

Sanskrit (*samskr̥ita*, 'perfected,' 'polished'—viz. *sam*, 'together' or 'completely,' = *ṣma*, Eng. 'same,' and *kṛita*, 'made,' probably connected with Lat. *creo*) is the name of the ancient literary language of India. It forms the easternmost branch of the great Indo-European (Aryan) stock of languages, and the one which, thanks to its early literary cultivation (from c. 1500 B.C.) and grammatical fixation, and its consequent transparency of structure and fullness of form, approaches nearest to the parent language. In some respects, however (notably in the change of a single *a*-vowel in place of the vowels *a*, *e*, *o*, prevailing in the European languages—e.g. Sansk. *bhārantam* = *φέροντα*), the primitive appearance of the Sanskrit, as of the closely allied Iranian or Persic branch, is now generally ascribed to a special Indo-Iranian development of the parent language. Whilst it is normally admitted that the Indo-European dialect out of which the literary language of India has developed cannot have been indigenous to the peninsula, but must have been introduced from the north-west, there is still considerable difference of opinion as to the original home of the primitive Indo-European community—whether it is to be sought for in Asia, a view supported by the discovery of the Tocharian language in Central Asia, or whether it was from some part of Europe that the Asiatic Indo-Europeans—the Armenians and Indo-Persians—originally came. On entering India, the Indo-European tribes found the country occupied by people of different races; but, favoured perhaps by physical and intellectual superiority, they gradually succeeded in extending their sway, as well as their language and their social and religious institutions, over the whole of Northern India. Owing, however, to various causes, such as original differences in the invading tribes, new political formations, or racial and tribal differences in the population absorbed by the ruling race, local dialects gradually sprang up within this area, which eventually developed into the modern vernaculars of Northern and Western India. See INDIA.

Although the term Sanskrit, as the 'perfected' language, properly speaking only belongs to the grammatically fixed form of the language which was employed from about the 4th or 5th century B.C., and which came more and more to assume the character of a mere literary and learned idiom, it is usual to extend the term so as to include an earlier form of the same language used in the Vedic writings, and hence often called Vedic or Vedic Sanskrit. The two phases of the language show considerable differences as regards both vocabulary and grammar. The vocabulary of the older language includes numerous words which are no longer used in Classical Sanskrit, and the very meaning of which had often become unknown; whilst, on the other hand, many of the commonest words of the later language are not found in the Vedic writings. As regards the inflectional system, the original wealth of grammatical forms has become considerably reduced in the later phase of the language. Thus, whilst the Classical Sanskrit has but a single infinitive in *tum*—being the accusative case of a verbal abstract noun in *tu*, and corresponding to the Latin first supine (e.g. Sansk. *dātum*, *yoktum* = Lat. *dātum*, *junctum*)—the Vedic Sanskrit also makes use for the same purpose of different case-forms of quite a number of verbal noun-stems, several of which occur again with a similar function in one or other of the allied languages—e.g. Sansk. *vidmāne* = *ἰδμεναι*; Sansk. *dāvāne* = *δοῖναι*, *δοῦναι*; Sansk. *jīvāse* = Lat. *vivere*; Sansk.

bhāradhaya = *phēresai*. Similarly the subjunctive mood, which formed a regular feature of the Indo-European and Vedic verb-systems, has almost entirely disappeared from the Classical Sanskrit; and alternative declensional and conjugational forms have usually been reduced to a uniform level. Indeed, levelling processes of this kind are seen to have been at work from the earliest times. Thus, a comparison of the language of the older portions of the *Rigveda* with that of the later hymns, and the closely allied *Atharvaveda*, shows how, both in declension and conjugation, vowel-stems gradually supersede the original radical and consonantal stems, which less readily adapt themselves to ease and personal affixes, and hence are apt to produce anomalies and irregularities. Such modifications become still more marked in the later Vedic prose-writings, the *Brāhmanas* and *Sūtras*, which may be considered an intermediate link between the two periods of the language. Though the process of change was at length arrested by rigid grammatical rules, to which every cultivated writer had to conform, it found all the more scope in the popular dialects, which soon lost touch of the literary language and became more and more removed from it. Sanskrit, originally a refined form of the vernacular of the Brahmins and the ruling class, easily understood by their inferiors, came more and more to be restricted in employment for ordinary speech outside the Brahmanical schools, but in addition to its supremacy in literature, which resulted in its use even by Buddhists and Jains, it became from the period of the Gupta revival of Hinduism (c. 300) the normal language of official life.

Literature.—In accordance with the general development of the language, the history of the ancient literature of India may conveniently be divided into two chief periods, the *Vedic Literature* and the (Classical) *Sanskrit Literature*. It must be understood, however, that the two periods overlap each other to some extent, inasmuch as certain classes of works, on account of their subject-matter as well as the archaic character of their language, have to be grouped along with the Vedic literature, though they cannot have originated in their present form till after the language had become settled. The Vedic Literature forms the subject of a separate article. See VEDA.

Classical Sanskrit Literature.—The dates of many important Sanskrit works being still very uncertain, it is not yet possible satisfactorily to subdivide this period chronologically; and the usual practice of treating it under the different departments of literature is therefore adhered to.

A. Belles Lettres.—(1) *Epic Poetry.*—The Hindus possess two great national epics, the *Mahābhārata* (q.v.) and the *Rāmāyana* (q.v.). Along with these may be classed the *Purāṇas* (q.v.), which, although, in their present form they were doubtless composed or recast for sectarian purposes several centuries after Christ, seem to contain a considerable amount of genuine old legendary matter akin to large portions of the *Mahābhārata*. Though the final redaction of that epic can scarcely be assigned to an earlier period than the early centuries of our era, it is clear that the vast mass of legendary lore and epic lays of which the *Mahābhārata* is composed must have required centuries to grow and assume its present shape. At a subsequent period, from about the 4th century A.D. onwards, there are extant epic poems of a different character; their literary affinity is with the *Rāmāyana*, especially in its later portions, which reveal in embryo their essential features. Whilst the old poems are composed in easy, natural language, such as might well have formed the living though cultured language of the people, these later works are

evidently the artificial product of an age when the literary language had long lost touch of the popular speech. Their subject-matter, such as there is, is entirely derived from the old legends; but the form in which it is here presented has nothing of the old popular ring about it—elaborate metres, long and complicated compounds, and elaborate figures of speech through which the epic narrative hardly progresses at all being the characteristic features of most of these productions, built up in accordance with a narrow code of rhetoric. They are nevertheless replete with poetic thoughts and genuine artistic feeling, which only require a less artificial form of presentment to please even the Western taste. Of such poems (*kāvya*) there existed a considerable number. The oldest extant are, curiously enough, two Buddhist epics, composed by the great philosopher and dramatist, *Aśvaghoṣa* (2d century A.D.), the *Buddhacharita* and the *Saundarānanda*. Though already marked by the characteristics of the *kāvya*, they are much less elaborate than even those of *Kālidāsa*, who manifestly was influenced by his predecessor. Indian taste has singled out six of them as *mahākāvya*s or great poems—viz. two by *Kālidāsa* (q.v.), by far the greatest poet of this period, the *Raghuvamśa* and the *Kumārāsambhava*; further the *Kirātārjunīya* by *Bhāravi* (probably about 600 A.D.); the *Śiśupālavadha* by *Māgha* (about 700 A.D.), hence also called *Māghakāvya*; the *Rāvaṇavadha* or *Bhaṭṭikāvya*, composed by *Bhaṭṭi* before 650 A.D. with the view of illustrating the less common grammatical forms of speech; and the *Naishadhiya* of *Śrī Harsha* (12th century).

(2) *Lyric, Descriptive, and Didactic Poetry.*—In this class of poetic production the highest rank is usually assigned to two poems by *Kālidāsa*—viz. the *Meghadūta*, ‘cloud-messenger,’ where an exiled demigod sends a message of love to his wife by a cloud, to which he describes, in glowing verse-pictures, the places and scenes it will have to traverse, and depicts with true pathos the sorrow of his beloved during their parting; and the *Ritusamhāra*, a description of the seasons. Of high poetic merit, though of a very sensuous character, is also the dramatic lyric *Gitagovinda* (12th century) of *Jayadeva* (q.v.), which describes the love-making of the god *Krishna* among the milkmaids, his separation from, and ultimate reconciliation with, his wife *Rādhā*; and which, like the biblical Song of Songs, is considered capable of being explained in a mystic-allegorical sense. Moreover, scattered over dramas and manuals of rhetoric, or collected in poetic anthologies, there are extant thousands of single stanzas, composed with the view of depicting some striking local scene or emotional sensation. They may be compared to our sonnets, being like them artificial productions, often composed with remarkable skill and neatness, and inspired by genuine poetic feeling. Didactic poetry, in Indian literature, takes chiefly the form of moral maxims, or sententious truths, expressed in single stanzas. There are a number of collections of such stanzas, intended to serve as manuals of ethical and social science, the best known of which are the *Rājatarīnginī*, ‘collection on the conduct of kings,’ ascribed to *Chāṇakya*; the *Kāmandakīya-Nītisāra*, by *Kāmandaki*; and the *Nītisataka*, ‘century (of stanzas) on ethic science,’ by *Bhartṛhari*, who also wrote two centuries of erotic and devotional verses. To render moral instruction more attractive to the youthful mind, sententious verses of this kind were also combined with humorous stories and fables.

(3) *Fables, Fairy Tales, and Romances.*—The beast fable, inculcating moral lessons, was early popularised in India by the *Tantrākhyāyika*, of

which the famous *Panchatantra* (q.v.) and the very popular *Hitopadeśa* are versions. These works are in prose, interspersed with maxims in verse either expressing in pithy form moral principles or summing up the point of the story in a form easy to remember. A famous early collection of fairy tales, the *Bṛihatkaṭhā* of Guṇādhyā (? 4th century) written in Pāṣāṇī Prākṛit—whether in prose or verse is disputed—is represented in Sanskrit by three versions, one, found in Nepal, by Budhaśvāmin, and two in Kashmir, derived from a common source which considerably altered the original, the *Bṛihatkaṭhāmanjarī* of the polymath Kshemendra, and the *Kaṭhāsaritsāgara* of Somadeva, both of the 11th century and written in verse. Other well-known collections are the *Vetālapanchavimśati*, 'twenty-five tales of a vampire,' recounted to the legendary king Vikramāditya; the *Siṃhāsanaadvātrīṃśikā*, 'thirty-two tales told by the lion-throne' of that king; and the *Sukasaptati*, 'seventy tales told by a parrot' to dissuade his mistress in her husband's absence from rash adventures. These three are in prose and of no great length. Their style is on the whole simple, and in this respect they contrast greatly with the prose romances extant, of which the oldest is probably the *Daśakumāracharita*, 'adventures of ten princes' by Daṇḍin (c. 600), a work in the picaresque manner of considerable force and power. Much more complicated in style are the *Vāsavadattā* of Subandhu (c. 625) and his contemporary Bāṇa's *Kādambarī*, though Bāṇa's skill in depicting passion and pathos is undoubted. A variety of this form of literature is the *Champū*, in which verse and prose are intermingled, as in the *Damayantīkathā* of Trivikrama Bhaṭṭa (c. 915).

(4) *History*.—The Brahmanical outlook on life, which saw in the material side of existence nothing that could endure, the lack of vital national happenings in Indian history, the naïve belief in the reality of the heroes of the epic, combined to divert the mind of Sanskrit writers from historical research. Besides inscriptions, numerous and often valuable, there is little of importance. Bāṇa's *Harshacharita*, despite much brilliance of description, contains very little history, in striking contrast with the full account of Harsha given by the Chinese pilgrim Hiuen T'sang. It is written in ornate prose, while verse is used by Padmagupta in his *Navasahasāṅkacharita*, written in honour of Sindhurāja of Dhārā in the 10th century, and Bilhana's *Vikramāṅkacharita* (c. 1050) celebrating the Chālukya prince Vikramāditya VI. Much more ambitious is the great chronicle of the kings of Kashmir, the *Rājataranginī* of Kalhana (c. 1150); but Kalhana is not concerned so much to narrate facts as to inculcate by the record of the rise and tragic fall of dynasties the supreme truth of the essential fact of resignation.

See A. A. Macdonell, *Sanskrit Literature* (1900); M. Winternitz, *Geschichte der indischen Litteratur*, vol. iii. (1923); A. B. Keith, *Classical Sanskrit Literature* (1923).

(5) *Drama*.—None of the existing plays are probably older than the 2d century of our era, and at one time the theory of Greek influence, through the New Comedy or the Mime, was in vogue. There is, however, reason to believe that, as in Greece, drama arose from religion, for Patanjali (q.v.) records the dramatic representation of the struggle between Krishna and his uncle Kamsa, and it is significant that the earliest dramatic fragments extant are those of plays written to extol the Buddhist faith by Aśvaghosha in the 2d century A.D. The number of extant plays has been greatly increased by recent discoveries in Southern India. Their plots are largely derived from epic legends, or

from the literature of the fable and popular tale, but many farces represent more or less conventionally the life of the people of the cities. The unities of time and place are ignored, and the number of actors is often very large, though the monologue is also a favourite form. Common types are heroic plays (*nāṭaka*), often based on the Rāma legend, and comedies of love intrigue in court circles or in humbler life (*nāṭikā*, *prakaraṇa*). The language is usually of a mixed nature, higher male characters speaking in Sanskrit, whilst women and lower male characters use Prākṛits, stereotyped forms of popular dialects. Plays frequently begin with a prelude in the form of a dialogue between the stage-manager and one of the actors, containing some allusion to the author, and leading over to the opening scene. Two interesting characters of the Indian stage are the *Vīta*, or dissolute associate of the hero, somewhat resembling the parasite of the Greek comedy, and the *Vidāśhaka*, his humorous companion, or *Gracioso*. The oldest extant plays are the thirteen dramas of Bhāsa, perhaps 300 A.D., discovered in 1910 in Travancore. The finest of these is the *Svapna-Vāsavadattā*, but the *Pratijñā-Yaugandharāyaṇa*, *Avimāra*, and *Cārudatta* are all of distinct merit as romantic comedies; the *Bālacharita* is devoted to the early deeds of Krishna, and among his one-act dramas the *Urbhanga*, describing the death of Duryodhana, approaches more nearly than any other extant drama the character of tragedy, which is forbidden by the later rules of drama. On the *Cārudatta* is based the *Mṛicchhakaṭikā*, ascribed to a King Śūdraka, in which the love of a noble Brahmin for a hetaira is cleverly mingled with a revolutionary conspiracy. The greatest of Indian playwrights is Kālidāsa (q.v.; c. 400 A.D.), the author of the *Sakuntalā*, the *Vikramorvaśī*, and *Mālavikāgnimitra*. Next to Kālidāsa, in the estimation of Indian scholars, ranks Bhavabhūti (q.v.; c. 700), likewise the author of three plays—viz. the heroic dramas *Mahāvīracharita* and *Uttararāmacharita*, and the domestic drama *Mālatīmādhava*. He is, however, far less of an artist than his great rival, and his language is much more artificial. Besides these may be mentioned Harshadeva, king of Kanauj (c. 625), the reputed author (or patron) of the *Ratnāvalī*, *Nāgānanda*, and *Priyadarsikā*; Bhaṭṭa Nārāyaṇa, author of the *Veṇīśamhara*; and Krishnamisra (12th century), who wrote the *Prabodha-chandrodaya*, or 'moonrise of Intelligence,' a clever allegorical play, the characters of which consist entirely of abstract ideas—virtues and vices—ranged in two contending armies.

See H. H. Wilson, *Theatre of the Hindus* (1871); S. Levi, *Le théâtre indien* (1890); A. B. Keith, *Sanskrit Drama* (1924).

B. *Scientific Literature*.—The first beginnings of nearly all the branches of scientific inquiry cultivated in mediæval India may be traced back to the later Vedic times, being the natural outgrowth of the Vedic religion and of the study of the sacred writings. This fact indeed receives a direct recognition in the traditional classification itself, inasmuch as it includes among the Vedic literature, under the title of *Vedāṅga*, or members of the Veda, the original or fundamental treatises of six sciences—viz. phonetics (*śikṣā*), prosody (*chhandas*), grammar (*vyākaraṇa*), etymology (*nirukta*), astronomy (*jyotiṣa*), and ceremonial law (*kalpa*). Though some of these treatises, in their present form at all events, cannot justly lay claim to so high an antiquity, it is not improbable that they are based on older treatises on their respective subjects.

(1) *Law (dharma)*.—The earliest attempts at an orderly statement of social and civil usages are to be found in the *Dharmasūtras*, or rules of law,

which form part of some of the Kalpasūtras, or ceremonial rules (see VEDA), in close connection with the Grīhyasūtras, or rules of domestic rites, out of which they may indeed have originally grown. The few extant sets of old Dharmasūtras—viz. those of *Baudhāyana*, *Apastamba*, *Gautama*, and *Vāsisṭha* (all trans. by G. Bühler)—though mainly composed in aphorisms, are interspersed with couplets or stanzas, giving the substance of several rules; and it is in these detached verses that many scholars would trace the first tendency toward the composition of the versified codes of law, the Dharmasāstras or Smṛitis, which, somewhere about the beginning of our era, came to supplant the Sūtra-codes, and remained for centuries the standard authorities on matters of law. Whilst some few of these new codes, like their prose prototypes, appear to have been directly connected with certain Vedic schools, such does not seem to have been the case as regards the vast majority of them, which were called by their authors, more or less fancifully, either after some old semi-mythic teacher or sage, such as Atri, Hārta, Śātātapa, or even after some god, such as Viṣṇu, Brihaspati, Yama. Hindu law usually recognises three distinct divisions—viz. *āchāra*, or established usage and religious observances; *vyavahāra*, or civil and criminal law and procedure; and *prāyaścitta*, or penances. The three most important Smṛitis are those of Manu (q.v.), Yājñavalkya, and Parāśara. This last code lacks, however, the section on civil law, which was only supplied some 500 years ago by the famous exegete Mādḥava, who composed a digest of law, based on Parāśara, with a special chapter on Vyavahāra. The new school of practical jurisprudence to which this work belongs was ushered in by Vijnāneśvara's *Mitāksharā* (11th century), which, though primarily a commentary on Yājñavalkya, constantly quotes other authorities, and thus serves the purposes of a digest of law, and remains to this day one of the standard works on Hindu law. Amongst other famous digests may be mentioned Lakṣmīdhara's *Smṛitīkalpitaru* (c. 1125); Devaṇabhaṭṭa's *Smṛitichandrikā* (c. 1200), highly esteemed in Southern India; Jimātavāhana's *Dāyabhāga* (15th century), the chief authority on inheritance in the Bengal school; the *Vṛamirodaya*, by Mitrāmīśra (c. 1625); and the *Vyavahāramayūlaka*, being the civil law section of a general digest by Bhaṭṭa Nilakaṇṭha (c. 1640).

(2) *Philosophy*.—While the main body of the Vedic hymns is the immediate outgrowth of a worship of the elemental forces of nature, not a few of the hymns, especially the later ones, evidence a strong tendency towards metaphysical speculation. It is only in the Upanishads (see VEDA), however, that we meet with the first attempts at some kind of systematic treatment of the great problems of mundane existence, and of the nature of the absolute spirit and its relation to the human mind. The drift of speculative inquiry in those days, as ever afterwards, is determined by two cardinal notions which are seldom questioned, and have assumed the force of axioms in Hindu philosophy—viz. the pantheistic notion of the spiritual unity of all sentient beings, and the transmigration of souls. Though of different origin the two views coalesce, the latter notion seeming the necessary consequence of the former. All individual souls are identical in nature, having emanated from, and being destined to return to, the infinite, all-pervading spiritual essence, the Brahman or Ātman. The apparent difference of the spiritual element in different kinds of animated beings (elemental gods, men, demons, animals, plants) is due to a greater or less degree of contamination with matter, and consequent obscuration; and it is only by a gradual process of

improvement and purification, in repeated terms of bodily existence—i.e. through metempsychosis—that lower beings can raise themselves to the state of purity requisite for their union with the Supreme Spirit (*paramātmā*). Ignorance of its own real nature, and of its identity with the world-soul, is what alone keeps the individual soul chained to matter, and to material existence with its hateful accompaniment of passion and suffering. To dispel this ignorance by setting forth the true relations between the individual being and the Brahman, as a preliminary to final emancipation, is the task and aim of philosophy.

Six philosophical systems (*darśana*) are recognised as orthodox by Hindus, which fall, however, into three pairs so closely connected that each pair forms a common school of philosophy—viz. *Mīmāṃsā* and *Vedānta*, *Sāṅkhya* and *Yoga*, *Nyāya* and *Vaiśeṣika*. Nothing certain is as yet known as to their date or order. The tenets of each system are propounded in a manual of concise aphorisms (*sūtra*), ascribed to the respective founder, and commented upon by numerous writers.

The *Mīmāṃsā*—or properly *Pārva-Mīmāṃsā*, 'Prior Inquiry'—is mainly a systematic exposition of the principles of scriptural interpretation. Its chief object is to maintain the authority of the Veda, and to urge the necessity of performing the duties enjoined therein, especially those of a ceremonial kind, with a view to securing the benefits, temporal and eternal, accruing from these meritorious works as the logical effect of an operative cause. A philosophical basis is secured for these dogmatic theories by the inclusion of verbal communication (*śabda*) among the five or six sources of knowledge, or modes of proof, agreed upon by both schools of the *Mīmāṃsā*. The sage Jaimini is the reputed founder of this school, and author of its fundamental *sūtras*, which were afterwards commented upon and supplemented so as to cover the field of metaphysics by Śabara Svāmīn (? c. 400 A.D.), Prabhākara (c. 600), and Kumārila Bhaṭṭa (c. 700).

The *Vedānta*, i.e. 'end of the Veda'—as the *Uttara-Mīmāṃsā* ('Later Inquiry') is more commonly called—is the system most closely in accord with the development of religious thought in Brahmanical India. In its main features it simply formulates and carries on the speculations of the older Upanishads. According to this system, God is the omniscient and omnipotent cause, efficient as well as material, of the world: He is both creator and nature; and at the consummation of things all are resolved into Him. The individual soul is of the same essence as the supreme one; it emanates from Him like one of the sparks that issue from a blazing fire, and ultimately returns to Him. It is not a free agent, but ruled by God; its activity—the source of its suffering—being solely due to its bodily organs. Whilst the evolution of the elements and organised bodies is minutely expounded in the original aphorisms—the *Brahma-sūtras* of Bādarāyana—the questions as to the *raison d'être* of material existence and the origin of evil find no satisfactory explanation. It is only by a later school of Vedāntists, represented by the *Kārikās* of Gauḍapāda (c. 700) on the late *Māndūkya Upanishad*, and by the famous theologian Śaṅkara Āchārya (q.v.), in his commentary on those *sūtras*, that a solution is found in the theory that the material world has no real existence, but is a mere illusion (*māyā*). This school is called the *Advaita*, or non-duality, school of Vedānta philosophy; its origin can be traced to certain passages in the Upanishads, and it was powerfully affected by the nihilistic views of Mahāyāna Buddhism. In opposition to it arose two other schools, both of which identify the supreme spirit with Viṣṇu—

viz. that of Rāmānuja (c. 1100), the founder of the Śrī-Vaiṣṇava sect, usually called the *Viśiṣṭādvaita*, or school of 'the non-duality of that which is qualified,' because they allow the Brahman to be 'qualified' by all good qualities, and to be 'distinct' from matter; and the school of Madhva Achārya (13th century), called the *Dvaita*, or duality, school from their maintaining the supreme spirit to be distinct both from man and from matter. These schools in fact show a certain leaning towards Sāṅkhya doctrines. The Rāmānujas and other Vaiṣṇava sects—especially the one founded by Chaitanya (c. 1500)—have, moreover, grafted on the Vedānta the doctrine and practices of *bhakti* (implicit faith, fervent devotion), which had early found expression in works such as the famous philosophic episode of the *Mahābhārata*, the *Bhagavadgītā* (trans. by J. C. Thomson and by K. T. Telang), and the *Bhāgavata-Purāṇa*, and are formulated in the late *Sāṅḍilya-Bhakti-Sūtra* (trans. by E. B. Cowell). In the system of Vallabha (c. 1500) *bhakti* is degraded into sensual love.

The *Sāṅkhya* system, as propounded in the *Sāṅkhya-sūtras* ascribed to Kapila, represents the realistic school of orthodox Indian philosophy. The *sūtras* are late (c. 1500), and the system appears in almost complete form in the *Sāṅkhya-Kārikā* of Gauḍapāda (4th century). It is apparently a development of ideas implicit in the *Kaṭha Upanishad*, where, however, the individual spirits are evolved, like matter, from the absolute self. Its influence on Buddhism is much discussed without clear results. It often appears in the *Mahābhārata*, where, however, there is a tendency to fuse it with Vedānta doctrines, and in the later Vedānta texts, such as the popular *Vedāntasāra* of Sadānanda (c. 1500), much of its detail is worked into that system. It maintains the eternal co-existence of a material first cause—the *mūla-prakṛiti*, or prime originant (plastic nature); also called *pradhāna*, or 'principal (cause)'—and a plurality of spiritual entities or selves (*puruṣa*). From the material first cause, devoid of intelligence, the phenomenal universe has been developed by a process of unconscious evolution. Consciousness arises from connection of the spirits with nature, which involves them in misery, and disappears with the recognition of the real separateness of spirit and matter. The school, since it does not admit the existence of an intelligent ruler (*īśvara*), is often called 'godless' (*nirīśvara*). The most popular summary of the doctrines of this system is the *Sāṅkhya-sāra* (trans. by H. J. Colebrooke, and by J. Davies), by Vijnāna Bhikṣhu (16th century).

The *Yoga* school, whose *sūtra* is ascribed to a Patanjali, perhaps of c. 300 A.D., accepts the speculative system of the Sāṅkhya with its twenty-five principles; but adds thereto a twenty-sixth—viz. the '*nirguṇa Puruṣa*' ('the self devoid of attributes'), the supreme god of the school, whence the *Yoga* (originally 'practice' as opposed to Sāṅkhya, 'reasoning') is also called the Theistic (*śeṣvara*) Sāṅkhya. Moreover, the school has developed, as its most characteristic feature, a complicated system of ascetic practices for the mortification of the senses, with a view to bringing about, even during life, the isolation of the spirit from matter, which in this system represents the transformation of the more popular idea of a spiritual union with the supreme spirit.

The *Nyāya* and *Vaiśeṣika*, though differing from each other on some important points, such as the number of the modes of proof, came in the 11th century to be considered as two branches of a single analytical system of philosophy which supplement each other and are commonly studied together. The *Nyāya* (lit. 'method,' 'rule'), ascribed to a probably mythical Gotama (or Gautama, also

called Akṣhapāda), though, like the other systems, it professes to deal with the whole round of metaphysical subjects necessary for complete knowledge and final emancipation, is especially remarkable for the very complete system of dialectics which it has developed, and which has gained for it the title of the Hindu science of logic. Originally a simple system of argument from particular instances, it is later developed into a complex doctrine of the nature of universals. A regular argument, or complete syllogism (*nyāya*), according to this system, consists of five members—viz. (a) the proposition (*pratijñā*): e.g. 'this hill is fiery'; (b) the reason (*hetu*): 'for it smokes'; (c) the instance (*uddharana*): 'as a culinary hearth'; (d) the application (*upanayana*): 'accordingly the hill is smoking'; (e) the conclusion (*niḡamana*): 'therefore it is fiery.' The *Vaiśeṣika* system, ascribed to a legendary Kaṇāda, also called Kāśyapa, whilst on the whole accepting the analytical principles of the *Nyāya*, occupies itself more especially with the physical or cosmic aspect of metaphysics; its name being probably derived from the assumption of atoms (*anu*), or ultimate substances possessed of separate individuality (or 'particularity,' *viśeṣa*), which are innumerable and eternal, and of which the phenomenal world is composed, rising out of them and periodically being resolved into them. Their aggregation, according to the original view of the school, is caused by an invisible force (*adṛiṣṭa*), the effect of the actions of spirits in past lives, whilst at a later stage it is ascribed to a supreme soul (*paramātman*), distinct from the individual souls (*jīvātman*) forming the immaterial atoms. The systems were developed by the 4th century A.D., and may be considerably older; Greek origin for both their logic and atomism has been suggested. By Dignāga (c. 400 A.D.) and later Buddhist writers very considerable advance was made in developing a profound and quasi-Kantian theory of knowledge. Both schools, originally atheistic or recognising a deity only formally, became later strongly theistic.

Of heterodox systems of philosophy—besides those of the Jains (q.v.) and Buddhists (q.v.)—only one deserves special mention—viz. the *Chārvaṅkas*, or *Lokāyatikas* ('materialists'). The doctrines of this school, traditionally ascribed to Brihaspati, admit but one source of knowledge and proof—viz. perception. According to them there is neither a supreme spirit, nor a future life, nor a soul distinct from the body; and the sole end of man is enjoyment derived from sensual pleasures.

A kind of mystic philosophy—in the sense in which the peculiar practices of the *Yoga* are regarded as such—underlies the doctrines promulgated by the Tantras, the religious text-books of the numerous sects of *Sāktas*—i.e. worshippers of the *śakti*, or active divine energy, personified in some female deity, especially in one of the many forms of Pārvatī, the wife of Śiva. In its origin a relic of primitive savage beliefs, the worship of the female principle as a means of obtaining transcendental powers came to receive philosophical support in the Sāṅkhya notion of the *prakṛiti* (fem.) or plastic material principle as the prime cause of the universe; and considering that this form of belief is referred to amongst the heterodox doctrines contended against by Sankarāchārya (c. 800 A.D.), it would seem to be of tolerable antiquity. The form in which it is inculcated in many of the Tantric writings is grossly licentious. The number of original Tantras is usually fixed at sixty-four. The best-known works of this class are the *Rudrayāmala*, *Kulārṇava*, *Syāmārahasya*, and *Kālikātantra*.

The best Indian survey of the Indian systems (except *Mīmāṃsā*) is Mādhava's *Sarvadarśanasamgraha* (trans.

by E. B. Cowell and A. E. Gough); see F. Max-Müller, *Six Systems of Indian Philosophy*; S. Radhakrishnan, *Indian Philosophy*; A. B. Keith, *Sāṃkhya System*, *Indian Logic and Atomism*, *Karma-Mīmāṃsā*.

(3) *Grammar (vyākaraṇa)*.—Grammatical research in India probably goes back to nearly as early times as the redaction of the Vedic hymns. The work traditionally accepted as the Vedāṅga-treatise in this science—viz. the *Aṣṭādhyāyī*, 'eight chapters' of aphoristic rules, by Pāṇini (q.v.)—marks the very highest point of its development, and would seem to presuppose a long period of growth. To the same author is ascribed the original treatise of another Vedāṅga—viz. phonetics (*śikṣā*), treating of the nature of the letters and accents, and the proper mode of sounding them. To this latter branch of science have to be referred the *Prāṭisākhya*s, elaborate treatises on the phonetic changes undergone by words in the connected form of the Vedic texts. Such treatises are in existence for all the Samhitās, except the *Sāmaveda*; those of the *Rik* and *Atharva* being ascribed to Śaunaka, that of the *Vājasaneyi-samhitā* to Kātyāyana, whilst the author of the *Taittirīya-prāṭisākhya* is unknown. Whether these works are in whole or part anterior or posterior to Pāṇini is still doubtful. Here must also be mentioned the oldest work on etymology and Vedic interpretation, Yāska's *Nirukta*, which is older than Pāṇini's grammar. Pāṇini's rules were partially amended and supplemented in Kātyāyana's *Vārtikas*, which on their part were critically examined by Patanjali (2d century B.C.) in his *Mahābhāṣya*, 'great commentary.' So minute and complete was the grammatical analysis of the language presented in these works that the efforts of subsequent authors of grammars were mainly directed towards the best rearrangement of the linguistic matter for practical educational purposes. The most important of these grammars, forming the text-books of special grammatical schools, are the *Chāndra-vyākaraṇa*, by Chandra-gomin of Kashmir (c. 600 A.D.); the *Kātantra*, by Sarvavarman (? 4th century), the text-book of the Kālāpa or Kaumāra school; the *Jainendra-vyākaraṇa* of Pūjyapāda Devanandin (c. 678); the *Sākātyāyana-vyākaraṇa* (c. 850); the *Samkshiptasāra* of Kramadīśvara; the *Sārasvatī prakriyā*, by Anubhūti-svarūpachārya; the *Haima-vyākaraṇa*, by Hemachandra (12th century); the *Mugdhabodha*, by Vopadeva (13th century); and the *Siddhānta-kumudī*, by Bhaṭṭoji Dikṣita (17th century).

(4) *Lexicography*.—Native dictionaries (*koṣa*), generally composed in verse, are either homonymous or synonymous. In the former the words explained are usually arranged according to the final consonant and then according to the number of syllables they contain. The most famous dictionary (chiefly synonymous), and one of the oldest, is the *Amarakoṣa*, by Amarasimha (c. 550). Of others the most important are Śāsvata's *Anekārthasamuchchaya* (homonymous), Yādavaprakāśa's *Vaijayantī* (c. 1050), Hemachandra's *Abhidhāna-chintāmaṇi*, Halāyudha's *Abhidhāna-ratnamālā* (10th century), and the *Medinī* (c. 14th century). See Th. Zachariae, *Die indischen Wörterbücher* (1897).

(5) *Prosody (chhandas)*.—The privilege of representing this science among the Vedāṅgas is assigned to the *Chhandas-sūtra*, ascribed to Pingala, who is traditionally identified with Patanjali, the grammarian, but is probably rather later in date. But, strange to say, the section of this work treating of Vedic metres is very meagre, whilst the chapter on post-Vedic metres is tolerably complete, and, with a commentary on it by Halāyudha (probably the lexicographer), still forms one of the chief authorities on prosody. Of other important manuals may be

mentioned the chapter on metre in the *Bhāratiya-Nāṭyaśāstra*, the *Vṛttaratnākara*, 'jewel-mine of rhythms,' by Kedarabhaṭṭa (before the 13th century); and the *Chhandomanjarī*, 'cluster of metres,' by Gaṅgādāsa. See Colebrooke, *Misc. Ess.* ii.; A. Weber, *Ind. Stud.* viii.

(6) *Music (saṃgita)*.—The existing treatises other than the chapters in the *Nāṭyaśāstra* on music are of comparatively modern origin. The two most important are the *Samgita-ratnākara*, 'jewel-mine of harmony,' by Śārngadeva, and the *Samgita-darpana*, 'mirror of harmony,' by Dāmodara. These works treat not only of music proper—including the notes, melodies, and measures, singing, concerted music, and instruments—but also of dancing, acting, and mimic representation.

(7) *Poetics (alankāra-śāstra)*.—The theory of poetic composition and the approved forms of literary style has been a favourite subject with Hindu writers; and the result of their labours is a minute classification of the various forms of composition, and an elaborate system of rules regarding the different sentiments and forms of speech applicable to certain characters and conditions of life. Dramatic poetry, as the most varied form of literary composition, usually occupies a large share of the attention of rhetorical writers. The *Bhāratiya-Nāṭyaśāstra* (c. 300) is the most ancient of the existing manuals of this art. The earliest work the date of which has been fairly ascertained is the *Kāvya-darśa*, 'mirror of poetry,' by Daṇḍin (c. 600); Bhāmaha is rather later. About 800 there developed a subtle doctrine of suggestion (*dhvani*) as the soul of poetry, and this was developed by Anandavardhana (c. 850) and Abhinavagupta (c. 1000). Of other works on poetics generally may be mentioned the *Kāvya-prakāśa*, or 'lustre of poetry,' by Mammata (c. 12th century), and especially the *Sāhitya-darpana*, or 'mirror of composition' (trans. in *Bibl. Ind.*), by Viśvanātha Kavirāja (15th century), the standard authority on literary criticism. The favourite manual of dramaturgy is the *Daśarūpa*, 'ten forms' (of plays), by Dhanañjaya (c. 10th century). See S. K. De, *Sanskrit Poetics* (1923-25).

(8) *Medicine (āyurveda, vaidyaśāstra)*.—The oldest systematic treatises on medical subjects are the *Samhitās* of Charaka and Suśruta (? 2d century), both composed in verse mixed with prose sections, and characterised by great diffuseness; they are largely interpolated and rewritten. The *Bhela-samhitā* is of uncertain age. Of later handbooks of medical science may be mentioned Vāgbhaṭa's *Aṣṭāṅga-hṛidayā* and Bhāvamiśra's *Bhāvaprakāśa*; whilst the *Rājaniḡhaṇṭu*, by the Kashmirian Narahari, is the most approved manual of materia medica. See T. A. Wise, *Commentary on Hindu Medicine* (1845), and *History of Medicine* (vol. i. 1867); J. Jolly, *Medicin* (1901).

(9) *Astronomy and Mathematics*.—Astronomy appears as one of the Vedāṅgas, or members of the Veda; and the treatise which has been handed down as such in the *Rik* and *Yajus* recensions—viz. the *Jyotiṣa*—presents indeed a comparatively primitive appearance, as it knows only a cycle of five years, each of 365 days, and mentions neither the zodiac nor the planets. Much the same phase of knowledge is represented by some other works, such as the *Gārgī Samhitā* (? c. 50 B.C.). A new scientific era, brought about by a knowledge of Greek astronomy, commenced about 250 A.D., and gave rise, in the first place, to five works called *Siddhānta* (*Sūryasiddhānta*, &c.), summarised in Varāhamihira's *Panchasiddhāntikā* (c. 550), and later on to the standard works on astronomy—viz. Āryabhaṭa's *Āryabhaṭīya* (c. 500), Varāhamihira's *Bṛihat-samhitā*, Brahmagupta's *Brāhma-Sphuṭa-siddhānta* (c. 625), and Bhāskara Aśhārya's *Sid-*

dhāntasīromani (1150). In the field of mathematics the greatest writers are Āryabhaṭa, Brahmagupta, and Bhāskara in his *Līlāvati* (arithmetic) and *Bījaganita* (algebra). The Indian origin of decimal notation is probable, but disputed; their algebraical discoveries were of considerable note. See G. Thibaut, *Astronomie, Astrologie, und Mathematik* (1899).

Sanson. See EXECUTION.

Sansovino, ANDREA CONTUCCI DEL MONTE, Florentine sculptor, was born at Monte Sansovino in 1460. He worked in Florence, Portugal, Rome, and Loreto. He died in 1529. See *Life by Schönfeld* (1881).—His pupil, JACOPO SANSOVINO or TATTI (1486–1570), sculptor and architect, was born in Florence, and lived from 1527 in Venice.

Sans Souci. See POTSDAM.

San Stefano, a village 6 miles W. of Constantinople, where was signed (3d March 1878) the preliminary Russo-Turkish agreement.

Santa Ana, an important town of Salvador, capital of the province of the same name, 40 miles inland, with trade in coffee, cigars, sugar, and cattle. There is a fine town-hall, and an important fair is held annually. Pop. 70,000.

Santa Ana, ANTONIO LÓPEZ DE, president of Mexico, was born in Jalapa, 21st February 1795. At the age of fifteen he entered the Spanish army, and served against his countrymen until 1821, when he joined Iturbide, who made him brigadier and governor of Vera Cruz. Iturbide had established an imperial rule over Mexico (q.v.), but in 1822 Santa Ana proclaimed a republic, and brought about his patron's downfall. In 1828 he headed a rising which placed Guerrero in the presidential chair; and in 1829 he defeated and captured a division of Spanish troops which had landed near Tampico, with the view of again bringing Mexico under Spanish rule. He now engaged in a series of intrigues which culminated in an open revolt against the president, Bustamente, in 1832, and his own election. Santa Ana, however, desired power without responsibility for the irksome details of government, and he retired to his country seat, leaving the executive in the hands of the vice-president; and when he ceased to be able to control this lieutenant, in 1834 he headed a rising against him, and had him deposed in 1835, and another appointed in his stead. But Santa Ana's reactionary policy, which reduced the states to provinces and placed all the power in the hands of the central government, in 1836 cost the country Texas (q.v.). He invaded the revolted province with 6000 men, and defeated and massacred his opponents with unbroken success until April, when he was routed at San Jacinto by Houston, and soon after taken prisoner. He escaped with eight months' imprisonment and a short detention in the United States; but at home his influence was not restored until, luckily for him, in 1838 the French attacked Vera Cruz, and in the gallant defence of the city he lost a leg. He was now encouraged to renew his intrigues, which were again successful, and from 1841 to 1844 he was either president or the president's master. Then there was a revolution on the other side, the army deserted him, and he fled towards the coast, but was arrested, imprisoned for a time in 1845, and ultimately permitted to retire to Havana. From this exile he was recalled in 1846 to be first commander-in-chief and then president. The war with the United States had begun, and begun badly: Palo Alto and Resaca had been lost, and in September Monterrey fell. In February 1847 Santa Ana, who had brought together some 20,000 men, attacked Taylor's weakened force of 5000 at Buena Vista; but the narrow pass and the strength of the American artillery were fatal

to him, and he was repulsed with heavy loss. At Cerro Gordo, in April, Scott defeated him and took 3000 prisoners. Santa Ana retired on the capital, but when its fall became certain he resigned the presidency and withdrew from the city by night. He was allowed to retire to Jamaica in 1848, but was recalled by a revolution in 1853, and appointed by an obedient congress president for life, with the title of Most Serene Highness. His harsh rule quickly produced a number of revolts, and in 1855 he was driven from the country, finally finding a refuge in St Thomas. On the establishment of the empire under Maximilian he was permitted to return on condition of his not interfering in political affairs; but he could not refrain from intriguing for himself and issuing the old proclamations, and so before long Bazaine sent him back to St Thomas. Even the appointment of grand-marshal of the empire could not keep him faithful, and a second conspiracy against Maximilian ended in another flight. He now vainly endeavoured to obtain employment against the empire, and in 1867, after the emperor's death, tried to effect a landing at Sisal, but was captured, tried by court-martial, and sentenced to death. Juárez, however, pardoned him on condition of his leaving Mexico; and the old man spent the succeeding years mainly on Staten Island, New York, in conspiring, cock-fighting, and card-playing, until a general amnesty in 1872 enabled him to return to his own country. There, disregarded and harmless, he died in the capital, 20th June 1876.

Santa Barbara, a health resort of California, is situated on the Pacific coast, 90 miles WNW. of Los Angeles. It is the centre of an important farming and fruit district, while petroleum wells and fisheries are also valuable. The old Franciscan Mission, rebuilt after an earthquake in 1786, was with other buildings again damaged by earthquake in 1925. Pop. 20,000.

Santa Caterina Villarmosa, a town in the centre of Sicily, 9 miles NW. of Caltanissetta, with sulphur-mines and manufacture of earthenware. Pop. (1921) 8716.

Santa Catharina, a southern coast state of Brazil, with an area of 20,785 sq. m. and a population of 668,743. The coast is very irregular, the interior mostly a plateau sinking gently to the west. The climate is not unhealthy, but moist. The industries are mainly in the hands of the very numerous German settlers, who maintain the use of their language and customs. The capital is Florianopolis (35,000), a port of call, on the hilly, fertile island of Santa Catharina (210 sq. m.).

Santa Clara, a province of Cuba, has a flourishing trade in coffee, tobacco, rice, cocoa, fruit, and some mining; area, 8257 sq. m., and pop. 692,000. The inland town, Santa Clara, its capital, is in the centre of rich farming and grazing country, with factories of high-class tobacco; pop. 20,000.

Santa Claus. See NICOLAS (St.)

Santa Cruz, or SAINTE CROIX, (1) one of the Virgin Islands, sold by Denmark to the United States (1916–17), with an area of 84 sq. m. and a population of 15,000. Sugar-growing and cattle-rearing are the chief industries; the capital is Christiansted, the chief port Frederiksted. Discovered by Columbus (1493), the island was held by Dutch, English, Spanish, French, and the Knights of Malta at various dates, and was bought by Denmark in 1733.—(2) The largest (area, 216 sq. m.) of a group of Melanesian islands, sometimes called Queen Charlotte Islands, east of the Solomon archipelago and 100 miles N. of the New Hebrides.—(3) Santa Cruz de Tenerife, capital of the Canary

Islands (q.v.), and the chief seaport of the group, stands on the north-east side of the island of Tenerife. Its port, enlarged and improved, is protected by moles, affords excellent anchorage, and is much resorted to by steamers for re-coaling. Santa Cruz is a closely-built town, with houses of the Spanish style, flat-roofed and with square patios, and is defended by forts and redoubts. It is the seat of a bishop and the headquarters of the Spanish governor; it has an observatory, a technical institute, and a naval school. Pop. 52,500. See BLAKE (ROBERT), under date 1657, and NELSON (1797).—(4) Santa Cruz de la Palma is the capital of Palma, another of the Canary Islands (q.v.), with an important harbour; pop. 7300.—(5) A southern territory of the Argentine Republic, between 46° S. lat. and Cape Dungeness, and stretching from the Atlantic to the watershed of the Andes. Area, 109,142 sq. m. It is a land of desolate plateaus, with little water and scanty pasturage, where, however, thousands of wild horses range.—(6) A province of Bolivia, with rich forest and mineral resources; cattle-rearing and agriculture are carried on; area, 144,941 sq. m., and pop. 345,000. Santa Cruz, founded 1592, the capital of the province, has an observatory, a national college, a geographical institute and law-courts; pop. 20,000.

Santa Fé, a wealthy province of the Argentine Republic, stretching north from Buenos Aires to 28° S. lat., and so embracing a considerable portion of the Gran Chaco. Area, 50,713 sq. m.; pop. 1,007,000. The province is well watered by the Paraná and its tributaries. Wheat, maize, and lucerne are grown in large quantities, and the pasture-land is very rich. Cattle-breeding is carried on. The largest town is Rosario. The capital is Santa Fé, on the Río Salado, which exports chiefly cereals, timber, and quebracho. There are two large docks for ocean-going steamers, and a university (1920). Pop. 60,000.

Santa Fé, the capital of New Mexico, is built among the Rocky Mountains, 6840 feet above the sea, and 1327 miles by rail WSW. of Chicago. The climate is very dry, so that irrigation is necessary for agriculture; and most of the houses are built of *adobe*. There is some mining in the vicinity. A School of American Research (1907) occupies the old Spanish governor's palace. Pop. 7000.

Santalaceæ, a family of dicotyledons, mostly trees and shrubs, semiparasitic. The leaves are undivided, sometimes minute. The European and most of the North American species (chiefly Thesium) are obscure weeds, whilst the trees of the family occur chiefly in the East Indies, Australia, and the South Sea Islands. Sandalwood (q.v.) is the produce of plants of this family. The leaves of *Osyris arborea* are used for tea. Some species are used in medicine in their native countries. *Fusanus acuminatus* is the Quandang Nut of Australia. Its taste and qualities resemble those of Sweet Almonds, as do also those of the seed of the *Cervantesia tomentosa* of Peru. *Pyrularia pubera*, the Buffalo Tree or Oil Nut, has a large seed, from which, in the southern states of America, oil is obtained.

Santalin, or **SANTALIC ACID**, the colouring matter of red Sandalwood (q.v.).

Santals, an aboriginal tribe of India, belonging to the Kolarian family, occupy a long narrow strip of country between the mouth of the Mahanadi in Orissa and the Ganges near Bhagalpur. In 1921 the total number of persons speaking Santali was 2,265,282, including Christian converts, and 100,000 Santals labouring in the Assam tea-plantations. They are fond of change, and prefer to live on the edges of the great forests: when the

ground gets well cleared and cultivated they move to a new site. In personal appearance they are not unlike negroes, having a broad round face, a broad flat nose, a large mouth with projecting lips, and coarse black hair. Their chief occupations are cultivating the soil, hunting, playing the flute (in which they are great proficient), and dancing round dances. They worship the sun for their supreme god, and after him a number of malignant spirits, whose evil influence they seek to avert. They are divided into twelve tribes, and their village government is patriarchal in type. The exactions of the Hindu money-lenders provoked the Santals to revolt in 1854; the rising was not suppressed without a good deal of bloodshed. Since then this people have been allowed to exercise their own forms of self-government, under the supervision of the British authorities. There is a Santal grammar by Skrefsrud (Benares, 1873).

Santa Lucia. See ST LUCIA.

Santa Marta, a town of Colombia, on the Caribbean Sea, was founded in 1525, the second Spanish town planted on the mainland. In 1834 an earthquake almost utterly destroyed the place, which is still, however, a bishop's see, and has an excellent harbour. Huge quantities of bananas are exported. Simón Bolívar died close by in 1830. Pop. 15,000. See also SIERRA NEVADA.

Santa Maura. See LEUKAS.

Santander, a thriving seaport on the north coast of Spain, stands on an inlet of the Bay of Biscay, about equally distant from Oviedo on the west and San Sebastián on the east, and by rail 316 miles N. of Madrid. The bay on which it stands is accessible to the largest vessels at all times. The town occupies a picturesque site, and has a cathedral and municipal library. Among the industries are fisheries, cigar factories, breweries, cotton, paper, and flour mills, iron-foundries, and shipbuilding-yards. The exports include iron ore, zinc, pig-iron, wine, cider, preserved fish and meat, sardines, mineral waters, wool, nuts; and the imports coal, iron and steel goods, tobacco, foodstuffs, codfish, textiles, petroleum, chemicals, timber, &c. In 1893 a ship in the harbour took fire, and the consequent explosion of a cargo of dynamite destroyed quays, whole streets of houses, and hundreds of lives. Santander is a favourite seaside resort in summer. Population, 72,000. There are caves used by prehistoric man some 20 miles away. It was here Charles I. embarked for England after his trip to the Spanish court, and in 1808 the town was sacked by Soult.—The *province*, a mountainous land, with fertile transverse valleys, is the seat of active pastoral, mining (iron, zinc, copper, magnesite, salt), and other industries, such as fish-canning on the coast. Area, 2108 sq. m.; pop. 332,000.

Santarem, (1) capital of the Portuguese province of Estremadura, stands on the right bank of the Tagus, 46 miles NE. of Lisbon by rail. An old Moorish castle, crowning a hill that overlooks the town, was during the middle ages the residence of the kings of Portugal. It has a cathedral and several churches; the kings Diniz I. and Henry died here, and Ferdinand I. lies buried here, as well as Cabral, the discoverer of Brazil. The army of Pedro of Brazil under Napier and Villafior routed here the forces of the usurper Miguel on 16th May 1834. It trades in wine, oil, grain, cork. Pop. 8000.—(2) A town in Para State, Brazil, near the junction of the Tapagos and Amazon. Pop. 5000.

Santa Rosa, capital of Sonoma county, California, on Santa Rosa Creek, 51 miles by rail N.

by W. of San Francisco. It is the centre of an agricultural district, with large dairy interests. Pop. 8700.

Santa Rosa, (1) A mining town of Colombia, in Antioquia; pop. 16,000.—(2) Santa Rosa de los Andes, a town of Chile, in Aconcagua; it is the centre of a cereal and fruit region, while brandy-distilling is carried on; pop. 10,000.

Santayana, GEORGE, American philosopher, was born of Spanish parents at Madrid in 1863, but was educated at Harvard, where he afterwards became for a time professor of Philosophy. In his principal work, *The Life of Reason* (1905), in 5 vols.—*Common Sense, Society, Religion, Art, Science*—he expounds with a lucid style his philosophy, a kind of fastidious Materialism. With Berkeley, he rejects the independence of matter, only considering it in virtue of what is attributed to it by direct contact with ideas. The philosopher delights in the pageant of life, and conceives the life of Reason as a mere romance. His other writings include *Winds of Doctrine* (1913), *Scepticism and Animal Faith* (1923), and a collection of *Selected Poems* (1923).

Santee, a river of South Carolina, is formed in the centre of the state by the junction of the Congaree and Wateree, flows south-east, and empties into the Atlantic Ocean. It is about 150 miles long, and is navigable for steamboats to Columbia and to Camden.

Santerre, ANTOINE JOSEPH, a French revolutionist, who for some time exercised an influence quite out of proportion to his abilities, was born at Paris, 16th March 1752. He followed the trade of a brewer in the Faubourg Saint-Antoine, and his wealth and generosity gave him an immense influence in the district. On the establishment of the National Guard in 1789 he received the command of a battalion, and took part in the storming of the Bastille. During the year 1792 the Jacobin agitators of the faubourgs often met in the brewery of Santerre, and it was there that the *émeute* of the 20th June was preconcerted, on which occasion Santerre marched at the head of the mob who invaded the National Assembly and turned out the Girondists. He also played a conspicuous part on 10th August, when he was made commander-in-chief of the National Guard. He was charged to keep order at the execution of the king, and it was he who bade the drummers drown the king's voice when he essayed to speak to the people from the scaffold. On 30th July he was appointed a general of division in the French army, and marched at the head of 20,000 men against the Vendéen royalists, but was miserably beaten (18th September), and in consequence recalled and imprisoned, and he only obtained his liberty after the death of Robespierre. He then withdrew into private life, and died 6th February 1809. Though he was hugely fond of 'brave words,' and menaced his opponents with all the bellicose grandiloquence of a French revolutionist, he was nearly as soft at heart as he was in the head. See *Life* by Carro (Paris, 1847).

Santhals. See SANTALS.

Santiago, (1) the capital of Chile and of Santiago province, stands in a wide and beautiful plain near the western base of the Andes, 1700 feet above sea-level, and 115 miles by rail ESE. of Valparaíso. The snow-capped cordilleras seem to enclose it on the north and east; while on the east side the picturesque Cerro de Santa Lucia—now ornamented with gardens, statues, balconies, &c.—rises abruptly within the city, some 400 feet from the level of the plain. Through the northern part rolls a small but turbulent stream, the Mapocho, now crossed by five handsome bridges. The city is regularly laid out, with streets comparatively broad, and

tramways in all directions; the Alameda, a magnificent avenue, 2 miles long, lined with trees, is especially beautiful. Some of the houses, however, are of one story only, owing to the earthquakes (the most serious have occurred in 1575, 1647, 1730, 1822, 1835, 1906), though handsome private buildings are becoming every year more numerous. The principal square is the great Plaza Independencia, with the government palaces, and the cathedral and archbishop's palace. The cathedral is a large plain building of brick and stone, but inside it is very richly furnished. On the site of the Jesuit church, burned down in 1863, there stands the monument in memory of the 2000 worshippers who perished in the fire. Other buildings of note are the mint, with the official residence of the president; the law-courts; the Casa Moneda, containing painting, sculpture, and historical relics; the Military Museum; and the National Library. Santiago possesses two universities, the State University of Chile (1743) and the Catholic University (1888). There are also a teachers' training college, schools of agriculture and of fine art, a geographical institute, an observatory, and several good libraries. The suburbs of Santiago are very beautiful, with villas and gardens bright with flowers. The climate is dry and generally agreeable, but the changes of temperature are somewhat trying. The city is of importance as a commercial place, and it has a busy stock exchange. Its manufactures include cloth, ship's biscuits, beer, brandy, &c., and it has also ice, fruit-conserving, and copper-smelting works. Santiago was founded by Pedro de Valdivia in 1541. Pop. (1920) 507,296.—Area of the province, 5893 sq. m.; pop. 685,000.—(2) A province of the Dominican Republic. Cotton, tobacco, coffee, and cacao are grown, and there are some gold mines; area, 1490 sq. m.; pop. 123,000. Its capital, Santiago de los Caballeros, has a pop. of 17,000.—(3) The largest and most populous of the Cape Verde Islands (q.v.); area, 396 sq. m.; pop. 60,000.—(4) An inland town of Panamá; the chief products are indiarubber, rice, coffee, and timber, and there are copper and gold mines; pop. 11,000.

Santiago de Compostela, a city of Spain, formerly the capital of Galicia, stands in a picturesque situation, surrounded by hills, 33 miles S. by W. of Coruña, and 26 by rail NE. of its port, Carril. Here in 835 the bishop of Iria discovered, according to the legend, the bones of St James (San Iago), being guided to the spot by a star, whence Compostela (*campus stellæ* = 'field of a star'); the relics were in 1884 solemnly affirmed by the pope to be still beneath the cathedral. This building, Romanesque in style, was built 1078–1188, and contains some fine sculptures and metal-work. It was the shrine that attracted every 25th July so many thousands of pilgrims in the middle ages, it being an especial favourite with Englishmen. It is now, however, out of repute, and is scarcely ever visited. This fact and the many ruined monasteries give the town a deserted and dreary appearance. Nevertheless it is still an archbishop's see, and has a university (1504). There is some trade in cereals, wool, and fruit. Pop. 26,000. The Spanish spelling is Compostela, not Compostella. See *The Story of Santiago de Compostela*, by Gasquoine Hartley (1912).

Santiago de Cuba, formerly the capital of the island of Cuba, and now the chief town of the eastern department, stands on a bay on the south coast, 475 miles from Havana, and has a harbour, deep, well protected, and fortified. During the Spanish-American War of 1898 Santiago was besieged by the United States forces; the Spanish fleet under Admiral Cervera, which had taken

shelter in the harbour, made a dash out (3d July), but all the ships were sunk or captured. The town surrendered 17th July. It produces sugar, copper, iron ore, cedar, hides, coffee, tobacco, and mahogany, and has a large cathedral. Pop. 70,000.

Santiago del Estero, a north central province of the Argentine Republic, with an area of 55,385 sq. m. and a population of 298,000. Except for a few insignificant sierras, it forms a vast plain, inclining gently from the north-west to the south-east. In the south-west and elsewhere there are great salt marshes. The only rivers are the Salado and Dulce; agriculture (sugar, maize, wheat, lucerne, cotton) depends mainly on irrigation. Cattle-farming is a leading industry.—The capital, Santiago, on the Río Dulce, 630 miles by rail NNW. of Buenos Aires, was founded in 1553, has a national college, a normal school, a racecourse opened 1923, and a pop. of 23,000.

Santipur, a town of Bengal on the Húglí, 43 miles N. of Calcutta. Pop. (1921) 24,792.

Sântis, or **SENTIS**, a mountain on the borders of the Swiss cantons of St Gall and Appenzell, consists of three parallel ridges, separated by deep valleys and connected by lofty saddles. The highest point is 8216 feet above sea-level. There are on the mountain, which commands very beautiful views, an observatory (since 1887) and a hotel.

Santley, **SIR CHARLES** (1834–1922), baritone, was born in Liverpool, and trained as a singer partly in Milan (1855–57). He made his first appearance in England in Haydn's *Creation* in 1857, singing the part of Adam, and up to 1876 appeared regularly in opera. He was even better known from his appearances at concerts and in oratorio. He made tours in America and the Dominions, and in 1892, when he had largely withdrawn from public work, he published *Student and Singer*. Further *Reminiscences* followed in 1909.

Santo Domingo. See **SAN DOMINGO**.

Santonin, $C_{15}H_{18}O_3$, is a crystalline neutral principle extracted from *Santonica*, the latter being defined in the British Pharmacopoeia as the dried unexpanded flower-heads of *Artemisia maritima*, var. *Stechmanniana*. The plant grows in Russia, and belongs to the family Compositæ. Santonin occurs in brilliant white flat crystals, which become yellow on exposure to light, few specimens being colourless unless they have been recently prepared or very carefully kept in the dark. It is odourless, and almost tasteless; practically insoluble in water. Santonin is used in medicine solely as an anthelmintic, and is especially poisonous to the round worm (*Ascaris lumbricoides*), being much less so to the thread-worm (*Oxyuris vermicularis*). The dose is 6 to 20 centigrams (1 to 3 grains) for an adult; it may be given in powder, alone or mixed with sugar, or dissolved in a little olive or castor oil, or as the official lozenge (1 grain in each). It should be used with caution in weakly children. It is excreted in the urine, to which it imparts a deeper yellow colour, changing to red if the urine become alkaline. On colour vision it has often a peculiar effect, the cause of which has never been satisfactorily determined. Objects appear first purple or blue and then yellow, colour vision finally becoming lost.

Santorin, or **THERA**, an island of the Ægean, the southernmost of the Cyclades, 70 miles N. of Crete. It is shaped like a crescent, the horns pointing west; between them lies the island of Therasia. The space so enclosed, 18 miles in circuit, resembles a volcanic crater, and three small islands it encloses (the Kaumenes) are all of volcanic origin. Santorin and Therasia have lofty and precipitous shores (up to 1000 feet) next the

crater; on their outer sides they slope away gradually to the sea, except that in the south-east of the former Mount St Elias rises to 1887 feet. The chief town, Thera or Phera, on the west coast of Santorin, is built in the cliffs of tufa and perched some 900 feet above the water's edge. Excellent wine is grown on the disintegrated volcanic soil. Eruptions have taken place, chiefly near the Kaumenes, in the years 196 B.C., 726 A.D., 1573, 1650, 1707, 1866, and 1925. Interesting prehistoric dwellings, containing pottery and other remains, have been found in the southern half of Santorin. There are also ruins of Greek temples and other buildings. There were important excavations in 1895–98, described in *Thera* (2 vols., Berlin, 1899–1902).

Santos, a port of the state of São Paulo in Brazil, founded in 1546, on the island of São Vicente. Santos has now become the leading coffee port in the world, being the outlet for most of the produce of the São Paulo (q.v.) state. It has modern buildings and splendid avenues, but formerly was very unhealthy. Pop. 114,000.

San Vicente. a town of Salvador, 40 miles NE. of San Salvador. Woollen goods are manufactured, and sugar, coffee, and tobacco are produced. Pop. 30,000.

São Francisco, a large river of Brazil, rises in the south-west part of the province of Minas Geraes, flows north, north-east, and east-south-east to the Atlantic, and in its lower course separates the provinces of Bahia and Sergipe from Pernambuco and Alagoas. Length, 1800 miles; drainage area, 248,000 sq. m. It is navigable as far up as its junction with the Paraopêba, except at three points.

São Luiz, a town of Brazil, capital of the state of Maranhão, situated on an island in the Bay of Maranhão, with a trade in rice, cotton, and sugar; pop. 53,000.

Saône, a river of France, an affluent of the Rhone (q.v.), rises in the dept. of Vosges, in the Faucelles Mountains, flows south-west as far as Chalon, thence south to the Rhone at Lyons. It is joined by the Doubs from the left. Entire length, 282 miles, of which 170 are navigable. Area of basin, 11,418 sq. m.

Saône, **HAUTE**, a department in the east of France, slopes south-west from the southern extremity of the Vosges, whose spurs diversify the north-east. It is watered chiefly by the Saône and its tributaries. Forests abound everywhere (one-third of area), and one-half of the total area is cultivable. The principal natural products are wheat, potatoes, and oats, iron, coal, and salt; and the manufactured, iron goods, glass and pottery, bricks, paper, and cottons. Fruit, especially cherries, is extensively cultivated. There are several mineral springs, the best known at Luxeuil. The arrondissements are Gray, Lure, and Vesoul; and Vesoul is the capital. Area, 2074 sq. m.; pop. (1920) 228,348.

Saône-et-Loire, one of the largest departments of France, part of ancient Burgundy, is bounded on the SE. by the Saône and on the W. by the Loire. The country consists for the most part of fertile plains, separated by rich vine-clad hills. The wines are well known as *vins de Mâcon*. Agriculture, iron and coal mining, and manufactures of cotton fabrics, pottery, iron rails and plates, machinery, engines, glass, &c. are carried on. The cattle are an exceptionally fine breed (white). There are five arrondissements—Autun, Chalon, Charolles, Louhan, and Mâcon; capital, Mâcon. The iron-town of Le Creusot, the pilgrimage resort of Paray-le-Monial, and the once famous abbey town of Cluny are all in this department. Area, 3330 sq. m.; pop. (1920) 554,816.

São Paulo, capital of the Brazilian state of the same name, stands almost 3000 feet high on a wide plain bounded by low hills, 4 miles from the Rio Tiete and 310 by rail W. by S. of Rio de Janeiro. It has a fine situation, is well laid out, and has tramways to the beautiful suburbs. Among the buildings are the old Jesuit college, now the government palace, the bishop's palace, a law college, a magnificent opera-house, and a polytechnic school. São Paulo is the headquarters of the coffee-trade, and four railways connect it with the great coffee districts in the interior. There are cotton-works, and manufactories of tobacco, boots and shoes, gloves, and hats. Pop. (1902) 332,000; (1920) 579,035, including many thousands of Italians and Germans.—The state (area, 112,278 sq. m.; pop. 4,592,188), the most promising in the republic, stretches from the ocean to the river Paraná, and consists of a tropical coast-belt (8 to 80 miles broad) and a temperate elevated region, occupying all the interior, and rising from 1600 feet. The principal ranges are the Serras da Mantiqueira and do Mar, while the rivers are numerous, and many of them of importance. The state produces more than half the world's supply of coffee, more than 3,160,000 acres being under cultivation, while cotton has become also very important. Every kind of agricultural enterprise, however, including cattle-ranching, is undertaken, the other principal crops being tobacco, maize, and vines. There is also a certain amount of mineral wealth, and rubber is grown.

São Salvador, or BANZA CONGO—the former being the Portuguese and the latter the native name—a town of Africa, in the Portuguese province of Angola, 170 miles E. by S. from the mouth of the Congo. A ruined fort and ruins of several churches are the only signs of what was an important town during the 16th and 17th centuries.

São Thomé, a volcanic island of Africa belonging to Portugal, lies in the Gulf of Guinea about 125 miles off the coast of Africa. Its southern extremity almost touches the equator. Measuring 32 miles by 21, it has an area of 360 sq. m.; pop. nearly 60,000, mostly natives. Although it rises to the altitude of 6000 feet, it has the reputation of being very unhealthy. Cocoa is grown, under regulations (1910-11) made necessary by contract-labour abuses; and other products are coffee, rubber, and cinchona. Chief town, São Thomé, on the north-east coast, the seat of a bishop. The island was discovered in 1470, and colonised in 1493 by the Portuguese, to whom it reverted after a Dutch occupation from 1641 to 1844. With the small island of Principe it constitutes a province under a governor.

Sap. See PHYSIOLOGY (VEGETABLE).

Sap, in Military Engineering, is a narrow ditch or trench by which approach is made from the foremost parallel towards the glacis or covert-way of a besieged place (see SIEGE). For Sappers and Miners, see ENGINEERS.

Sapajou, a name sometimes applied to all that division of American monkeys which have a prehensile tail, and sometimes limited to those of them which are of a slender form, as the genera *Ateles* (see SPIDER-MONKEY), *Cebus* (q.v.), &c.

Sapindaceæ, a family of dicotyledons, trees and twining shrubs furnished with tendrils, very rarely herbaceous climbers, the leaves often marked with lines or pellucid dots. They are natives of warm climates, especially of South America and India. Some produce delicious fruits, others are purely medicinal, some again abound in a saponaceous principle, while a few are dangerously poisonous, and still fewer yield wholesome food-

products. The root of *Cardiospermum Halicabum* (Heart-seed) is diaphoretic, diuretic, and aperient, while in the *Moluccas* its leaves when cooked are eaten as a vegetable. The genus *Serjania* is poisonous; and the same poisonous principle resides in the genus *Paullinia*; yet from the seeds of *P. Cupana* Guarana Bread (q.v.) is made. These three genera take the common name of Supple-Jack from the long rambling stems which are cut into lengths for walking-sticks. In the genus *Schmidelia* the same contradictory qualities are exhibited. The Soapberry (q.v.) is the fruit of *Sapindus Saponaria*, the type of the order.

Sapium. See TALLOW-TREE.

Sapodilla Plum, the fruit of *Achras Sapota*, also known as Black-bully, Bally-tree, and Naseberry or Nisberry, a tree of the family Sapotaceæ common in Mexico, Central America, and the north of South America. The bark is febrifugal. The seeds are aperient and diuretic, but an overdose is dangerous. The pulp of the fruit is subacid and sweet, and is much esteemed for dessert in the West Indies. The wood, which is greenish and very durable, is used for shipbuilding. The inspissated resinous latex, called chicle gum, is the most usual basis of American Chewing-gum (q.v.).

Saponification. See OILS, FATS, and SOAP.

Saponin is a vegetable principle contained in various plants, including the *Saponaria officinalis*, or Soap-wort, the *Polygala Senega*, several varieties of *Lychnis*, the fruit of the horse-chestnut, and in *Quillia* bark. It is readily extracted from the root of soap-wort by means of boiling alcohol, which, as it cools, deposits the saponin as an amorphous sediment. It derives its name from its behaviour with water, in which it is soluble in all proportions, yielding an opalescent fluid which froths when shaken like a solution of soap, if even $\frac{1}{1000}$ th part of saponin be present. Its solution, or an infusion of soap-wort, is sometimes employed in place of a solution of an alkaline soap for cleansing the finer varieties of wool from grease. Various preparations for cleaning kid gloves, &c., sold under fancy names, owe their virtues to saponin. It is also employed by aerated water-makers to give apparent body to their lemonade, &c.

Sapotaceæ, a family of dicotyledons, consisting of trees and shrubs, often abounding in milky juice. The leaves are leathery, entire, and without stipules. They are natives of the warmer regions of both hemispheres, but are comparatively rare in Australia, the Cape of Good Hope, North-west Africa, and South America. The most important species from an economical point of view is the Gutta-percha Tree (q.v.; *Dichopsis Gutta*). The substance called *Monesia*, an extract from the bark of *Lucuma glycyphleæ*, employed in France in medicine, is a moderate stomachic excitant, alterative, and mild astringent. The Mammee-Sapota, or American Marmalade, is the fruit of *Lucuma mammosa*, a lofty tree of tropical America and the West Indian Islands (not the Mammee-apple, q.v.). The pulp is luscious, but the kernels abound to a dangerous extent in prussic acid, a very little of one kernel being capable when eaten of causing sickness. The fruit of *Chrysophyllum Cainito* is the Star Apple (q.v.). *C. Roxburghii*, a native of Silhet, also produces a fruit prized by the natives; but neither of these fruits finds much favour with Europeans. The Sapodilla Plum (q.v.) is the fruit of *Achras Sapota*. The flowers of some of the species of *Bassia* (see BUTTER-TREE) are edible; they are eaten raw or cooked in various ways; those of *B. latifolia* yield a strong ardent spirit by distillation. Oil is also expressed from the fruit of some of these, which is used in the

manufacture of soap and as an inferior lamp-oil and lubricant. The seeds of *Argania Sideroxylon*, a Moroccan tree, yield argan-oil, a substitute for olive-oil. *B. butyracea* and *Butyrospermum Parkii*—the latter the Shea Tree of tropical Africa—both yield from kernels of their fruits a fine vegetable-butter. Valuable timbers are produced by some species of this family; one of the Iron-woods (q.v.) is the timber of *Sideroxylon inerme*. The Galimeta Wood of Jamaica is the timber of *Diphotis salicifolia*. The flowers of *Mimusops Elengi*, a native of the East Indies, are powerfully aromatic, and yield a fragrant water by distillation, and the seeds abound in oil which is used by painters. *M. Balata* yields Balata (q.v.; see also BULLET-TREE). Djavi Nuts and Douka Mahogany are got from the tropical African *M. djave*. *M. elata* is the Masseranduba or Milk-tree of Brazil, from which exudes, when the bark is cut, an abundant thick creamy milk, which can be used not only as food, but as glue. Exposed to air, it becomes tough like gutta-percha. The fruit is edible, the timber durable.

Sappan Wood, or SAPANWOOD. See BRAZIL-WOOD.

Sapper, the name given to a private soldier in the corps of Royal Engineers (q.v.).

Sapphire, a gem variety of Corundum (q.v.). All precious varieties of corundum other than those coloured red (i.e. Rubies) are termed sapphire. Colourless stones are called *white sapphire*, yellow stones *yellow or golden sapphire*, and pale pink stones *pink sapphire*. The true sapphire is blue, the most valuable stones being coloured royal blue, velvet blue, or cornflower blue. The so-called *Brazilian sapphire* is a blue variety of the mineral Tourmaline. Sapphire crystallises usually in six-sided prisms, terminated by six-sided pyramids; it is sometimes found embedded in gneiss, but more frequently occurs in alluvial soils. It occurs in Scotland and Saxony, but European sapphires are of no commercial importance. The finest are found in Ceylon; Kashmir and Burma also produce fine specimens; and sapphires are found in Siam, Madagascar, Victoria, New South Wales, Queensland, Tasmania, North Carolina, and Montana. The value depends on quality more than on size, and does not increase with the size as does that of the ruby. One of 165 carats has been sold for £8000. In spite of its hardness it is sometimes engraved. Like the ruby, the sapphire is nearly pure alumina; and genuine sapphires, like rubies, are now made on a commercial scale of ammonia alum fused in the blow-pipe flame. See RUBY, and Herbert Smith's *Gem Stones* (1912).

Sappho, according to Swinburne the greatest poet that ever lived, was born either at Mitylene or at Eresos in Lesbos. She was only six years old when she lost her father Scamandronymus, and she must have flourished about the end of the 7th century B.C., as she was contemporary with Alcæus, Stesichorus, and Pittacus. But little is known with certainty of her life, save that she had a daughter named Cleis, and was acquainted with Alcæus. We are told, with much less certainty, that she fled about 596 from Mitylene to some place of refuge in Sicily, but after some years was again at Mitylene, the centre of a group of girls with a passion for poetry. Her famous plunge into the sea from the Leucadian rock, because Phaon did not return her love, seems to have no historical foundation whatever. The traditional account of her moral character was first assailed by Welcker (1816), who made her a paragon of virtue. This view Bergk and Colonel Mure both attacked, and the progress of the controversy may be seen in the *Rheinisches*

Museum (1857-58). About the much more important question of her genius there can be no doubt whatever. For sincerity, depth of feeling, passion, and exquisite grace of form her lyrics stand alone among the masterpieces of antiquity. Her poems were divided by the Alexandrine scholars into nine books, according to their metres. Till recent times but two of her odes, one to Aphrodite, with a number of short fragments, were known. Most of these were composed in the metre named from her the *sapphic strophe*, rendered familiar from its use by Horace. Since 1879 many fragments and some almost complete odes, discovered in Egypt, have been published.

A standard text is that in Bergk's *Poeta Lyrici Græci*; see also H. T. Wharton's text, with life, translation, &c. (4th ed. 1898). The fragments are to be found in Grenfell and Hunt's *Oxyrhynchus Papyri* and in Lobel's edition (1925). There are treatises on her by Arnold (1871), Brandt (1905), Steinert (1907), Bascoul (1911), Patrick (1912), and Tucker (1914); imitations by Michael Field (in *Long Ago*) and Bliss Carman (1906); and translations by Futen (1903), Way (1920), and Haines (1926).

Saprolegnia, a fungus once thought to be the cause of disease in Salmon (q.v.).

Saprophytic Plants are plants that feed upon decaying organic matter. In common with many of the Parasitic Plants (q.v.), which are plants that live on or in and at the expense of other organisms, they are often devoid of chlorophyll. The reason of this peculiarity is obvious. Chlorophyll being the material used by ordinary plants for the decomposition of the carbon dioxide of the air in order that they may retain the carbon, and with it build up all the carbon compounds characteristic of organic nature—see PHYSIOLOGY (VEGETABLE)—it is plain that those plants which in virtue of a saprophytic or a completely parasitic habit obtain their carbon compounds ready-made up to a certain point do not require a special mechanism of green stuff to manufacture them. If the saprophytism be not complete or 'pure' there will be at least some chlorophyll remaining, as in the flowering axis of the orchid *Neottia*. Saprophytes may obtain their nourishment and especially their carbon compounds either from the remains of dead organisms or from organic compounds formed by living organisms. The fungi that live upon the bark of trees and the leaf-soil of forests and meadows (e.g. mushrooms) are examples of the former case; those that feed upon the juice of fruits and sugary solutions (e.g. moulds and yeasts) of the latter case. Examples of saprophytes are found in the Spermatophytes, the Fungi, and the Bacteria. Among the Spermatophytes are some well-known British plants—*Neottia*, *Coralorhiza*, and *Monotropa*.

Fungi (q.v.) may be physiologically classified as parasites and saprophytes; but this classification does not coincide with a morphological one. Further, there are certain species which lie between the two extremes, and these may be described as parasites which may become wholly or in part saprophytic, through the whole course of their development or during certain stages of it; and also there are saprophytes which, with the same variations, may become parasitic. Hence the complete physiological classification of the Fungi becomes (1) Pure saprophytes; (2) 'Facultative' saprophytes—i.e. parasites which become saprophytic; (3) 'Obligate' parasites—i.e. species to which the parasitic life is indispensable; (4) 'Facultative' parasites.

The external conditions necessary for the commencement of germination of Fungi are the same as those needful to the germs and seeds of other plants: they are a certain temperature, a supply of oxygen and of water, in certain cases a supply of nutrient substances. The spores of the Pereno-

sporeæ and of the Uredineæ germinate on drops of pure water; nutrient solutions may even be a hindrance. The Mucorini, on the other hand, emit only rudimentary germ-tubes in pure water; they require a nutrient solution for germination. Most Fungi vary towards one extreme or other according to the species.

A further characteristic of many Fungi is that certain species are only to be found upon a specific substratum. For instance, the Saccharomycetes, which excite alcoholic fermentation, appear on fruits only when these are ripe, and in the winter are found in soil around those plants whose ripe fruit they attack, and very rarely in any other place. Further, the effect upon the substratum varies with the species to a greater or less extent. On the other hand, many diverse species live on the same substratum and effect the same results upon it—e.g. many species of Saccharomycetes and certain species of Mucor produce very similar fermentations in saccharine fluids (see FERMENTATION). A destructive effect is witnessed in the reduction of timber to a mass of dirt by *Merulius lacrymans*.

Bacteria (q.v.) may be classified physiologically in the same terms as the Fungi. And their functions vary in the same way. Many oxidise their substratum; the Micrococcus of vinegar oxidises ethyl-alcohol into acetic acid, and by further combustion into carbon dioxide and water. Others excite characteristic fermentations, lactic acid, butyric acid fermentations, &c. See also PUTREFACTION.

Sapucaia Nut, the seed of *Lecythis Ollaria* and of *L. Zabucajo*, trees plentiful in the forests of the north of Brazil, belonging to the family Lecythidaceæ. The fruit is urn-shaped, as large as a child's head, and opens by a lid which falls off. Each fruit contains a number of seeds or nuts, as in the case of the allied Brazil nut; but the flavour is finer than that of the Brazil nut. Its form is oval, somewhat pointed at both ends, which are slightly bent in opposite directions.

Sarabaitai. See MONACHISM.

Saraband (Fr. *sarabande*, Span. *zarabanda*—word and thing both derived from the Moors), originally a slow dance, and hence a short piece of music, of deliberate character, and with a peculiar rhythm, in $\frac{3}{4}$ time, the accent being placed on the second crochet of each measure. The saraband is of frequent occurrence among the *suites* of Bach and other old masters.

Saracens, a name variously employed by mediæval writers to designate the Mohammedans of Syria and Palestine, the Arabs generally, or the Arab-Berber races of Northern Africa, who conquered Spain and Sicily, and invaded France. At a later date it was employed as a synonym for all infidel nations against which crusades were preached, and was thus applied to the Seljuks of Iconium, the Turks, the Gypsies, and even the pagan Prussians. The epithet Sarakēnoi was applied by the Greek writers (from the 1st century A.D.) to some tribes of Bedouin Arabs in eastern Arabia, though they do not agree among themselves as to the particular tribe so denominated. Pliny and Ammianus place the Saracens in Arabia Petrea and Mesopotamia, on the common frontier of the Roman and Persian empires; and the description of them by Ammianus, a most painstaking and accurate historian, coincides, in every important particular, with what is known at the present day of the Bedouin tribes of those regions. See ARABIA, KHALIFS, CRUSADES, MOHAMMEDANISM, MOORS, SALADIN, SPAIN, TEMPLARS; also the *Cambridge Mediæval History*, vol. ii. (1913); for Saracenic architecture, see ARABIAN ARCHITECTURE, and the section on architecture in the articles INDIA and PERSIA.

Saragossa (Span. *Zaragoza*), a city of Spain, formerly the capital of the kingdom of Aragon, by rail 212 miles N.E. of Madrid and 227 W. by N. of Barcelona, stands on the Ebro, which divides the city into two parts, and is crossed by a noble stone bridge of seven arches, built in 1437. The city has an imposing appearance from a distance, being adorned with numerous slender towers and spires; but inside the walls it is full of narrow winding lanes, with brick houses of most solid structure, though many of them are now falling into decay. The quarters that have been rebuilt since the French siege are of course different; the streets wide and the houses of better appearance. Saragossa was the Celtiberian *Salduba*, changed to *Cæsarea Augusta* in 25 B.C., of which the present name is a corruption. Although a place of importance under the Romans, there are few remains of the Roman city. One of the first cities of Spain to adopt Christianity (3d century), it afterwards became rich in relics, to which miraculous powers were ascribed. Saragossa was taken by the Goths in the 5th and by the Moors in the 8th century, and was recovered from them in 1118 by Alphonso of Aragon after a siege of five years, during which great part of the inhabitants died of hunger. The most momentous event in its recent history was the siege by the French (June to August 1808 and December 1808 to February 1809), in which the inhabitants offered a most determined resistance, some 60,000 in all perishing (see PALAFOX). The services of the 'Maid of Saragossa,' said to have assisted or fought by the side of her artilleryman-lover, seem to have been greatly exaggerated by Southey, Byron, and Sir David Wilkie in treating the theme. Saragossa has two cathedrals, the older a Gothic edifice (1316); the more modern (17th century) boasts of a pillar on which the Virgin descended from heaven (40 A.D.), to which pilgrims still flock. Its defences include the citadel (Aljaferia), anciently the palace of the kings of Aragon and later the headquarters of the Inquisition in this part of Spain. There are also a university (1474), an academy of sciences, and an archiepiscopal palace. The leaning Torre Nueva, dating from 1504, was 84 feet high and 10 feet out of the perpendicular, but as unsafe was taken down in 1894. The town makes cloth, silks, leather, soap, and chocolate. Pop. (1900) 99,118; (1920) 141,350.—The province has an area of 6726 sq. m. and a pop of 501,495.

Sarajevo, or BOSNA-SERAI, capital of Bosnia, stands on the hill-slopes that overlook the Bosna River (3 miles distant), 100 miles N.N.E. by rail (1891) of Metković, a port near the mouth of the Narenta in the Adriatic. The citadel and the minarets of 100 mosques, the crowded 'charsia' or bazaar, and the steep and narrow streets climbing the hillsides amidst gardens, represent the ancient Moslem town; the wide streets on the plain near the railway station, the Roman Catholic cathedral, and the Bosnian museum reflect the swift progress that was made after the Austrian occupation in 1878. The Bogova-Jamia mosque dates from 1506; the Greek cathedral is a large building; and the Moslem college (1890) is in Oriental style. The town has considerable trade, and manufactures tobacco, cigars, and cigarettes; the Hungarian government revived, in a large factory, the ancient Bosnian art of inlaying gold and silver in copper and wood. Pop. 66,000, mostly Bosnians by race, and more than half Mohammedans, the remainder Greek Orthodox, Roman Catholics, and Jews. Sarajevo was the scene, on 28th June 1914, of the murder of the Archduke Franz Ferdinand, the immediate occasion of the outbreak of the Great European War a month later. On 31st October 1918, the National

Council which met there proclaimed the union of Bosnia and Herzegovina with Serbia.

Sarapis. See SERAPIS.

Sarasate, PABLO DE (1844-1908), Spanish violinist, was born of Basque parentage, at Pamplona, where an annual fête was afterwards held in his honour. Taken to Paris whilst still a child, he won the first prize for violin at the Conservatoire in 1857. He made extensive tours all over Europe and America, visiting England first in 1861, and everywhere met with outstanding success. Though Sarasate was not a profound musician, his style of playing was always pure, refined, easy, and graceful. His compositions are only of slight importance.

Sarasvati is, in Hindu Mythology, the name of the wife, or the female energy, of the god Brahmā, the first of the Hindu Trimūrti or triad. She is also the goddess of speech and eloquence, the patroness of music and the arts, and the inventress of the Sanskrit language and the Devanāgarī letters.—Also the sacred river of Allahabad (q.v.).

Saratoga Springs, one of the chief watering-places in the United States, is in New York, 38 miles by rail N. of Albany. It contains more than a score of mineral springs, whose waters, prescribed in diseases of the liver, chronic dyspepsia, &c., are bottled in large quantities for exportation. There is a race-track, and regattas are held on Saratoga Lake, 4 miles distant. Twelve miles to the east a handsome obelisk (1877), 155 feet high, on a bluff 350 feet above the Hudson River and overlooking the scene, commemorates the surrender of Burgoyne (q.v.) to Gates, on 17th October 1777. Pop. 13,000.

Saratov, a city of Russia, on the right bank of the Volga, exactly 500 miles by rail SE. of Moscow. It is a city of broad streets and fine squares, and stands on terraces rising from the river. It has a handsome new cathedral (1825), an old cathedral (1697), a fine art gallery and library, and a university. Manufactures of brandy, liqueurs, flour, oil, and tobacco are carried on. Fishing is prosecuted in the river, and market-gardening (especially fruit and the sunflower) in the vicinity. There is an important trade in corn and other cereals, wool, leather, and textiles. The population has grown rapidly—70,000 in 1860; 137,109 in 1897; 190,000 in 1920. Pillaged by Pugatchev in 1774, the city suffered much from fire several times during the 19th century.

Sara'wak, a state on the north-west of the island of Borneo, placed by its ruler, Raja Brooke, in 1888 under the protection of Britain. The Chinese Sea washes its north-west side; on the north-east is the protected state of Brunei; and on every other side it is surrounded by Dutch Borneo. The area of Sarawak is estimated at 42,000 sq. m., and its pop. 600,000. The coast-belt is in many parts low, the interior hilly, rising to close upon 8000 feet near the frontiers. The country is drained by a number of short streams, several of which have wide estuaries; the longest, the Rajang, has a sinuous course of 350 miles, and is easily navigable for 150 miles up. The state contains valuable coal and oil fields; gold is mined, and antimony is found, also diamonds from time to time. The chief products, all of which are exported, are sago, rubber, gutta jelutong, pepper, benzine, oil-fuel, and cutch. The trade is principally with Singapore. The chief town is Kuching, 23 miles inland, on the Sarawak river; pop. 25,000. Round Kuching there are roads; there is a government telephone system, and several wireless stations. Dying in 1868, Sir James Brooke was succeeded by his nephew,

Sir C. J. Brooke, who, greatly extending his territory northwards after 1881, was succeeded by his son, Sir C. V. Brooke, in 1917.

See BORNEO and BROOKE (SIR J.), and the books there cited; also Baring-Gould and Bampfylde, *History of Sarawak* (1909).

Sarcina. See BACTERIA.

Sarcocaulon, a small South African genus of Geraniaceae, presents pronounced aerophytic construction in all parts, the span-high stems being very fleshy and covered with a thick layer of wax, preventing excessive evaporation during the high winds. In many places *Sarcocaulon* constitutes the sole vegetation on the sand and gravel plains, *S. Burmanni*, the so-called Hottentot Candle, being particularly plentiful. The leaf-blades disappear soon, leaving thorns in their place, which add to the strange appearance of these extraordinary plants, fit companions of the even stranger *Welwitschia*.

Sarcocystis. SEE GREGARINIDA.

Sarcocoe. See PROTOPLASM.

Sarcolemma is the term applied to the delicate sheath which invests each primary muscular fibre. See MUSCLE.

Sarcoma is an ancient term which was vaguely used of tumours of a more or less flesh-like consistence, but had fallen into disuse. It was adopted by Virchow as the general name for a large and important class of new formations, and is at present universally employed as defined by him. The tumours now called Sarcomata are mainly composed of cells resembling those of some form of embryonic or imperfectly developed connective tissue, rather than those of any part of the adult organism. Their structure, as well as their individual cells, usually suggests an embryonic condition: the cells are imbedded in a structureless matrix; and the blood-vessels are often mere channels between the tumour-cells. They are thus distinct from the Carcinomata, or cancers proper, which consist of epithelial cells in a framework of fully organised fibrous tissues; though they share with them the property of malignancy (see TUMOUR). They are generally classified, according to the form of their most characteristic cells, as round-celled, spindle-celled, and myeloid sarcomata. They are most common before middle life, and may occur in any organ of the body. Their course presents the greatest possible variety: some myeloid and spindle-celled sarcomata are slow in their growth, and but little apt to recur after removal: some forms of round-celled sarcoma may rival and even surpass the true cancers in rapidity of growth and diffusion through the body. When secondary tumours occur they are not commonly in the neighbouring lymphatic glands, as in cancer, but in distant organs, and particularly in the lungs.

Sarcophagus (Gr., 'flesh-eater'), any stone receptacle for a dead body. The name originated in the property assigned to a species of stone, found at Assos in Troas and used in early times, of consuming the whole body, with the exception of the teeth, within the space of forty days. The oldest known sarcophagi are those of Egypt, some of which are contemporary with the pyramids. The earliest of these are of a square or oblong form, and either plain or ornamented with lotus leaves; the later are of the form of swathed mummies, and bear inscriptions. The pyramids were sepulchral tombs built to contain the sarcophagi of the kings of Egypt: the Phœnician and Persian kings were also buried in sarcophagi. The Roman sarcophagi of the earlier republican period were plain. Sarcophagi were occasionally used in the later republic,

although burning had become the more general mode of disposing of the dead. The use of stone chests for the interment of distinguished persons has not been altogether discontinued in modern times. See BARROW, BURIAL, COFFIN, MAUSOLEUM.

Sard, or **SARDA**, a variety of quartz, differing from carnelian only in its very deep red colour, blood-red by transmitted light. It is rare, and brings a much higher price than common carnelian. The name is probably from Sardis. The Sardonyx is an Onyx (q.v.) containing layers of sard.

Sardanapa'lus. See ASSYRIA.

Sardes, or **SARDIS**, the capital of ancient Lydia, stood at the northern foot of Mount Tmolus (5906 feet) and 2½ miles S. of the Hermus. Through its market-place flowed the Pactolus over sands rich in gold, an allusion in all probability to the wealth of the inhabitants, who wove woollen stuffs and carpets, and organised the traffic between the highlands of the interior and the coast; it was, moreover, the grand and luxurious capital of Croesus, a monarch of fabulous wealth. In spite of the strength of its citadel, it was destroyed by the Cimmerian Gauls in the 7th century B.C., by the Athenians in the 6th, by Antiochus the Great in 215 B.C., and by Timur in 1402; besides this it was overwhelmed by earthquake in the reign of Tiberius. Both Xerxes and Cyrus the Great resided here before setting out on their great expeditions. As Byzantium rose to importance, Sardis lost the advantages of its situation on the great land-route between Persia and Rome, and gradually declined. At the present day there is nothing left at its site, Sart, except a small village and ruin mounds. The cemetery of the ancient city, 4 miles distant across the Hermus, is of great extent, and has been in part opened up. Other excavations have been made in the 20th century. See reports of the American expedition in the *Amer. Journ. of Archaeology*.

Sardine (Gr. *sardē*, Lat. *sarda*, *sardina*; perhaps 'the Sardinian fish,' used possibly of the pilchard, possibly of a kind of tunny), the French name for Pilchard (q.v.), and specially for small pilchards specially prepared. In France and Portugal sardines are cured with oil in tin boxes, forming a much-esteemed delicacy, and, at the same time, a most wholesome article of food; in this form they are exported to all parts of the world. To cure them in this way, they are first carefully washed in the sea, then sprinkled with fine salt, and after a few hours the head, gills, &c. are removed; they are then washed again, and spread out on willow branches or wire-work, exposed to the sun and wind, if the weather is dry, but in damp and rainy weather to a current of air under cover. They are next put into boiling oil, in which they remain for a short time, and when they are taken out the oil is drained away from them as much as possible, and they are put into the tin boxes whose shape and appearance are so familiar to everyone. The boxes, being filled with sardines, are filled up with oil, the lid is soldered on, and they are placed for a short time in boiling-water, or exposed to hot steam. The boxes which have leaked or have burst in boiling are rejected, and those which remain sound are now ready for the market. Trade usage extended the name to any small fish of the herring kind thus prepared, specially the Norwegian sprat or brisling; but the Court of King's Bench in 1915 decided that this is illegal. Maine, U.S., produces excellent 'sardines' from a small kind of herring; menhaden and anchovies are also so called. And there are Japanese and Australian 'sardines.'

Sardinia, an island of Italy, after Sicily the largest in the Mediterranean, lies 135 miles W. of the Tiber mouth, and immediately south of Corsica, being separated from it by the Strait of Bonifacio, 7½ miles wide. In shape it resembles an oblong set on end, with a deep wide bay, the Gulf of Cagliari, in the south, and another, the Gulf of Porto Torres, in the north.¹ From north to south it measures 160 miles, and from east to west, on the average, 75 miles. Area, 9187 sq. m. Off various points along the shores lie islands, the largest being Sant' Antioco, San Pietro, Asinara, Maddalena, Caprera, Tavolara, &c. The surface is generally mountainous, the configuration that of a tableland running up into ranges and isolated peaks. The highest points occur along the eastern side of the island, and reach 6016 feet in Gennargentu in the centre, and 4468 in the mountains of Limbara in the north. The western side of the island ranges at about 1240 feet, though the extinct volcano of Monte Ferru reaches 3448. The south-west corner is separated from the main mass of the island by the low alluvial plain of Campidano, which stretches from the Gulf of Cagliari to the Gulf of Oristano, on the west coast; at both extremities of it there are extensive salt lagoons. The only other low-lying tracts are the lower portions of the river valleys. The streams, however, are mostly short, the longest not exceeding 65 miles. The north-eastern shores are high and rocky. On the west the coast-line is more irregular than on the east; the grotto of Neptune, on this west coast, is one of the finest in Europe.² Ever since the time of the Roman possession the climate of the island has been in evil repute. This is because of the malaria that prevails in the low-lying tracts, where there is often much stagnant water after the rains, and much decaying vegetable matter in the hot season. The parts that lie at a higher level are quite as healthy as the corresponding districts of Italy. A more extended cultivation of the soil and the drainage of the marshes or inland lagoons would greatly diminish the malaria, as experiment in certain districts has proved, and further works of the kind are in contemplation, but considerable capital will be needed.

Sardinia is in nearly all respects a backward island. It has fine natural resources—fertile soil, valuable mines, extensive forests, rich fisheries, and excellent facilities for manufacturing industry. But owing to the old-fashioned conservatism of the people, their primitive methods of agriculture, lack of enterprise and capital, and want of means of communication, and long years of negligent if not inefficient government, its resources have by no means been developed to their full extent, and the population is only one-fourth of that of Sicily, whereas the area of the two islands is practically the same. Further, there are practically no facilities for the ordinary tourist. With the defects, however, of a long isolated mountain race, the Sardinians have all its virtues—less affected, so anthropologists maintain, by foreign admixture than most parts of southern Europe, and preserving many of the physical characteristics of the so-called Mediterranean race of Neolithic days. They possess a strong sense of honour and of hospitality, a considerable national dignity, and a fine courage. National costumes and village festivals and customs are very remarkable. Feudalism was not finally abolished in the island until 1865. Of the total area about one-third is arable land, one-third pasture, and nearly one-third (28 per cent.) forest. The first place amongst the natural resources is taken by the agricultural

¹ The Greek name, Ἰχνοῦσα, was given it from a supposed resemblance to a footprint.

² It is situated near Alghero (q.v.).

products, in spite of the backward farming, the heavy taxation, and the extremely minute subdivision of the soil. The principal produce is wheat, barley, beans, potatoes, wine (a considerable quantity consisting of some strong, sweet varieties which are practically unknown outside Italy), olive-oil, oranges, lemons, tobacco, flax and hemp, cheese, butter, and wool. The breeding of horses is an important industry; and large numbers of cattle, sheep, swine, and goats are kept. The growing of fruits and the breeding of the domestic animals are both carefully attended to, and the products of both industries are improving; but the only improvement in the management of the soil (much of which, it is true, is very poor) is the drainage of the marshes by the government (who own one-fifth of the area) and private individuals. The artificial lakes of the Tiroso and the Coghinas provide a considerable quantity of electric power and also water for irrigation, which is necessary to facilitate intensive cultivation and thus conquer the malaria. Besides being in ancient times the granary of Rome, Sardinia was renowned for its mineral wealth. After lying unused from the fall of the Roman empire the mines were again worked by the Pisans in the 14th and 15th centuries; but work was not resumed in them with any degree of energy until towards the middle of the 19th century. At the present time some 12,000 persons are employed in extracting of lead (with silver) and zinc, and to a less extent lignite, antimony, and manganese. Iron and copper also exist. Granite, marble, and clay for pottery are quarried. Salt is manufactured from sea-water, chiefly by convicts at Cagliari. The mines are mostly situated in the south-west, in the neighbourhood of Iglesias. The centre and north of the island are chiefly covered with forests, though they are being all too rapidly diminished. The commonest as well as the most valuable trees are the oak, ilex, cork, and wild olive, which yield timber, cork, bark for tanning, acorns, and charcoal. The seas yield large quantities of tunny, sardines, anchovy, and coral, though the fisheries, except for tunny, are not prosecuted by Sardinians, but by Italians; the native fishermen prefer to catch trout, eels, lobsters, crabs, &c., in the rivers and inland lagoons. Sardinia has no extensive manufacturing industries, though there is some tanning and making of cigars, aerated waters, macaroni, flour, and spirits. There are, however, a variety of domestic industries for home use; most of the women still ply the spinning-wheel. Until the year 1828 Sardinia had no roads for wheeled vehicles, the Roman roads having gone to ruin centuries ago. Now there are good roads throughout the island upon which motor omnibus services run; and they are supplemented by 770 miles of railway. In spite of their maritime situation the Sardinians are not fond of the sea. The island has numerous fairly good ports—Cagliari (the capital), Porto Torres, Terranova, Tortoli, Alghero, Carloforte, and Bosa—most of which are being improved by the construction of harbour-works. Pop. (1815) 352,367; (1840) 524,000; (1871) 636,660; (1901) 791,754; (1921) 866,681; (Sicily, with an area of 9960 sq. m., has a pop. of 4,132,156). This gives a density of 93 persons to the square mile; Italy has 329 to the square mile. Education is in a very backward state. The two universities at Cagliari and Sassari are frequented by only 420 students in all. The practice of the vendetta and brigandage were extremely prevalent amongst the people; but both have now almost entirely ceased. The language is a mixture of Latin, Spanish, and Italian; but the dialects of different parts differ considerably. The moufflon or wild sheep, with red deer, fallow deer, wild boar, and an abundance

of smaller game, such as hares, partridges, woodcock, snipe, &c., are still to be found. Administratively the island is divided into the two provinces of Cagliari and Sassari. There are three archbishoprics, Cagliari, Sassari, and Oristano, and eight bishoprics.

History.—The early history of Sardinia is entirely unknown, though it has been believed by many that we should identify with the Sardinians the Shardana, who occur as foreign mercenaries of the kings of Egypt, from the time of Rameses II. onwards. Traces of habitation in the Neolithic period have been found; but the island must have been well populated during the Bronze Age, when a large number of important monuments were erected. There are as many as 6000 *nuraghi* still traceable in the island—circular towers built of rough blocks of stone; the diameter is some 30 feet at the base, but decreases rapidly; and within the massive walls are one, two, or even three superposed chambers with beehive roofs. This simple form is often strengthened by additional towers, bastions, and curtain walls; and they sometimes protected or enclosed a settlement of small round huts of similar construction, just as the baronial castle protected the mediæval village. Besides these considerations, their collocation in positions of strategic importance and of relation to one another shows that they cannot have been tombs, as some have believed, but were strongly fortified dwellings. Indeed, the tombs of their inhabitants are of two classes: (1) the so-called giants' tombs, chambers 30 or 40 feet long, in which many bodies could be accommodated, with a curved façade in front, developed out of the simple dolmen; (2) the *domus de gianas* (houses of the spirits), which are small grottoes cut in the rock. A considerable amount of research has recently been carried on among the remains of this period, and some very interesting sanctuaries, several of them erected over sacred springs, have been brought to light. (See *Cambridge Ancient History*, II. 1926, chap. 21, where a full bibliography is given.) The existence of a numerous and powerful population may explain the comparative rarity of Greek colonies, only Olbia, the modern Terranova (q.v.), and Neapolis, on the west coast, being attributable to them. The conquest of the island by the Carthaginians (500–480 B.C. ?) led to the foundation of a few cities in the south-west of the island—Cornus, Tharros, Sulci, Nora, Carales (the modern Cagliari). They treated it as a granary, and their rule, as far as it reached, seems to have been oppressive. How far they obtained the mastery of the interior is very doubtful. In 238 B.C. their mercenaries revolted, and the Romans demanded and obtained the surrender of the island. The resistance of the native tribes was quelled after several campaigns; and after a rebellion in 215 B.C. they were still more severely dealt with, being treated as a conquered race, and forced to pay a tithe in corn and a further tribute in money. With Sicily and Africa, it became one of the chief sources of the corn supply of Rome. Saltworks were also in operation. Cicero gives the inhabitants a very bad character; and under the early empire it was remarkable for its unhealthiness and for the audacity of its brigands, and was often used as a place of exile. Administratively it was coupled with Corsica, and alternated between the Senate and the emperor. Carales was the chief place in the island, and next came Turris Libisonis (Porto Torres), Olbia, Othoca (Oristano), Neapolis, Forum Traiani (Fordungianus), Usellis, and Cornus. There was an extensive road system, and numerous milestones have been found. Constantine gave to Corsica and Sardinia a separate governor for each, dependent on the *vicarius urbis Romae*. After

the fall of the Roman empire evil days fell upon the island: it was overrun by Vandals and Goths, and then for many years was incessantly harassed by the Saracens. During this time its nominal masters were the Byzantine emperors (till the 10th century in name at least) and the popes, to whom it seems to have been given in 774 or 817 by a not very effective donation. In the beginning of the 11th century the Pisans and Genoese undertook the task of driving out the Saracens and holding the island against them; but they had a hard task for twenty years or more. Then, the Moslems beaten off, they took to quarrelling with one another, and only agreed to divide the island between them in 1284, Genoa taking the north, Pisa the south. But the real internal government was in the hands of four 'judges' or chiefs, each ruling a separate province; this arrangement existed several centuries before the Pisans came, and continued to exist for several centuries longer. The pope, who still claimed the over-lordship, in 1297 gave Sardinia to the king of Aragon; and he made himself definitively master of it in 1326. The Aragonese and their sovereign successors, the Spaniards, kept possession of it till the treaty of Utrecht (1713); it then passed to Austria, but in 1720 was given to the House of Savoy in exchange for Sicily. United with Savoy and Piedmont, it gave title to a new kingdom, the kingdom of Sardinia. In ecclesiastical architecture either Pisan Romanesque or Spanish Gothic survives, the Renaissance having had little influence upon it. See SAVOY.

See Tennant, *Sardinia and its Resources* (Rome, 1885); Tyndale, *Island of Sardinia* (3 vols. 1849); C. Edwardes, *Sardinia and the Sardes* (1889); La Marmora, *Voyage en Sardaigne* (1837-57); the historical works of Manno and Spano (1825-58); Pais, *La Sardegna* (Rome, 1881); G. Vuillier, *The Forgotten Isles* (Lond. 1896); *Guida d'Italia del Touring Club Italiano: Sardegna* (1918).

Sardis. SEE SARDES.

Sardoniac Smile is a term applied by the older medical writers to a spasmodic affection of the muscles of the face, somewhat resembling laughter. It may occur in tetanus or lock-jaw, and other convulsive affections, or may result from the action of certain vegetable poisons. The name is said to be from a ranunculus termed *Herba sardonica*, a Sardinian plant; but is probably from the root *sar*, 'to grin' (Gr. *sairein*).

Sardonix. SEE ONYX, and SARD.

Sardou, VICTORIEN (1831-1908), French dramatist, was born at Paris. He studied medicine, but took to the writing of dramas instead of practising. His first efforts were decidedly failures, but through his marriage with an actress, who nursed him when sick and in the extremity of want, he became acquainted with the celebrated Déjazet, for whom he wrote two very successful pieces, *Monsieur Garat* and *Les Prés Saint-Gervais* (1860). In a few years he had amassed a fortune. He was almost as prolific as Scribe, with whom he may be fitly compared, but whom he in many respects excelled. With a first-rate knowledge of stage-effect he combined an unrivalled instinct for what would just suit the taste of the playgoing public. His comedies are in general loosely constructed, but full of rapid action; the character-sketching and the emotional elements are both superficial; the dialogue is brilliant and witty, but the episodes are often very improbable. Sardou makes fun of the foibles of his contemporaries in a very clever, amusing fashion. His works are hardly literature; they are much better suited for acting than for being read. Pieces like *Nos Intimes* and *Les Ganaches* (1861), *Les Vieux Garçons* and *La Famille Benoiton*

(1865), *Nos Bons Villageois* and *Maison Neuve* (1866), *Rabagas* (1872), *Dora* (1877), *Daniel Rochat* (1880), *Odette* (1882), and *Marquise* (1889) make a fair sample of his capabilities and style. For Sarah Bernhardt he wrote the well-known *Fédora* (1883), *Théodora* (1884), and *La Tosca* (1887). Historical plays are *La Patrie* (1869), *La Haine* (1874), and *Thermidor* (1891). Sardou was elected to the Academy in 1877. See the study by Claretie (1883) and Jerome Hart, *Sardou and the Sardou Plays* (1913).

Sargasso Sea. See ATLANTIC, GULF STREAM, GULFWEEDE.

Sargent, JOHN SINGER, perhaps the greatest portrait-painter of his age, was born of American parents in Florence, 12th January 1856, was educated abroad, studied art at Florence and then under Duran at Paris, but from 1884 till his death lived mostly in London. He was elected A.R.A. in 1894, R.A. in 1897. His chief works comprise the mural decorations in Boston Public Library, *Carmencita*, *Carnation Lily Lily Rose*, *Gassed*, some water colours, and a long series of magnificent portraits, including those of the Wertheimer family exhibited at the National Gallery, London—one of the very few occasions on which this honour has been accorded to a living artist. His output is characterised by a brilliancy of execution and a sureness of touch, while his portraits reveal a ruthless and vivid analysis of character. He died at Chelsea 14th April 1925. See Life by Downes (1926), with catalogue and plates.

Sargon, king (722-705 B.C.) of Assyria (q.v.).

Sark (or *Sercq*), the most beautiful and wildest of the Channel Islands (q.v.), 6 miles E. of Guernsey (and in the bailiwick thereof) and 12 NNW. of Jersey. Only 3 miles long and 1½ mile wide, it is almost entirely rockbound, and consists of Great Sark (1035 acres) and Little Sark (239 acres), connected by an isthmus called the Coupée, 5 to 8 ft. broad, 300 ft. long, and as many high. Lead and silver were mined during 1835-45; fishing and agriculture are carried on. The seigneur and tenants of the manor form practically a feudal court. Pop. 580.

Sarmatians (anc. *Sarmatæ*) a race who spoke the same language as the Scythians (q.v.), and who are believed to have been of Median descent and so Iranian in stock, though some authorities think they belonged to the Ural-Altaic family. They were nomads, wild and savage in appearance, excellent horsemen and archers, and dressed in leather armour. Their young women went into battle on horseback; hence probably the Greek legends about the Amazons. Several tribes were embraced under the name; they roamed over the wide plains of eastern Europe, from the Vistula and the Danube to the Volga and the Caucasus. Their country was arbitrarily divided by the ancient writers into European and Asiatic Sarmatia, the river Don being made the dividing-line. In the second half of the 4th century B.C. they subjected the Scythians to their yoke. Their empire lasted until the 4th century A.D., when it was overthrown by the Goths. Shortly after that their name disappears from history. The Jazyges (q.v.) were a Sarmatian tribe who also disappeared amongst Goths and Huns. But the name of Sarmatia is sometimes applied to the vast region in which the Sarmatians roamed, and is sometimes rhetorically used for Poland. See ART; and Rostovtseff, *Iranians and Greeks in South Russia* (1922).

Sarnia, a town and port of Ontario, just below the issue from Lake Huron of the St Clair River, 170 miles WSW. of Toronto by rail. There are

oil-refineries, foundries, and fisheries. A great tunnel beneath the St Clair (q.v.) connects it with Port Huron (q.v.) on the American side. Pop. 15,000.

Sarno, a city of Southern Italy, 30 miles by rail E. of Naples, on the farther side of Vesuvius, has an ancient castle, a cathedral (1625), a seminary, paper, cotton, linen, and ribbon manufactories, and produces fine silk. Pop. 19,100. Here Teias, king of the Goths, was vanquished and slain in a desperate battle with the army of Justinian I., commanded by Narses, in 552.

Sarpi, PIETRO, better known as FRA PAOLO, born at Venice, 14th August 1552, from 1575 was professor of Philosophy in the Servite monastery there. In early life he devoted himself to Oriental languages, mathematics, astronomy, &c., including the medical and physiological sciences, in which he attained to great proficiency, being by some regarded as entitled to share in the discovery of the circulation of the blood. In the dispute between Venice and Paul V. on the subject of clerical immunities Sarpi became the champion of the republic and of freedom of thought. On the repeal (1607) of the edict of excommunication launched against Venice he was summoned to Rome to account for his conduct. He refused to obey, was excommunicated, and was seriously wounded by assassins. He afterwards busied himself with writing his great *Istoria del Concilio Tridentino* (London, 1619). He died 15th January 1623. His collected works were published at Naples (24 vols. 1789-90).

See Lives by A. G. Campbell (1869), Bianchi-Giovini (1836), A. Robertson (1894 and 1912), and T. A. Trollope's *Paul the Pope and Paul the Friar* (1861).

Sarraceniaceæ, a family of dicotyledonous pitcher-plants, including the genera *Sarracenia*, *Darlingtonia*, and *Heliamphora*. See INSECTIVOROUS PLANTS.

Sarre, Sarreguemines, &c. See SAAR, SAARGEMÜND, &c.

Sarsaparilla, or SARSA. This is the dried root of the *Smilax officinalis*, a plant belonging to the Liliaceæ, and a native of Central America. In medicine the root, known as *Sarsæ Radix*, or Jamaica Sarsaparilla, was at one time much used as an alternative, having been brought into Europe from the West Indies about 1530. Other species of *Smilax* with the same properties grow in the warmer parts of America. They are twining shrubs, sometimes attaining a considerable height, and growing only where there is abundance of water. The roots, many feet long, thick as a goose-quill, brownish, with numerous rootlets, are folded and packed into bundles about 18 inches long and 4 inches in diameter, bound by a long root. The taste is mucilaginous, slightly bitter and acid. The root contains a crystalline glucoside, *smilacin*, a volatile oil, resin, starch, &c. The preparations act as diuretics and diaphoretics, and are used as alternatives in syphilis, rheumatism, and some skin diseases, but their value is now much discredited. *Hemidesmus indicus* is called Indian Sarsaparilla; *Smilax aspera*, Italian Sarsaparilla; and the roots of various species of *Carex*, German Sarsaparilla.

Sarsdens, or SARSEN STONES, the Greywethers (q.v.) of Cornwall (from some confusion about Saracens). See STONEHENGE.

Sarsfield, PATRICK, Irish Jacobite, had fought abroad under Monmouth, and in England at Sedgemoor against him, when in 1688 he was defeated in the skirmish of Wincanton, and crossed over to Ireland (he was member for Dublin county). Created Earl of Lucan by James II., he drove the English out of Sligo, was present at the battles of

the Boyne and Aghrim, defended Limierick (q.v.), and on its final capitulation in 1691 entered the service of France. He fought at Steenkirk (1692), and was mortally wounded at Neerwinden, 19th July 1693. See Life by Todhunter (1895).

Sarthe, a dept. of France, north of the Loire, formed out of the old provinces of Anjou and Maine. Area, 2410 sq. m.; pop. (1866) 465,615; (1921) 389,235. The Sarthe flows south through the department, and the Loire west along the southern border. Essentially an agricultural department, it produces wheat, oats, barley, and potatoes, sends its geese, chickens, eggs, cattle, and swine to Paris, is famous for its horses, and makes much wine and cider. There are also engineering, brick and linen works, tanneries, and paper-mills, while pottery is carried on. The arrondissements are Le Mans, La Flèche, Mamers, and St Calais; capital, Le Mans.

Sarti, GIUSEPPE (1729-1802), composer, born at Faenza, held posts at Copenhagen, Venice, Milan, and St Petersburg, and died at Berlin. He composed a dozen operas, masses, sonatas, &c.

Sarto, ANDREA DEL, Florentine painter, whose real name was Vannucchi, was born 17th July 1486; 'del Sarto' was an allusion to his father's trade of tailor. In 1509-14 he was engaged by the Servites in Florence to paint for their church of the Annunciation a series of frescoes; and a second series was next painted for the Recollets. In 1518, on the invitation of Francis I., he went to Paris, returned next year to Italy with a commission to purchase works of art, but squandered the money and dared not return to France. He died of the plague at Florence, 22d January 1531. Andrea's most celebrated single pictures are the several Madonnas, a Last Supper, the 'Fathers of the Church Disputing,' a Pietà, and two Annunciations—most of them at Florence. He was a rapid worker and accurate draughtsman, displaying a refined feeling for harmonies of colour; but, though called 'the Faultless,' lacks the elevation and spiritual imagination of the greatest masters.

See books by Von Reumont (Leip. 1835), Guinness (1899), Knapp (1908); also Janitschek in Dohme's *Kunst und Künstler*; and Crowe and Cavalcaselle, *Painting in Italy*.

Sartoris, ADELAIDE. See KEMBLE.

Sarts. See TURKESTAN.

Sarum. See SALISBURY, LITURGY.

Sarzana, a city of Northern Italy, 8 miles by rail E. of Spezia. It has a cathedral (1204-1477), and an ancient fortress (now a prison), and is the birthplace of Pope Nicholas V. Its position at the entrance of the Magra valley (up which a railway runs through the Apennines to Parma) at all times made it an important frontier post. Above the town is the castle of Sarzanello. For the Bonaparte family see SAN MINIATO. Pop. 13,500.

Sasebo, a great naval dockyard of Japan, on the NW. coast of Kiūshū, 30 miles N. of Nagasaki; pop. 93,000.

Sasine. See INFESTMENT.

Saskatchewan (named from an Indian word meaning 'rushing water'), a province of the Dominion of Canada, lies between Manitoba and Alberta, bounded on the south by the United States, and on the north by the large unorganised area known as the North-west Territories. With Alberta, it was formed in 1905 from the provisional districts of Assiniboia, Saskatchewan, Alberta, and Athabasca. Area, 251,700 sq. m., including 8329 sq. m. of water. Pop. (1906) 257,000; (1911) 492,432; (1921) 757,510. The capital is Regina. The province may be divided into three well-defined zones. The southern portion consists chiefly of

open rolling prairie. The city of Saskatoon, 150 miles north of the United States boundary, is about on the dividing line between this prairie zone and the tract of partly wooded and partly prairie country known as park country, extending to about 150 miles north of Prince Albert, on the Saskatchewan. The northern part of the province is chiefly wooded and is largely unexplored. The prairie produces principally wheat. The park country also produces wheat largely, but is splendidly adapted for mixed farming and stock-raising. The principal river of the province is the Saskatchewan (with two head-streams, the North and South Saskatchewan), 1200 miles in length, rising in the Rocky Mountains and emptying into Lake Winnipeg. The Churchill in the north, 1000 miles long, drains an area of 116,600 sq. m.; smaller rivers are the Qu'Appelle, 270 miles, and the Souris, 450 miles long. There are many large lakes in the northerly portion of the province, the principal being Athabaska, 2842 sq. m., half of which is in Alberta; Reindeer, 2437 sq. m.; and Wollaston, 906 sq. m. The climate is hot in the summer months, but generally tempered by cool breezes; while the winter is cold, but dry and bracing. The southern plains of Saskatchewan, once the home of mighty herds of bison, have now been converted into cultivated fields, and the only products of animal life are water-fowl, grouse, jack rabbits, hares, and coyotes; but in the north, moose, elk or wapiti, caribou, blacktail and whitetail deer are found, and wolves are still numerous. Beaver are found in large numbers; and fish, including white fish, the most valuable of fresh-water food-fish, abound in immense quantities in the lakes.

Saskatchewan is eminently an agricultural province, but only about one-quarter (26 million acres) of the land capable of cultivation is used for that purpose. The principal crops are wheat and oats (two-thirds and one-third of the total Canadian crops), but barley, rye, and flax are also grown. Before being marketed, the grain is handled through elevators, where it is stored, awaiting transport by rail to lake ports on Lake Superior. Stock-raising is very important, the province containing large numbers of horses and cattle; and fruit and vegetable growing are carried on. In the north the production of furs is very considerable. Few minerals have yet been found, but there is evidence of silver, copper, gold, and iron in the northern limits, and coal of a fair quality is now worked extensively. Timber to a large extent is taken from the forested area in the north. The three great transcontinental railway lines traverse the province, which has a total railway mileage of 6500 miles. There is a good system of elementary and secondary schools. The University of Saskatchewan (1907) is at Saskatoon. Presbyterians, Roman Catholics, Anglicans, and Methodists are about equal in number. The affairs of the province are administered by a Lieutenant-governor, a cabinet, and a Legislative Assembly of 63 members, elected for five years. The province sends 21 representatives and 6 senators to the Dominion parliament. The early history of Saskatchewan is practically that of the Hudson's Bay Company (q.v.), but since the construction of the great railways (see CANADA) the province has made rapid progress, especially in the 20th century. The provincial government encourages all development, allowing, for instance, subsidies to co-operative creameries.

See the books cited at CANADA; also Louis Gilbert, *La Saskatchewan* (1924).

Saskatchewan, a large river of Canada, draws its waters from the Rocky Mountains, and is formed of two branches. The north branch

risers among the glaciers near Mount Hooker, the south branch in the very north of Montana (see ALBERTA). The former has a course of 760, the latter of 865 miles, before they meet in the province of Saskatchewan (q.v.) at about 105° W. long. and 53° N. lat. The united river then flows east some 300 miles to Lake Winnipeg, from which its waters are carried to Hudson Bay by the Nelson River (q.v.). The Northern Saskatchewan is navigable as far as Edmonton.

Saskatoon, a town in Saskatchewan, 160 miles NW. of Regina, on the South Saskatchewan River. It is a large railway centre and an important distributing centre in a rich wheat-growing district, with mills, elevators, &c. Here is the University of Saskatchewan (1907). Pop. 25,700.

Sassafras (*Sassafras*), a genus of trees or shrubs of the family Lauraceæ. The Sassafras-tree (*S. officinale*) of North America, found from Canada to Florida, a mere bush in the north,



Sassafras (Sassafras officinale):
a, branch of male tree in flower; b, branch with ripe fruit and developed foliage. (Bentley and Trimen.)

but a tree of 50 feet in the south, has deciduous leaves, yellow flowers, which appear before the leaves, and small dark-blue fruit. The wood is soft, light, coarse in fibre, dirty-white and reddish brown, with a strong but agreeable smell, resembling that of fennel, and an aromatic, rather pungent and sweetish taste. The wood of the root possesses these properties in a higher degree than that of the stem, and the thick spongy bark of the root most of all. The wood is brought to market in the form of chips, but the bark of the root is preferred for medicinal use, is a powerful stimulant, sudorific, and diuretic, and is employed in cutaneous diseases, gout, rheumatism, and syphilis, generally in combination with other medicines. It contains a volatile oil, *Oil of Sassafras*, which is often used instead. An agreeable beverage is made in North America by infusion of sassafras bark or sassafras wood; and a similar drink was once commonly sold in the streets of London under the name of *Saloop*. The leaves of sassafras contain so much mucilage that they are used for thickening soup.—The name is given also to *Cinnamomum Parthenocylon*, found in Sumatra, and (with or without explanatory prefixes) to trees of various families found in Victoria, New South Wales, Tasmania, Brazil, and Chile.

SASSAFRAS NUTS are the cotyledons of the South American lauraceous tree *Nectandra puchury*, used as medicinal aromatics. They are also called Picurim Beans and Brazilian Beans.

Sassanidæ. See PERSIA.

Sas'sari, a city in the north-west of Sardinia, ranking next after the capital Cagliari; it stands 12 miles by rail from the Gulf of Asinara, where its port, Porto Torres (pop. 6260), is situated, and 162 miles N. by W. of Cagliari. A prosperous-looking town, with both old and new houses, embosomed in orange and olive groves, it has a cathedral (12th century to 1531), an old castle (1327-31), a university (1677, reopened in 1766), a museum of prehistoric, Phœnician, and Roman antiquities, a natural history collection, and a library (1556), and is the seat of an archbishop and of several of the old Sardinian nobles. There is a busy trade in grain, olive-oil, cheese, and hides. It was no doubt founded by refugees from Porto Torres, whence the see was transferred in 1441. Pop. (1921) 42,950.

Sassoferrato, an Italian painter, whose real name was GIAMBATTISTA SALVI, was born at Sassoferrato in the March of Ancona, 11th July 1605, and worked mainly at Rome, where he died 8th April 1685. He painted Madonnas, Holy Families, an Annunciation, and an Assumption.

Sassoon, or SASSUN, the scene of atrocities perpetrated on the Armenian inhabitants by Kurds and Turks in 1894 and 1915, is a small town in the mountains of Kurdistan, 50 miles W. of Bitlis.

Sassoon, SIEGFRIED, poet, was born in 1886, and educated at Marlborough and Cambridge. His *Collected War Poems* appeared in 1919, *Selected Poems* in 1925, and *Satirical Poems* in 1926. His war poems reveal a tremendous dynamic quality with a fierce hatred of trifles and shams, but sometimes the cold irony of the satirist outweighs the inspiration of the poet. The combination of passion and intellect, however, makes his best work very powerful.

Satan. See the articles DEVIL, HELL.

Sátará, a town of Bombay presidency, India, occupies a high, healthy site on the Deccan plateau, near the Kistna, 56 miles S. of Poona. It is commanded by a hill-fort, which came into the hands of the British in 1848. Pop. (1921) 22,454.—The *district* has an area of 4910 sq. m. and a pop. of 1,026,259 (1921).

Satellites are members of the solar system which revolve round their several planets as the moon does round the earth (see MOON). The gravitational pull of the planet or 'Primary,' on account of its proximity to the satellite, exercises such a controlling influence that the satellite circulates about its primary while both are circulating round the much more distant sun. From the period of revolution of a satellite and its distance from its primary the mass of the latter may be calculated. In this way the masses of all the planets which have satellites can be readily compared with that of the earth or sun. The first satellites to be discovered were the four large satellites of Jupiter, found by Galileo when he turned his telescope on the

planet in 1610. This discovery was of great importance in removing some of the difficulties, and helping in the establishment of the Copernican theory. In the course of their movement round Jupiter, the satellites are sometimes seen projected on the face of the planet, sometimes eclipsed by the shadow of the planet, and sometimes occulted at its limb. These phenomena are of frequent occurrence, and make an attractive subject of observation with the telescope. The paths of the satellites round Jupiter are approximately circular, and the times of the disappearances and reappearances can be tabulated. It was noticed by the Danish astronomer Römer that these phenomena actually occurred before the tabulated times when the earth was comparatively near to Jupiter, and later than the tabulated times when the earth was farther away. This was explained by Römer as due to the greater distance the light had to travel to reach the earth. Thus the very important discovery of the finite velocity of light was made (see LIGHT, SUN). Titan, the largest of the satellites of Saturn, was found by Huyghens, who also discovered the ring, which is now known to consist of myriads of very small bodies revolving round the planet, and is thus of the nature of a collection of satellites. Eight more satellites of Saturn have been discovered since, as well as four of Uranus and one of Neptune. Two satellites of Mars were discovered in 1877. These are very small bodies, very near to Mars, and revolving very rapidly round it, the near one more rapidly than the planet rotates on its axis. In 1892 a very small fifth satellite of Jupiter was discovered by Barnard. This satellite is much nearer the planet than the four Galilean satellites, and can only be seen with the largest telescopes. In 1896 Phoebe, a very small and distant satellite of Saturn, was discovered photographically by W. H. Pickering. Two small distant satellites of Jupiter were discovered photographically by Perrine in 1906, an eighth by Melotte in 1908, and a ninth by Nicholson in 1914. Generally the satellites revolve round their primaries in the direction the primaries move round the sun. The satellites of Uranus and Neptune, the eighth and ninth satellites of Jupiter, and Phoebe, have a retrograde motion.

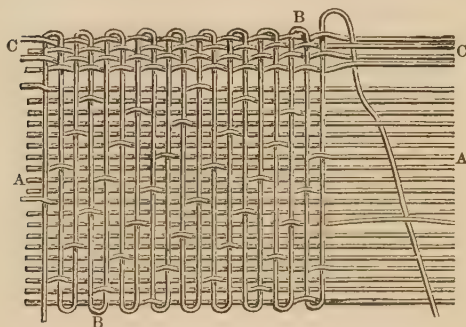
Primary.	Name of Satellite.	Mean Distance from Centre of Primary.	Period of Revolution.	Diameter.	Discoverer.
		Miles.	d. h. m.	Miles.	
EARTH	Moon.....	239,000	27 7 43	2160	
MARS	Phobos.....	5,800	0 7 39	11	Hall.
	Deimos.....	14,600	1 6 18	9	"
JUPITER	V.....	115,000	0 11 57	200	Barnard.
	Io.....	265,000	1 18 28	2470	Galileo.
	Europa.....	420,000	8 13 14	2060	"
	Ganymede..	670,000	7 8 43	3580	"
	Callisto....	1,180,000	16 16 32	3360	"
	VI.....	7,150,000	251 0 0	100	Perrine.
	VII.....	7,540,000	265 0 0	80	"
	VIII.....	14,910,000	789 0 0	25	Melotte.
	IX.....	15,560,000	745 0 0	15	Nicholson.
SATURN	Mimas.....	113,000	0 22 37	400	W. Herschel.
	Enceladus..	145,000	1 8 53	700	"
	Tethys.....	180,000	1 21 18	1000	Cassini.
	Dione.....	231,000	2 17 41	1000	"
	Rhea.....	324,000	4 12 25	1500	"
	Titan.....	750,000	15 22 41	3000	Huyghens.
	Hyperion...	910,000	21 6 38	800	Bond & Lassell.
	Japetus....	2,170,000	79 7 56	1000	Cassini.
	Phoebe.....	8,000,000	550 0 0	80	W. H. Pickering.
URANUS	Ariel.....	115,000	2 12 29	400	Lassell.
	Umbriel....	160,000	4 3 28	400	"
	Titania.....	260,000	8 16 56	500	W. Herschel.
	Oberon.....	350,000	13 11 7	500	"
NEPTUNE	Triton.....	250,000	5 21 3	2000	Lassell.

Satellite Towns, a name given to those garden cities (see HOUSING AND TOWN-PLANNING) intentionally built near great towns to arrest the

congestion and sporadic extensions of the latter, and at the same time to provide for the continued increase of population. The aim is to create a fresh centre of life and activity, to limit the satellite town to a certain size, and, by insisting on the importance of gardens and of a surrounding agricultural belt, to combine the virtues of urban and rural life. The whole of the land is held in direct public ownership or in trust for the community. Letchworth (q.v.) was the first garden city established in Great Britain, while Welwyn (q.v.) has been described as the first satellite town to London.

Sati. See SUTTEE.

Satin, a fabric in which so much of the weft is brought uppermost in the weaving as to give a more lustrous and unbroken surface to the cloth than is seen when the warp and weft cross each other more frequently; this will be better understood by reference to the figure than by any verbal description. A are the warp threads, of which only every tenth one is raised to allow the shuttle to pass, but they are all raised in regular succession, so that the weaving is quite uniform throughout; B are the weft threads; and C is the selvage, which is formed on each side of the piece of stuff



by the regular method of plain weaving—that is, by raising every other warp thread for the passage of the weft. The figure shows a ten-thread satin twill, but there are various others made, such as a five, a six, a seven, and an eight-thread satin. The lowest satin twill that can be produced is a four-thread, which is sometimes called the satinnet twill. The term satin is rarely applied to other than silk textiles (see SILK). A cotton, and sometimes even a woollen, fabric woven in the way described is called sateen.

Satin-bird. See BOWER-BIRD.

Satin Spar. See ARAGONITE, GYPSUM.

Satinwood. This is perhaps the most valuable of the light-coloured furniture woods. Two kinds of satinwood are known in commerce, both being somewhat similar in appearance, although they do not appear to be closely allied botanically. One kind is obtained from a moderate-sized rutaceous tree (*Chloroxylon Swietenia*), growing in Central and South India, including Ceylon. It is allied to the mahogany-tree, and as regards appearance the wood might be called a yellow mahogany. In India satinwood is used for house-building and agricultural implements, as well as for furniture purposes; but richly figured pieces of it, especially, are exported to England for cabinet-work. West Indian satinwood is the better of the two kinds—at least it is more commonly used for furniture. It comes mainly from San Domingo and Porto Rico, but, although the wood has been long used in Europe, its botanical source is not certainly known. It is, however, supposed to be furnished by an ebenaceous tree. Satinwood, of either kind, is

hard, very closely-grained, and takes a fine polish. It can be cut into small mouldings better than most woods, but it is of a greasy nature, and does not hold glue well. In colour it is of a subdued yellow passing into brown, and much of it has a rich satiny or feathery figure which is very beautiful. It has been much used in costly furniture, but not so extensively in recent years. The cabins of passenger steamers are often panelled with satinwood, which is also a good deal employed for small ornamental articles.

Satire is a species of literature more than usually difficult to define. It shades off in various directions into moral and philosophical discussion, preaching, controversy, prophetic denunciation and warning, exercises in wit, in friendly humour, indulgences in spite and in obscenity, sensational realism and tearful despondency. As it is generally used to-day, the word has reference rather to the spirit than to the form of a composition. Satire may be found in any form: prose or verse, essay, romance, comedy, epic, eclogue, even lyric, as in Dorset's hands, may be satirical. But a work is not necessarily a satire because it contains satire. Were Andrew Marvell's satires lost, his *Rehearsal Transposed* would prove that he possessed satirical powers of the highest kind, but in the author's intention and in the form of the book the satirical is outweighed by the polemical. One of the least unsatisfactory definitions of literary satire, Dr Garnett's, makes it 'the expression in adequate terms of the sense of amusement or disgust excited by the ridiculous or unseemly, provided that humour is a distinctly recognisable element, and that the utterance is invested with literary form.'

Yet the least humorous of all possible poses, that of the impeccable castigator of vice, has been more than most others assumed, without humorous intention, by satirists, and that too under the influence of that literature which claimed satire as its own peculiar product. Part of the confusion is due to the composite origin of modern satire. Modern nations would be equally justified in admitting the Roman claim 'satura tota nostra est,' and in putting forward a like claim in their own behalf. Satire has sprung up independently in many societies from the railings of rustics at their festivals, or from the taunts and jibes of champions on the battlefield or at the banquet. At later stages these have been profoundly influenced in their development by the Latin forms that had sprung from a similar source. But the Latin *satura* was already far removed from its origins. The word *satura*, that is *satura laux*, a full dish, meant, it is said, the first fruits offered to the gods at harvest festivals, and so a medley. It had reference, therefore, to the form, or formlessness, of the kind, and to its rusticity rather than its censoriousness. There are some satires among those of Horace to which nobody nowadays would give that name. To complicate matters further, a rival etymology connected satire with the satyrs of the Greeks. Thus alongside of popular satire, with its fighting efficiency as highly developed as its authors' skill allowed, there has been introduced from time to time an artificial classical kind, the plaything of scholars, in which the arbiter elegantiarum too often affects the satyr's shaggy hide, and the censor morum his lewdness.

The iambic verse of the Greeks, practised at the festivals of Demeter, was at first satirical. In its original or in its seazontic form it was used satirically by Archilochus, Simonides of Amorgos, and Hipponax. Of these little has survived; but important Greek influences were passed on to modern satire by the comedies of Aristophanes, the character-essays of Theophrastus, and later by the dialogues of Lucian. Among the Romans Lucilius

has come down only in fragments. Horace, the friendly worldling, in pedestrian verse employs the insinuating mode of satire. Persius, the high-minded Stoic, serene and philosophic in thought, is harsh and obscure in form. Juvenal, the vehement inveigher against vice, uses the most lurid colours. His power of impressing a picture on the memory is very great, though his rhetoric may bring suspicion upon his sincerity. All these reprehend chiefly private vices and follies, with violent transitions, and unexpected strokes at one victim as they pursue another. In addition to these formal satirists, Martial wrote satirical epigrams, and Petronius a form of prose fiction that anticipates the Spanish picaresque novel.

In Old English satire is difficult to detect. The railing Hunferth in *Beowulf* had doubtless successors in real life, but in literature hostility found less spirited expression in homilies and complaints. In the 12th century continental, and perhaps Welsh, influences find entrance to England in Latin verse-forms, some of which before very long became models for vernacular work. Nigel Wireker's *Speculum Stultorum*, the story of Brunellus the ass that wished for a longer tail, was long popular. From the 12th century onwards the Goliards, scholars who led irregular, wandering lives in England and Europe, wrote lively Latin rhymes, many of which attacked the morals of churchmen. The central figure was the voluptuous glutton Bishop Goliard, whose *Confession*, containing the famous 'Meum est propositum,' has been doubtfully attributed to Walter Map. Continental vernacular forms of similar tendency are the fabliau and the beast-epic. The story of Reynard the Fox, popular in Germany and France, was slow to make way in England, but one section, *The Vox and the Wolf*, appears about the middle of the 13th century. *The Land of Cockayne*, with something of the fabliau character, belongs to the same time. It describes a monastery built of pasties and fat puddings, where geese fly roasted on the spit, and everything else that a sensual monk can desire is at hand. After the battle of Lewes Richard of Cornwall is derided in spirited English verses, and from that time English takes its place beside Latin, and finally supersedes it as the language of purely political ballads. International animosities are seen in Scottish jeers at the maidens of England who had lost their lemans at Bannockburn, and in the vigorous crowing of Laurence Minot over Halidon Hill and Sluys. Shortly before this time France produced a satirical writer destined profoundly to influence the literature of Europe. Guillaume de Lorris's unfinished love-allegory, the *Roman de la Rose*, had been written in the troubadour spirit. Jean de Meung seasoned his encyclopedic continuation with mockery of women and priests. Chaucer was perhaps not exactly a satirist, but there is much satire of the finest kind diffused through his work. His tolerant, urbane humour, trained by his Italian studies, enabled him to practise one of the gentlest though most effective modes of satire. A very different kind of satirical power, belongs to the author (or authors) of *The Vision of William concerning Piers the Plowman*. Langland has sometimes been likened to Juvenal. He resembles him in vividness; but Juvenal is a rhetorician, Langland a prophet, whom few satirists have approached in moral earnestness. His subject is the whole commonwealth of England and the duty of each man to perform his own function faithfully. In the more worldly William Dunbar an equal visualising power is combined with wildly grotesque humour, and employed for the amusement of the Scottish court and his own advancement therein.

Renaissance and Reformation flooded Europe with satire, Latin and vernacular. In Latin,

scholars like Erasmus and Scaliger fell foul of one another, or like George Buchanan in his attacks on the Franciscans, and Ulrich von Hutten, Johann Jäger, and other authors in the *Epistolæ Obscurorum Virorum*, joined in the quarrel of religion. Besides Buchanan, the Scottish Reformers had an ally in their own tongue in Sir David Lyndsay, who used the morality play and other mediæval forms. The same shrewd humour of the German people that had shown itself in *Reynard* had again appeared in the merry roguery of *Till Eulenspiegel*. In South Germany Sebastian Brant gave a new turn to the methodical mediæval satire of classes by changing abstractions to types in his *Narrenschiff* (1494); and Niklaus Manuel showed what pungent dialogue could do to advance the Reformation. Manuel found English imitators; but Brant, who at home influenced Geiler, Fischart, and Murner, is the strongest German force in English satire. His influence seems traceable in the real types introduced by that reckless and breathless railer at Wolsey, John Skelton. Alexander Barclay, who introduced satirical eclogue in imitation of Baptista Mantuanus, is better remembered for his *Ship of Fools* (1509), partly translation, partly imitation of Brant. One of Brant's fools, Grobianus, in the hands of Dedekind and other Germans became the patron saint of slovens, and the centre of a literature that reached England in Dekker. To mediæval despondency over the world's instability a new tone of serene philosophical rectitude, and a new polish and scholarly ease, were given by Wyatt in his paraphrases of Horace, Persius, and the Italian Alamanni. Gascoigne's long, solemn, monotonous blank-verse poem, *The Steele Glas* (1576), classical in intention, is almost wholly mediæval in character. It is a moral discourse for staid readers. At least two of the master works of European literature, produced in the Renaissance spirit, are more than touched with satire. Italy, if it had no Rabelais or Cervantes, had a school of cultured mock-heroic in Pulci, Ariosto, and Berni, who blended satire with romance. In England, however, the romantic spirit of Elizabeth's reign did not favour satire, though Spenser at some time in his youth wrote the beast-fable *Mother Hubbard's Tale*, which passed on the mediæval tradition to Drayton (*The Owl*) and William Goddard. Spenser only printed his satire in 1590, when a reaction was already becoming visible. A taste was springing up for realistic and picaresque literature on the one hand, and on the other for analysis of humours in preference to full presentation of complete human characters. Under the influence of didactic theories of literature these, and sometimes erotic writings, often assumed a satirical mask. Books on coney-catching and thieves' slang, descriptions of tavern-scenes and swashbucklers, approach satire, and some of the prose works of Nash, Lodge, Dekker, and Breton come within its borders. Jonson placed satire on the stage in the comedy of humours. A new generation in the universities, more studious than adventurous, dissatisfied with romanticism, sought in social changes the causes that made it difficult for purely academic accomplishments to make a living without recourse to flattery, simony, or charlatanism. These young men showed a snappish irritability in satires pieced together, in great measure, out of Juvenal. Donne stands apart because of his metaphysical style, his use of Horace, and above all the expression of his genius and personality in his satires. Lodge gave Horace's tone to Juvenal's matter. Joseph Hall used Persius as well as Juvenal. Marston, Guilpin, and others followed Hall. These writers deal not with politics—for that was dangerous—nor with offences against the commonwealth, as older English satirists had done, but with vices seen from Juvenal's

point of view; and they write with one eye upon Elizabeth's England and one upon Domitian's Rome. Their satire is self-conscious and histrionic. They cultivated obscurity, harsh versification, uncouth jargon, and lubberly manners. Nicholas Breton protested against their absurdities in *No Whipping nor Tripping, but a kind friendly Snipping* (1601), one of the most melodious and sweetest-tempered satires in English, much resembling the Bernesque manner.

Early in the 17th century John Barclay, in Latin prose, imitated Petronius in his *Euphromionis Satyricon*, and in *Argenis* essayed political romance; Quevedo in Spanish passed on the dream-form to the German Moscherosch; and in Italian Tassoni gave an example of the mock-heroic in *La Secchia Rapita*.

After 1600 the school founded by Hall gradually abandoned satire and affectation, and split into a realistic branch represented by Samuel Rowlands and a moral branch represented by Wither and Brathwaite. Meanwhile a lighter satire appeared, still scholarly, but convivial and unguarded, carelessly written in popular forms. Ballads, drinking songs, epistolary itineraries, were written by Bishop Corbet, Alexander Brome, Sir John Mennis, and Dr James Smith; and Suckling's *Sessions of the Poets* had many imitators. Others combined this manner with the vivacity and metaphysical wit of Donne, which they turned to playful or political use. Of these Cleveland yields in brilliance only to Butler; but though his explosions of wit emit amazing flashes of light the damage they inflict upon the enemy is trifling. Wit and animosity, though present together, do not co-operate. Butler's *Hudibras* takes its plan from *Don Quixote*, and is indebted to the *Satyre Ménippée* (1594), in which the French Politiques had mocked the Leaguers. It is a sordid, cynical burlesque, not on the Puritans only but on the whole spirit of the early 17th century, written by one in whom the impulses of that spirit were baffled by a sense of futility that came from the Restoration craving for criticism and restriction.

After Butler political satire becomes more and more journalistic. Lampoons, epigrams, and occasional satires abound in the Restoration period. Denham and Marvell found means of combining these elements into longer satires by parodying the *Instructions to a Painter*, in which Waller had too hastily celebrated the Duke of York's exploits in the Dutch War. Marvell exceeds his contemporaries in earnestness, moral weight, and pictorial power. He had previously written good-humoured witty satires in the metaphysical manner; and now in addition to what he did in more dignified forms he wrote popular ballads of great vigour and epigrammatic sting. Such prose satire as was written in the 17th century was very largely in the form of character essays. A cynical, satirical tone prevailed on the stage and in conversation. Every turn in politics was followed by a crowd of dreams, prophecies, ghost-speeches, burlesque litanies, and other old forms, as well as verse essays and directions to painters. The standard of accomplishment could hardly have been lower, but the age of satire had begun, and satirists were eager to find out each other's faults. Writers on satire such as Casaubon and Dacier were studied; and above all neo-classical France, to which all eyes were turned, had then one of the world's most influential satirists to offer as a model. Satire of the classical kind had already been practised in France by Régnier. Boileau as a disciple of Horace now remodelled French verse, laid down laws that held for many a day, and executed them himself upon his weaker contemporaries. His satires show strong prosaic common-sense. Over

a basis of platitude he lays a highly polished veneer of Horace and Juvenal. He taught Butler, Rochester, and Oldham to translate and adapt the Latin satirists; and they used Boileau himself in the same way. Oldham's coarse and hectoring *Satires on the Jesuits* (1681) borrow their matter from Juvenal and Buchanan. As a rule Horace and Boileau are preferred by others; and Englishmen at last decide, as Mulgrave puts it, that 'A satyr's smile is sharper than his frown.' This doctrine tempered Dryden's native energy. He owes his pre-eminence to his combination of technical accomplishment, strength, and a sure instinct for selecting the right means and stopping at the right point. *The Medal* is a fine piece of satirical reasoning, *Macflecknoe* a dignified and on the whole decorous mock-heroic influenced by, rather than imitated from, *Le Lutrin* of Boileau. But Dryden is at his best in the mingled narrative and character-drawing of *Absalom and Achitophel*. After Dryden, Boileau's influence became paramount in Garth and in Pope. What Dryden did in the exhilaration of execution could only be very imperfectly followed by smaller men. Pope substituted minute, patient finish for Dryden's breadth and strength. To the heroic couplet, which even in Wither's hands had shown an epigrammatic tendency, he gave the last degree of point and sparkle, and fixed the technique of verse satire for a century. Among contemporaries Prior and Gay wrote light verse; Edward Young assailed *The Universal Passion* for fame; while Defoe, Arbuthnot, and above all Swift, excelled in prose. In 'sæva indignatio,' expressed in relentless irony, Swift has never been equalled. The influence of these English writers has been traced in the German satire of Liscow, Rabener, Wieland, and Lessing, and in French in the brilliant mockery of Voltaire. Johnson adapted Juvenal; Goldsmith showed himself one of the most genial of satirists; and Cowper was intermittently successful; but between Pope and the end of the century the greatest satirists in English are Churchill and Burns. Churchill, a vigorous slashing follower of Dryden, was an immortal champion of morality, a carper of great verve, with a knack of writing lines that only wanted to be a little better to become commonplaces of quotation. His lack of judgment was more fatal to his memory than the obscurity of his victims or the falsity of his charges. Burns belongs to a different tradition, which reaches back through Robert Ferguson and Allan Ramsay to Dunbar; but Dunbar alone can claim comparison with the humour and biting sarcasm that Burns turned against the hypocritical orthodox. The odes of Wolcot ('Peter Pindar') are amusing in small quantity, but soon grow nauseous. In his imitations of Persius and Horace William Gifford bullied the Della Cruscan poetasters with unnecessary acrimony and strenuity but some felicity of expression. Under his editorship *The Anti-Jacobin* (1797-8), to which George Canning, George Ellis, and John Hookham Frere contributed their brilliant parodies, nearer to Aristophanes than anything before them in English, far outshone the Whig *Rolliad*. Moore and Byron both deserted the Popian convention of their earlier satires, Moore to write witty but watery Hudibrastics and anapaests against the Prince Regent and the Tories, Byron to follow Frere in acclimatising Bernesque satire which had come down in Italian to Casti. Less exquisite in form than Frere's, and less delectable in humour, Byron's are as satires among the greatest; but he puts so much of himself into them, and of his revolt against the spirit of his age, that they are not satires pure and simple. His function in history has analogies with Voltaire's and with Heine's. Though denunciatory

verse has been written by Coleridge, Shelley, Tennyson, Browning, Swinburne, and Sir William Watson, pure satire has dwindled away as the hard-and-fast lines of fixed dogmas have faded out under the influence of romanticism and scientific criticism. Canning's prayer, 'Save, save, oh! save me from the Candid Friend,' has not been answered. But if the Candid Friend's discrimination and tolerance seldom allow him to be scornful, they do allow a refined spirit of satire to pervade general literature more thoroughly and more subtly than before. Peacock gave a well-compounded flavouring of Aristophanes, Petronius, and the Italians to his songs and novels. Landor, Sydney Smith, Carlyle, Thackeray, Dickens, and Mr Bernard Shaw have mingled satire, or something like it, with their work. Even Samuel Butler's *Erewhon* is not un-mixed satire. Satire of the humorous, and therefore tolerant, kind has been written by Southey and Coleridge, Hood, Praed, Thackeray, Sir W. S. Gilbert, and Sir Owen Seaman, and in America by Washington Irving, J. R. Lowell, Wendell Holmes, and many others.

See the articles on the several writers and literatures; such articles as *BURLESQUE*, *CARICATURE*, *CHARACTER*, *FABLIAUX*, and *PARODY*; Hannay, *Satire and Satirists* (1854); Alden, *Rise of Formal Satire in England* (Philadelphia, 1899); Previt6-Orton, *Political Satire in English Poetry* (1910); Hugh Walker, *English Satire and Satirists* (1925).

Satisfaction. See *ATONEMENT*.

Satrap was the governor of a province in the ancient Persian monarchy. His duties and position were clearly defined by Darius I. in the 6th century B.C., although there had been satraps before his day. They enjoyed the right to command the royal army in the province (though not the troops in the fortresses), to levy mercenaries, and to coin money. Alexander in the 4th century greatly curtailed their power. When the Persian monarchy began to decline some of the satraps founded independent kingdoms, the most famous being that of Pontus.

Satsuma. See *JAPAN*, *POTTERY*.

Saturn, an ancient Italian divinity, who presided over agriculture. His name, from the same root as *satum* (*sero*, 'I sow'), indicates what was probably one of the earliest personifications in the Italian religion Saturn being the god who blessed the labours of the sower. His identification with the Greek Kronos by the later Græcising myth-mongers was a peculiarly infelicitous blunder, the two having absolutely nothing in common except their antiquity. The Greek *Demeter* (Ceres) approaches far more closely to the Italian conception of the character of Saturn. The process of amalgamation in the case of Kronos and Saturn is visible enough. First, there is the Greek myth. Kronos, son of Uranos ('Heaven') and Gæa ('Earth'), is there the youngest of the Titans. He married Rhea, by whom he had several children, all of whom he devoured at birth except the last, Zeus (Jupiter), whom his mother saved by a stratagem. The motive of Kronos was his hope of frustrating a prophecy which declared that his children would one day deprive him of his sovereignty, as he himself had done in the case of his father Uranos; but fate is stronger even than the gods, and when Zeus had grown up he began a ten years' war against Kronos and the Titans, which ended in the complete discomfiture of the latter, who were hurled down to Tartarus, and there imprisoned. So ran the common myth. But other myths added that after his banishment from heaven Kronos fled to Italy, where he was received hospitably by Janus, who shared his sovereignty

with him. At this point the Greek myth coalesced with the Italian. Saturn, the old homely deity of the Latin husbandmen, was transformed into a divine king, who ruled the happy aborigines of the Italian peninsula with paternal mildness and beneficence, taught them agriculture and the usages of a simple and innocent civilisation. Hence the whole land received from him the name of *Saturnia*, or 'land of plenty,' and his reign was that 'golden age' of which later poets sang as the ideal of earthly happiness. At the foot of the Capitoline, where the fugitive god had formed his first settlement, there stood in historical times a temple dedicated to his worship. Ancient artists represented him as an old man, with long, straight hair, the back of his head covered, his feet swathed in woollen ribbons, a pruning-knife or sickle-shaped harp in his hand. Other attributes are of later invention. For the planet Saturn, see *PLANETS*.

The *SATURNALIA* was most probably an ancient Italian rural festival of the old Italian husbandmen, commemorative of the ingathering of the harvest, and therefore of immemorial antiquity. Its characteristic cessation from toil and its self-abandoning mirth were expressive of the labouring man's delight that the work of the year was over, and not of an artificial enthusiasm for a 'golden age' that never had been. During the festival the distinctions of rank disappeared or were reversed. Slaves were permitted to wear the *pileus*, usually the mark of freedom, and sat down to banquets in their master's clothes, while the latter waited on them at table. Crowds of people filled the streets, and roamed about the city in a peculiar dress, shouting '*Io Saturnalia!*' sacrifices were offered with uncovered head; friends sent presents to each other; all business was suspended; the law-courts were closed; schoolboys got a holiday; and no war could be begun. During the Republic the *Saturnalia* proper occupied only one day—the 19th of December (xiv. Kal. Jan.). The reformation of the calendar by Julius Cæsar caused the festival to fall on the 17th (xvi. Kal. Jan.), a change which produced much confusion, in consequence of which the Emperor Augustus ordained that the *Saturnalia* should embrace the whole three days 17th, 18th, and 19th of December. Subsequently the number was extended to five, and even seven; but even in the times before the Empire it would appear that the amusements often lasted for several days. But while the whole week was regarded in a general sense as devoted to the *Saturnalia*, three distinct festivals were really celebrated—the *Saturnalia* proper; the *Opalia*, in honour of *Ops*, the wife of Saturn, and the goddess of field-labour (from *opus*, 'a work'); and the *Sigillaria*, in which *sigilla*, or little earthenware figures, were exposed for sale, and purchased as children's toys. The modern Italian carnival would seem to be only the old pagan *Saturnalia* baptised into Christianity.

Saturnian Verse, the name given by the Romans to that species of verse in which their oldest national poetry was composed. In the usage of the later poets and grammarians the phrase has two different significations. It is applied in a general way to denote the rude and unfixed measures of the ancient Latin ballad and song, and perhaps derived its name from being originally employed by the Latin husbandmen in their harvest-songs in honour of the god Saturn (q.v.). It is also applied to the measure used by Nævius, and a common opinion, sanctioned by Bentley, is that it was a Greek metre introduced by him into Italy. But most scholars now maintain that the measure of Nævius is of Italian (Hermann even thinks of Etruscan) origin, and that it merely improved on the primitive Saturn-

ian verse. According to Hermann, the basis of the verse is contained in the following *schema* :

— — — — — | — — — — —,

which, as Macaulay points out, corresponds exactly to the nursery rhyme,

The queen was in her parlour | éating bréad and hóney,
and is frequently found in the Spanish poem of the *Cid*, the *Nibelungenlied*, and almost all specimens of early poetry; but in the treatment of it a wide and arbitrary freedom was taken by the old Roman poets, as is proved by the extant fragments of Nævius, Livius Andronicus, Ennius, and the old inscriptionary tables in the Capitol.

Satyriasis is a phase of insanity in man of which the characteristic is ungovernable sensuality. The term has also sometimes been applied to Leprosy (q.v.), on account of the disfigurement of the face to which it leads. See SATYRS.

Satyrs, in Greek Mythology, were a race of woodland deities, half human, half animal in their attributes. They are generally described as roaming the hills in the train of Dionysus (Bacchus). In appearance they were at once grotesque and repulsive, like all old woodland demons. They are described as robust in frame, with broad snub noses, large pointed ears like those of animals (whence they are sometimes called *theres*, 'wild beasts'), bristly and shaggy hair, rough skin, little horny knobs on their foreheads, and small tails. The satyrs are of course sensual in their inclinations, and ravishers of the woodland nymphs, fond of music, dancing, wine, and of the deep slumbers that follow a debauch. To men they were mostly inimical. The Roman poets identified them with the *Fauni* of their own mythology, and gave them larger horns and those goats' feet with which they are so often represented (see FAUNS). Ancient sculpture was fond of the Satyr as a subject. The older satyrs were called Sileni, and were represented as already described; the younger had a handsomer and more pleasing exterior—e.g. Praxiteles's famous Satyr at Athens.

Sauces. See DIET.

Sauchieburn, a battlefield of Stirlingshire, adjoining Bannockburn. See JAMES III.

Sauerkraut, a preparation of the common white cabbage, in extensive use in Germany and the north of Europe. The cabbages are gathered when they have formed firm white hearts, are sliced or cut fine, and then placed in a succession of thin layers in a cask, each layer being sprinkled with fine salt, to which some add juniper-berries, cumin-seed, caraway-seeds, or other condiment. A board is placed on the top, with a heavy weight, so as to press the whole down firmly, but gently; and ere long fermentation takes place. Sauerkraut is generally eaten boiled, in the same way as fresh cabbage, but is sometimes sweetened.

Saugor. See SAGAR.

Saul, the first king of Israel, was the son of Kish, a wealthy chief of the tribe of Benjamin. The circumstances that marked his election to the royal dignity are familiar to all readers of Scripture. Gigantic in stature, noble in mien, and imperious in character, he was admirably fitted to accomplish the task of consolidating the tribes of Israel. His earlier achievements augured hopefully for his future. The deliverance of the men of Jabesh Gilead, above all his victories over the Philistines, Ammonites, and Amalekites, were unmistakable proofs of his military capacity; but gradually there showed itself in the nature of the man a wild perversity—'an evil spirit of God' it is called—which found vent, along with other forms, in a mad jealousy of David, his son-in-law and

the chief of his bodyguard, and culminated in paroxysms of insane rage, which led him to attempt David's life with his own hand, and to commit such frightful deeds as the massacre of the priests of Nob. Saul had, however, apparently the strong opposition of the priestly class to contend against, for at length Samuel retired from court, and secretly anointed David as king; see the article SAMUEL. Saul fell in a disastrous and bloody battle with the Philistines on Mount Gilboa, and all his work seems to have been undone.

Saulcy, FÉLICIEEN CAIGNART DE, numismatist, was born at Lille, 19th March 1807, became an artillery officer, and after lecturing for a few terms on mechanics, was made keeper of the artillery museum in Paris in 1842. A member of the Academy and a senator, he travelled in Iceland and Greenland, and subsequently in Syria and Palestine. Besides innumerable works on numismatics, he wrote on Palestine, Jerusalem, and the Dead Sea, on Julius Cæsar in Gaul, and on Jewish history. He died 4th November 1880.

Saulte Ste Marie (pron. *Soo*), a port of Ontario, on the St Mary River, near the outlet of Lake Superior, 622 miles by rail W. of Montreal. A canal avoids the obstruction caused by the rapids (*sault*), and the tonnage passing through it is 40 per cent. greater than that of the Suez and Panamá canals combined. There are paper-mills, foundries, engineering and steel works, and it is the centre of a farming and lumber district. Pop. 21,000.—(2) A city and port of Michigan, on the St Mary River, opposite the above, with which it is connected by ferry and railway bridge. It manufactures leather, paper, flour, woollen goods, &c., and the fishing is important. Pop. 12,000.

Saumarez, JAMES, BARON DE, English naval commander, was born at St Peter-Port, in Guernsey, on 11th March 1757. He entered the navy as midshipman at the age of thirteen, and served in the American war (1774-82), for his gallantry at the attack of Charleston (1775) being promoted to lieutenant. He did good service in the action against a Dutch convoy fleet off the Dogger Bank (August 1781), and was made commander, being soon afterwards placed under the orders of Admiral Kempenfeldt on the Jamaica station. In the great fight between Rodney and De Grasse (12th April 1782) Saumarez commanded the *Russell*, a line-of-battle ship, and gained much distinction by his coolness and intrepidity. For his gallant capture on 20th October 1793 of the French frigate *La Réunion*, with one inferior in size and equipment, he received the honour of knighthood; and in command of the *Orion* he served under Lord Bridport at the battle of L'Orient, June 23, 1795. He also took a prominent part in the battle off Cape St Vincent (February 14, 1797), and was second in command at the battle of the Nile, in which he was severely wounded. In 1801 he was created a baronet and vice-admiral, and in the same year fought his greatest action, off Cadiz (July 12), defeating a French-Spanish fleet of fourteen ships with a squadron of only six, causing to the enemy a loss of 3000 men and three ships. This contest, than which, according to Nelson, 'a greater was never fought,' gained for Saumarez the Order of the Bath, the freedom of the city of London, and the thanks of parliament. In the war that broke out between Sweden and Russia in 1809 he commanded the English Baltic fleet that was sent to the assistance of the Swedes. In 1814 he was promoted to the rank of admiral, to that of vice-admiral of Great Britain in 1821, was created a peer in 1831, and died in Guernsey, 9th October 1836. See *Life* by Sir John Ross (2 vols. 1838), and Mahan, *Types of Naval Officers* (1902).

Saumur, a town of France, dept. Maine-et-Loire, on the left bank of the Loire and on an island in it, 38 miles by rail W. by S. of Tours. The most prominent buildings are an old castle, the 16th-century town-hall, some interesting churches (including that of St Peter, dating from the 13th century), and private houses of good French architecture. There is a cavalry school. Sparkling wines are made, and rosaries and articles in enamel. Pop. 16,000. Saumur was a stronghold of the Protestants during the reign of Henry IV., but its prosperity was annihilated by the revocation of the Edict of Nantes. From 1598 till 1685 it was the seat of a famous school of Protestant theology, the most conspicuous professors being John Cameron of Glasgow (1577-1625) and his pupils Amyraut (or Amyraldus, 1596-1664) and Cappel (1585-1658). The school was noted for its freedom in biblical criticism and its less rigid doctrine of the divine decrees; it was even denounced by the opposing school of Sedan as heretical for teaching a hypothetical universalism—the view that God had not by arbitrary decree excluded any from being saved by the death of Christ. Saumur was brilliantly captured by Laroche-Jaquelein and the Vendéans in the summer of 1793. The largest dolmen in France is $1\frac{1}{2}$ mile south of the town; and prehistoric caves line the river close by.

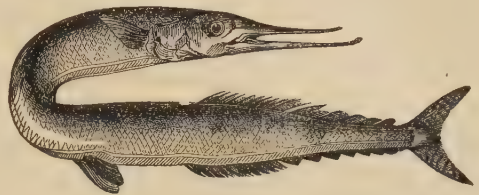
Saunderson, NICHOLAS, the blind mathematician, was born at Thurlstone in Yorkshire in January 1682. He lost his eyesight from smallpox at the age of twelve months, but received a good education in both classics and mathematics. In 1707 he proceeded to Cambridge, and there delivered a series of lectures on the Newtonian philosophy, including Newton's theory of optics. Four years afterwards he was appointed to succeed Whiston as Lucasian professor of Mathematics. He was on friendly terms with Newton, Demoivre, Halley, and other eminent mathematicians amongst his contemporaries. He died 19th April 1739. A Life is prefixed to his *Elements of Algebra* (2 vols. 1740); another treatise by him on *Fluxions*, including a discussion of the principal propositions in Newton's *Principia*, appeared in 1756. It is said that, in spite of his blindness, he understood the rules of perspective, the projections of the sphere, and some of the more recondite propositions of solid geometry.

Sauria, in the system of Cuvier an order of reptiles, including what are now distinguished as separate orders—the lizards (*Lacertilia*) and the crocodilians (*Crocodylia*). Saurian is often used as a very general title for extinct reptiles, and Huxley applied the term Sauroid to birds and reptiles which he included under the technical title Saur-opsida. See REPTILES.

Saurin, JACQUES, a celebrated French Protestant preacher, was born at Nîmes, 6th January 1677, studied at Geneva, and was chosen minister of a Walloon church in London in 1701. But the climate of England did not agree with his delicate health; and in 1705 he settled at the Hague, where his extraordinary gift of pulpit oratory was prodigiously admired. But at length his clerical brethren enviously assailed him with the accusation of heresy. The dispute was carried to the synod of the Hague, and Saurin was subjected to a series of petty persecutions that shortened his days. He died at the Hague on December 30, 1730. As a preacher he has often been compared with Bossuet, whom he rivals in force, if not in grace and subtlety. His chief productions are *Sermons* (12 vols. the Hague, 1749; abridged Eng. trans. 6 vols. 1775-76); *Discours sur les Événements les plus Mémorables du V. et du N. T.* (Amst.

1720-28), often called Saurin's Bible; and *État du Christianisme en France* (The Hague, 1725).

Saury Pike (*Scomberesox saurus*), a species of fish of the family Scomberesocidae, having the body greatly elongated, and covered with minute scales; the head also much elongated, and the jaws produced into a long sharp beak, as in Belone; from which, however, this species differs in the division of the dorsal and anal fins into finlets, as in mackerels. The Scomberesocidae are usually placed among the Physostomi, although the air-bladder has no opening. They resemble the Physostomi in the abdominal position of the



Saury Pike (*Scomberesox saurus*).

pelvic fins. The saury pike is about 15 inches long, the back dark blue, the under parts white; the fins dusky-brown. It approaches the coast in summer and autumn and enters firths in shoals, which are pursued by larger fishes, porpoises, &c.; and in order to escape from these it often leaps out of the water, or rushes along the surface, for a distance of one hundred feet, scarcely dipping or seeming to touch the water. Hence the name Skipper, which it very commonly receives on the British coasts. Vast shoals sometimes enter bays, so that they may be taken by pailfuls, and great numbers are sometimes found among the sludge at the ebbing of the tide in the upper parts of the Firth of Forth and elsewhere. It is not uncommon on the east and west coasts of England, but most abundant on the south coast, where it is often taken in pilchard nets. The eggs are furnished with long filaments, like those of other species of the family, by which they are entangled in clusters and attached to solid objects. As food the saury pike is said to be palatable, but it is not commonly sent to the market.

Sausage-poisoning. See BOTULISM.

Saussure, HORACE BÉNÉDICT DE, Swiss physicist and geologist, was born at Conches, near Geneva, 17th February 1740. He early showed an interest in the study of nature, his inclination being quickened by his uncle Bonnet, the naturalist, and his friend Haller, the physicist. In 1762 he obtained the chair of Physics and Philosophy in the university of Geneva. In 1768 he commenced a series of journeys which were fraught with important consequences to science; he visited the Jura and Vosges Mountains, Germany, England, Italy, Switzerland, Sicily and the adjacent isles, the extinct craters of Auvergne, and traversed the Alps in nearly all directions. He was the first 'traveller' (a party of guides were actually the first) who ever ascended to the summit of Mont Blanc, in 1787. During this course of travel he made numerous observations on the minerals, physical features, botany, and meteorology of the districts he visited; and these were put together in the work *Voyages dans les Alpes*, &c. (4 vols. Geneva, 1779-96). His observations were made with considerable labour; he had in many cases to perfect or even invent the instruments he used. In 1786 he resigned his chair, and, after a long period of suffering, died at Geneva, 22d January 1799. He always took a deep and active interest in the public affairs of his native canton. Besides the great work

above mentioned, and some minor productions, he wrote *Sur l'Hygrométrie* (1783), which Cuvier pronounced to be one of the most important contributions to science in the 18th century. His life was written by Senebier (1801), by Cuvier in *Biographie Universelle*, by De Candolle in *Phil. Magazine*, i. 4, and by Douglas Freshfield (1920).—His son NICOLAS THÉODORE (1767–1845) lived a very retired life, and wrote a valuable work on the physiology of plants, entitled *Recherches Chimiques sur la Végétation* (Paris, 1804).

Saussurea, a genus of composites near allied to the thistles, inhabiting the mountainous regions of high northern latitudes and the most elevated mountain ranges of the northern hemisphere, with one species in Australia. Of *S. gossypina*, Hooker in his *Himalayan Journals* says: 'It forms great clusters of the softest white wool six inches to one foot high, its flowers and leaves seeming clothed with the warmest fur that nature can devise.' This and several other species grow on Mt. Everest; one of these, *S. tridactyla*, was thought to be the highest-going flower till an *Arenaria* put the matter in doubt. *S. alpina* is found in Great Britain and western Donegal.

Sausrurite (named after Saussure), a dull, opaque, white, gray, or greenish compact mineral, of indeterminate or variable composition, which has resulted from the alteration of felspar, as in the rock called Gabbro (q.v.).

Sauterne, a district near Bordeaux, famed for its white Wine (q.v.). The village of Sauternes (dept. Gironde) is 8 miles NW. of Bazas.

Sauvage, FRÉDÉRIC (1785–1857), a shipbuilder of Boulogne, is by Frenchmen regarded as the inventor of the screw-propeller, in virtue of his having in 1832 improved the pattern in use.

Savage, RICHARD, a minor English poet, who loudly claimed to be the illegitimate child of Lord Rivers and the Countess of Macclesfield—a story for which he himself was the only original authority. His alleged mother married in 1683, but lived unhappily with her husband, and separated from him in March 1685. She bore two children to Richard Savage, fourth and last Lord Rivers, during the period of separation; the one, christened Ann Savage, was born in 1695, and died in infancy; the other, whom Richard Savage afterward claimed to be, was born January 16, 1697, was baptised and registered as Richard Smith, and most probably died also at nurse. The Earl of Macclesfield raised proceedings against his wife in the Arches Court in 1697, and obtained a divorce in the House of Lords in 1698, but some extenuation seems to have been found in the husband's conduct, for the whole of the wife's fortune was restored to her. Two years later she married Colonel Henry Brett, who died in 1724, apparently before the startling story was made fully public. Meantime the disreputable claimant, having no profession, had become by necessity an author, and had assumed the name of Savage at least as early as 1717 in the title to a pamphlet on the Bangorian controversy. In the title-page and dedication to *Love in a Veil* (1718) he first claims the parentage openly, but in Curll's *Poetical Register, or Lives of the Poets*, edited by Giles Jacob (1719), the story is for the first time fully given, no doubt by his own pen. Aaron Hill befriended him, and in June 1724 published in *The Plain Dealer* a brief outline of his story. Further letters and allusions followed, together with significant hints of pecuniary distress, which brought subscribers for his *Miscellanies* (1726). A Life appeared in 1727, from the pen of Beckingham and another, and undoubtedly helped to get him off the sentence of death for murder in a tavern brawl. His insulting attacks upon Mrs

Brett now became louder and more bitter—in a 'Preface' (1728) to the Life of the year before; in his poem, *The Bastard* (1728). Mrs Brett herself took not the slightest notice of the claim; but her nephew, Lord Tyrconnell, seems to have laboured privately to procure Savage's pardon, and after the publication of *The Bastard* to have silenced him with a bribe. *The Wanderer* was dedicated to him in 1729, but his bounty soon ceased, and Savage was again thrown upon the world. His disreputable habits brought with them misery and hunger, and the pension of £50 which the queen allowed him in return for a birthday ode was usually dissipated in a week's debauchery. On the queen's death Pope set agoing a subscription to find him the means of living quietly at Swansea, but after about a year of impatient exile he went over to Bristol, where he wearied out the benevolence of the most long-suffering sympathising friends, was flung into gaol for debt, and there languished till he died, July 31, 1743.

Neither to his poetry nor yet to his remarkable story does Savage owe his enduring reputation, but solely to the noble and touching Apology in which Samuel Johnson immortalised his ill-fated friend (1744). He knew Savage in his own years of hunger in London, had walked round St James's Square with him all night for want of a lodging, warmed only by the resolution to stand by their country, and out of the profound pity of his heart for a dead friend's sufferings wrote what is perhaps the most perfect shorter Life in English literature. He had heard Savage's story from his own lips, and the natural strength and shrewdness of his own intelligence was betrayed by the partiality of friendship. Yet Savage had not been communicative of the facts of his early life, and he never furnished the world with the proofs he boasted in 1724 that he possessed. All Johnson's authorities were traceable to Savage himself, and the story remains imperishably enshrined in literature, although marked by 'inherent improbabilities, cautious vagueness, inconsistencies, and proved falsehoods.' But even so stout a friend as Johnson should have paused for proof of such startling and unnatural charges as that Mrs Brett kept the child out of a death-bed legacy (1712) of six thousand pounds by giving Lord Rivers a false assurance of his death, and still further that she tried to kidnap him to the American plantations, and even laboured to prevent his obtaining a pardon when lying under sentence of death.

See W. Moy Thomas in *Notes and Queries* (1858), and Stanley Makower, *Richard Savage* (1909).

Savage Island, or NIUE, a coral islet to the east of the Friendly Islands. The Polynesian inhabitants were notorious for their ferocity, but are now Christianised. Niue was annexed to New Zealand in 1901. See *Savage Island*, by Basil Thomson (1902).

Savaii. See SAMOA.

Savanilla, a port of Colombia, on a bay of the same name on the Caribbean Sea, 17 miles WNW. of Barranquilla by the railway to Puerto Colombia. The roadstead is roomy but shallow, and its trade has passed to Puerto Colombia.

Savannah (Span. *zabana*, said to be a Carib word; not connected with Span. *sábana*, 'a sheet'), a name given by the early Spanish settlers to the great treeless plains of the North American continent. It is practically the equivalent of 'prairie' and 'steppe'; but is a term in use mainly in the southern Atlantic States of the American Union, especially Florida.

Savannah, a river which, with its right branch, forms the boundary between Georgia and South

Carolina, rises near the southern border of North Carolina, and flows south-south-east to the Atlantic. Its length is 450 miles, and it is navigable from November to June for large vessels to Savannah, for steamboats of 150 tons to Augusta.

Savannah, a city and port of Georgia, stretches several miles along the south bank of the Savannah River, 18 miles from its mouth, and 115 miles by rail SW. of Charleston. It is built on a sandy plain, 40 feet above the river, with broad streets shaded by beautiful trees, while many commodious parks are a delightful feature of the place. The chief buildings are the custom-house, city exchange, cotton exchange, court-house, Hodgson Hall, the Telfair Academy of Arts and Sciences, a Roman Catholic cathedral, the Independent Presbyterian Church, Christ Church, on the site of the chapel where John Wesley first ministered to the colonists, and the hospitals and asylums. The coloured people have churches and good schools for themselves. There are many handsome private houses. Savannah has an excellent deep-water harbour with nine miles of river frontage, and, besides coastwise sailings, has a large steamship connection with European, South African, and Pacific ports. It has long been the first naval stores station and the leading port in the South Atlantic coast in respect of the quantity of cotton exported. The shipments of timber, rice, wool, and hides are also very heavy, and there is an immense shipping business in fruits and early vegetables for the northern markets. Sugar and tobacco are grown, and there are several large shipbuilding plants. The city was founded by General James Oglethorpe in 1733, and incorporated in 1789. It was taken by the British in 1778, and by General Sherman in December 1864. Pop. (1880) 30,709; (1900) 54,244; (1920) 83,252.

Savary, ANNE JEAN MARIE RENÉ, Duc de Rovigo, a French general and diplomatist, was born at Marcq, in Ardennes, 26th April 1774, entered the army as a volunteer in 1790, and served with distinction under Custine, Pichegru, and Moreau on the Rhine, under Desaix in Egypt, and in the battle of Marengo (1800). Napoleon, whose notice he had attracted, made him commander of his bodyguard, and employed him in diplomatic affairs, for which he showed an admirable capacity. In 1804, as commandant of the troops stationed at Vincennes, he presided at the execution of the Duc d'Enghien, an event which he is believed to have unduly hastened; and in the wars of 1806-8 he acquired high military reputation at Jena, in the capture of Hameln, and by his victory at Ostrolenka (February 16, 1807), a brilliant achievement. Created Duke of Rovigo in the beginning of the following year, he was sent to Spain by the emperor, and negotiated the perfidious arrangement by which the Spanish king and his son were kidnapped. In 1810 he superseded Fouché as minister of Police. After the fall of Napoleon, to whom he had always been passionately devoted, and whom he served with a fidelity that stopped not at unscrupulous acts, he wished to accompany him to St Helena; but he was confined by the British government at Malta for some months, and at last made his escape to Smyrna. After experiencing several vicissitudes he returned to Paris in 1819, and was reinstated in his titles and honours. In 1831 he was appointed commander-in-chief of the army in Algeria; but ill-health forced him to withdraw to France in March 1833, and on the 2d of June following he died at Paris. Savary's *Mémoires* (Paris, 8 vols. 1828) are among the most curious and instructive documents relating to the first empire.

Save, a river of Yugoslavia, and an important affluent of the Danube, rises in the angle of the Julian Alps and the Karawanken, and flows south-east through Slovenia, passing Laibach; then it traverses Croatia, and going eastwards separates Bosnia and Serbia on the south from Slavonia on the north, and after a course of 556 miles effects its junction with the Danube at Belgrade. It is navigable up to Sisak in Croatia, 366 miles from Belgrade.

Savernake, a beautiful woodland region in Wiltshire, to the south of Marlborough.

Savery, THOMAS (1650?-1715), military engineer and inventor. See STEAM-ENGINE.

Savigliano, a town of North Italy, by rail 32 miles S. of Turin. It is surrounded by old fortifications, and has a triumphal arch to Victor Amadeus I. of Savoy. There are large railway-carriage works. Pop. 18,000.

Savigny, FRIEDRICH KARL VON, writer on jurisprudence, was born, of an old Alsatian family, on 21st February 1779 at Frankfort-on-the-Main, and studied law at Marburg and other German universities. In 1800 he began to teach as a *privat-docent* at Marburg; three years later he was made professor of Jurisprudence there and published a treatise on the Roman law of property, *Das Recht des Besitzes* (Eng. trans. 1849), that quickly won him European fame. In 1808 he was called to the chair of Jurisprudence at Landshut, but in 1810 removed to the corresponding chair at Berlin. This he held, along with several state offices, such as member of the commission for revising the code of Prussia, member of the Supreme Court of the Rhine Provinces, &c., until 1842. In that year he devoted his energies entirely to the task of reforming the laws. He resigned office in 1848, and died in Berlin on 25th October 1861. His greatest books were *Geschichte des römischen Rechts im Mittelalter* (6 vols. 1815-31) and *System des heutigen römischen Rechts* (8 vols. 1840-49), and the continuation of this last, entitled *Das Obligationenrecht* (2 vols. 1851-53). Savigny in those works applied the principles of the historical school to the study of the historical aspects of Roman law with brilliant success. From 1815 onwards he edited in conjunction with Eichhorn and others the *Zeitschrift für geschichtliche Rechtswissenschaft*. His *Vermischte Schriften* appeared in 5 vols. in 1850. There are biographies by Arndt (1861), Rudorff (1862), Bethmann-Hollweg (1867), Landsberg (1890), and others.

Savile. See HALIFAX (MARQUIS OF).

Savile, SIR HENRY, a learned scholar, was born in Yorkshire, 30th November 1549, entered Brasenose College, Oxford, but migrated in 1561 to Merton College, where he was elected to a fellowship. He travelled on the Continent (1578); after his return was Queen Elizabeth's tutor in Greek and mathematics; became Warden of Merton College in 1585; Provost of Eton in 1596; was knighted in 1604; and died 19th February 1622. Three years before, he had founded chairs of Geometry and Astronomy at Oxford which still bear his name.

His principal works are *Rerum Anglicarum Scriptores post Bedam præcipui* (1596), a folio containing the works of William of Malmesbury, Henry of Huntingdon, Roger Hoveden, and Ingulph; *Commentaries concerning Roman Warfare* (1598); *Power Bookes of the Historics* and the *Agricola* of Tacitus (1581); and a magnificent edition of St Chrysostom (8 vols. folio, 1610-13), a work which cost £8000, one-fourth for paper alone.

Savine, or SAVIN. See JUNIPER.

Savings-banks.—*General History*.—Savings-banks, for the receipt of small deposits, and their accumulation at compound interest, are either (1) voluntary associations, the property and manage-

ment of which are vested in their trustees and managers, or (2) institutions established and managed by the state. The first class comprises: (a) certified *Trustee Savings-banks*, governed by the Trustee Savings Banks Acts, 1863-1920, and some banks in Scotland registered under the Scottish act of 1819, 59 Geo. III. c. 62; (b) *Penny Banks*, largely under the control of Trustee and Post-office Savings-banks; (c) *Railway Savings-banks*, established under private acts of parliament for the benefit of railway employees; (d) certain societies acting as savings-banks, existing in various industries. The second class includes (a) *Post-office Savings-banks*, regulated by the Post Office Savings Banks Acts, 1861-1908, and under the control of the Postmaster-general; (b) *Military Savings-banks*, established under the Military Savings Banks Act, 1859, for the benefit of non-commissioned officers and men of the military forces, and controlled by the War Office; (c) *Naval Savings-banks*, established under an act of 1866 and controlled by the Admiralty for the benefit of warrant officers and men in the Royal Navy; (d) *Seamen's Savings-banks* for the benefit of seamen in the merchant service, established under the Merchant Shipping Acts, 1894-1925, and regulated by the Board of Trade; (e) to these must be added the *National Savings Certificate* system, the continuation of the War Savings movement started during the Great War (1914-18).

The formation of trustee savings-banks was first suggested by Defoe in 1697. Though, however, the project was revived by Francis Maseres, Cursitor Baron of the Exchequer, in 1771, and by Jeremy Bentham in 1797, it was not practically carried out in England till the year 1799. The first savings-bank established in Europe is said to have been that of Brumath in France, established in 1765, which was followed by one at Loire (dept. Rhône) in 1790. In Germany savings-banks were first established at Hamburg in 1778 and Oldenburg in 1786; in Switzerland at Bern in 1787, Basel 1792, Geneva 1794, and Zurich 1805; and in Denmark at Kiel in Holstein in 1796. The first English bank was established in 1798 by Mrs Priscilla Wakefield at Tottenham, who made provision for a 'Children's Bank' in the rules of a 'Female Benefit Society' then instituted by her. Another was founded in 1799 by the Rev. Joseph Smith, rector of Wendover, Bucks, who, in order to encourage frugality in his parish, offered with two other inhabitants to receive any weekly sums not less than 2d., and if the amount were not touched before Christmas to add one-third to it on every 3s. paid in, as bonus or encouragement. In Scotland the Rev. John Mackay established a friendly bank for savings of the poor at West Calder in 1807, and in 1810 the Rev. Henry Duncan founded a similar institution at Ruthwell in Dumfriesshire, which has served as a model for all subsequent ones. In Ireland a savings-bank was established at Stillorgan, County Dublin, in 1815; and one of the earliest founded in Wales appears to have been that at Brecon, established in 1816.

The establishment of savings-banks under government supervision was proposed as early as 1806 by Samuel Whitbread (q.v.); but the credit of first suggesting their formation in connection with the post-office is due to the Ven. George Hans Hamilton, Archdeacon of Northumberland, who propounded a scheme to this effect in 1852 and again in 1858. In 1859 a paper, containing many valuable suggestions subsequently adopted by the Postmaster-general, was read by Sir Charles Sikes of the Huddersfield Banking Company, before a Social Science Congress at Bradford. The plan of the present system was drawn up in 1860 and established by the Post Office Savings Bank Act, 1861.

Trustee Savings-banks.—The first two savings-banks acts were passed in 1817, and authorised the formation of banks in Ireland and England respectively for the benefit of depositors, deducting from the income earned on deposits only sufficient to provide for the expenses of management, but 'deriving no benefit from such deposits or the produce thereof.' In 1818 the rules, like those of friendly societies, were made subject to confirmation by justices at quarter sessions, and in the following year the system was introduced into Scotland. In 1828 it was, however, enacted that the rules should be submitted to a barrister appointed by the National Debt Commissioners, who was to certify that they were in conformity with law, and who, in 1844 was also empowered to settle all disputes between the trustees and the depositors. In 1863 the law was consolidated by an act which repealed all previous acts, and enacted that the rules of all banks should contain regulations providing for (1) the attendance of at least two trustees, managers, or specially appointed paid officers on all occasions of public business; (2) the comparison of the pass-books of the depositors with the ledger on every repayment, and also on their first production at the bank after each 20th November; (3) the audit half-yearly of the books of the bank by a public accountant, or one or more auditors appointed by the trustees and managers, but 'not out of their own body'; (4) a book containing an extracted list of the depositors' balances made up every year to the 20th November, to be kept open at any time during the hours of public business for the inspection of the depositors; (5) meetings of the trustees and managers half-yearly at least, the keeping of minutes of their proceedings in a separate book, and the transmission by them of weekly returns, showing the amount of the week's transactions, to the National Debt Commissioners.

Post-office Savings-banks were established in 1861 by an act designed to grant additional facilities for depositing small savings at interest, with 'the direct security of the state' for the repayment of the deposits. It empowered the Postmaster-general, with the consent of the Treasury, to authorise 'such of his officers as he shall think fit to receive deposits for remittance to the principal office and to repay the same,' under such regulations as, with the consent of the Treasury, he may prescribe, paying the moneys so received to the National Debt Commissioners. It provided for the transfer of deposits to and from trustee savings-banks, and fixed the rate of interest on deposits at £2, 10s. per annum. The Act of 1861 was amended in 1863 by one which facilitated the transfer of the accounts of minors, and also provided for the closing, under certain conditions, of trustee banks, and the transfer of unclaimed accounts to the post-office banks.

Since 1863 several acts relating to savings-banks have been passed, a few of which apply to trustee banks only. In 1876 the Savings Bank Barister Act transferred the powers of settling disputes and certifying rules invested in the barrister appointed by the National Debt Commissioners to the Registrar of Friendly Societies. The interest payable by those commissioners on the funds of the banks invested with them was originally 3d. per cent. per diem—i.e. £4, 11s. 3d. per cent. per annum, reduced to 2½d. in 1828—i.e. £3, 16s. 0½d. per cent. per annum, the rate to depositors being fixed on the latter occasion at 2½d. per cent. per diem—i.e. £3, 8s. 5½d. per cent. per annum. In 1844 these rates were reduced to £3, 5s. and £3, 0s. 10d. respectively. The Savings Bank Act of 1880 reduced the interest payable to the trustees of savings-banks to 3 per cent., and that payable to depositors to a maximum of £2, 15s., and the

National Debt (Supplemental) Act, 1888, lowered the respective rates still further to £2, 15s. and £2, 10s., depositors thus getting the same as in the post-office banks. An act of 1920 permitted the rate payable to the banks to move between £2, 15s. and £2, 17s. 6d., according to Treasury Order, the addition being in aid of management expenses.

Other important provisions of the 1880 act were those authorising the investment of deposits in post-office and trustee banks in government stock, to the amount of £100 in any one year, and to a total amount of £300. Regulations issued under this act in 1881 were amended by those of 1888, which fixed the minimum amount of stock purchasable at one shilling. In 1893, £50 was made the statutory maximum for yearly money deposits; government stock to the extent of £200 in one year, and to a maximum holding of £500 at any one time, could be purchased in addition. All limits were temporarily removed by a Treasury Order in 1915, and the Savings Banks Act, 1920, left their re-imposition in the hands of the Treasury, subject to certain safeguards. An Order of 1923 imposed an annual limit of £500 for cash deposits. Apart from the above regulations there are those which govern the Special Investment departments of trustee banks, in which a depositor with at least £50 to his credit in an ordinary account, may invest up to £500 in any manner authorised by law in the case of investments by trustees approved by the National Debt Commissioners.

From very early in their history savings-banks began to come under the legislative influence of the state, the purpose being the protection of the depositors against loss of their money. Failures, chiefly caused by negligence in controlling the work of the paid officers of banks, were of frequent occurrence, one of the earliest being that of the Mildenhall Bank (Suffolk) in 1825. Between 1842 and 1857 there were twenty-three in England and four in Ireland, involving loss to the depositors in some cases, but in others losses were made good by the trustees; after 1857 there were a number of cases of defalcations by paid officials, resulting in closings of banks. Prior to 1828 the trustees and managers were personally liable for any deficiency, unless they protected themselves by their rules. The Act of 1863 provided that no trustee or manager of any bank in the United Kingdom should be personally liable except (1) for moneys actually received by him on account of or for the use of the bank, and not disposed of as directed by the rules; (2) for neglect or omission in complying with the regulations prescribed by the act as to the maintenance of checks, the audit and examination of accounts, the holding of meetings and keeping minutes of proceedings; (3) for neglect or omission in taking security from officers as required by the act. In 1887 events led to the passing of the Trustee Savings Bank Act of that year, empowering the Treasury, on the representation either of the depositors or of the National Debt Commissioners, to appoint a commissioner to hold a local inquiry with regard to any trustee bank, and it also provided for the winding-up of trustee banks as 'unregistered associations' under the Companies Acts. The Savings Bank Act, 1891, took a very important step in the same direction by providing for the appointment of an Inspection Committee of Trustee Savings-banks, charged with the duty of ascertaining, by means of inspectors, whether the banks were duly complying with their rules, and keeping their expenditure within due limits. If the committee on the report of any inspector, were of opinion that a bank had made default in either of these respects, they must report the matter to the National Debt Commissioners, who might, in their discretion, either

close the account of the trustees, or report to the Treasury, in order that an inquiry be held under the Act of 1887. Further provision was made by an act of 1904 for the amalgamation of trustee banks, for superannuation allowances for retired bank officials, for the foundation of subsidiary penny-banks; also for the annual appointment of auditors, and an annual presentation before Parliament of a statement of liabilities, &c. This act restored the Special Investment business of trustee banks, and an act of 1918 established further safeguards in this department.

Progress of the System.—By the end of 1817, when legislation on the subject first began, upwards of 135 trustee savings-banks were in existence, of which 122 were in England, 4 in Wales, 5 in Ireland, and 4 in Scotland. The establishment of the post-office system in 1861 almost immediately caused a decrease in the business of the older institutions, and by the end of 1869, 145 of the 638 trustee banks open in 1860 had been closed, and capital amounting to £1,816,335 transferred to the post-office banks, the number of which has risen rapidly. To-day post-office savings-banks exist at all money-order offices, and at some smaller offices as well.

In 1829, after the passing of the Act of 1828, the number of savings-bank accounts in the United Kingdom was 409,714, amounting to £14,311,192. In 1845, after the passing of the Act of 1844, it rose to 1,062,930, amounting to £30,748,868; and at the introduction of the post-office system was 1,585,778, amounting to £41,258,368. In 1912 the total number of depositors in the trustee savings-banks was 1,870,510, and the total amount due to them was £53,811,899, an average of about £28, 15s. In the same year the depositors in the post-office savings-banks totalled 8,868,008, and the total amount due to them was £182,104,564, an average of about £20, 10s. The trustee banks were arrested from a decline by the administrative improvements resulting from the Acts of 1891 and 1904, which re-established public confidence in them. Their growth has been slower than that of the post-office banks, although it must be admitted the spread of the latter is facilitated by the fact that in most cases the offices already exist, and the savings-bank is merely a new department requiring little or no addition to staff or premises.

During the war years of 1914-18 savings-banks, far from succumbing to financial embarrassment—which fate had been predicted for them by some prophets—actually strengthened their positions as agencies for promoting thrift, the number of their accounts growing fast. This fact was the more remarkable as a new competitor had meanwhile entered the field, the Treasury issuing through the post-office various securities to attract the small investor, the best known being War Savings Certificates. These appeared in February 1916 at a price of 15s. 6d. each, repayable plus 4s. 6d. interest on the fifth anniversary of issue, although they could be withdrawn at any previous date if desired. The maximum holding was 500, and the interest was free of income-tax. The work of the Central National War Savings Committee was aided by countless war savings associations throughout the country, and a spirited propaganda in the interests of thrift was carried on, the sentiment of patriotism being specially appealed to. By 1920 over 440 million certificates had been sold. The scheme was continued after the war under the National Savings Committee, the certificates being called National Savings Certificates. The rate of interest has been lowered since 1922. By 1925 the net balance due to holders of certificates (including accrued interest) was about 459 million pounds. In spite of the competition of this attractive invest-

ment, the trustee and post-office savings-banks with their interest limited to £2, 10s. per cent.—a limitation which was appealed against in vain—continued to enlarge their holdings. In 1925 the trustee savings-banks held £83,396,491 in respect of 2,340,644 accounts, and the post-office savings-banks held £285,491,388 in respect of 12,431,373 active accounts. These figures exclude holdings of government and other stock. The other types of savings-banks are of relatively small importance. Depositors in railway savings-banks in 1924 numbered about 150,000 and deposits over £14,000,000.

The Government Annuity and Insurance System.—The foundations of the government insurance system were laid in 1833 by the 3 and 4 Will. IV. chap. 14 (extended to Scotland in 1835), which allowed the purchase of annuities, immediate or deferred, through the medium of savings-banks or of societies authorised to be established for the purpose in parishes where there were no savings-banks, and the system was further developed in 1853 by the 16 and 17 Vict. chap. 45, and in 1864 by the 27 and 28 Vict. chap. 43. The latter act is embodied in the Government Annuities Act, 1882. Under these statutes a 'savings-bank annuity' may be of any amount not exceeding £100 a year, and may be granted to any person not under five years of age, while a 'savings-bank insurance' may be granted for not exceeding £100 to any person between the ages of fourteen and sixty-five, or for not exceeding £5 to a person not under eight years. 'Annuity and insurance regulations' under the acts are made by the National Debt Commissioners as respects trustee, and by the Postmaster-general as respects post-office savings-banks, and in practice this business is confined to the latter class.

Savings-banks Abroad.—A savings-bank was established in Paris by a law of 1818, and the system spread rapidly throughout the departments. A post-office savings-bank system was instituted in France by a law of 1881. Savings-banks in Germany are of great variety. The first municipal bank was opened in Berlin in 1818. The post-office bank has not developed in Germany, but is a feature of all the other principal states of Europe, as well as of India and the Dominions.

In 1816 the first savings-banks in the United States—the Philadelphia Savings Fund Society, suggested by Condé Ragnet, and the Boston Savings-bank—were established, and in 1819 were followed by one at New York. Savings-banks in the United States are not as clearly separated from banks in general as in the United Kingdom. In the eastern states the business is pursued mostly by mutual savings-banks, which have no capital and whose earnings go as dividends to depositors; in the other states mostly by stock savings-banks managed by a board of directors elected by the stock-holders, who obtain as dividends the earnings left after paying interest to depositors. But savings-bank business is also carried on by special departments of state banks, national banks, private banks, trust companies, and by school savings-banks. The number of depositors in 1926 totalled 46,762,240. A postal savings system was founded by an Act of 1910. It receives deposits up to 2500 dollars and pays interest at 2 per cent. A depositor may take up Postal Savings Bonds yielding a tax-free interest of 2½ per cent. The system counted, in 1924, 402,325 depositors.

See Lewins, *History of Banks for Savings in Great Britain and Ireland* (1866); Scratchley's *Practical Treatise* (2d ed. 1863); A. Urquhart Forbes, *The Law relating to Trustee and Post-office Savings-banks* (1878-84); the reports of various Select Committees on Savings-banks and kindred topics (1857, 1889, 1902, 1916, 1923); the annual reports and returns. American books on the subject are: E. W. Keyes, *History of Savings Banks*

in the United States (1900); E. W. Kemmerer, *Postal Savings* (1917); E. L. Robinson, *One Hundred Years of Savings Banking* (1918); W. H. Kniffin, *The Savings Bank and its Practical Work* (1918). For France, see A. Cormont, *Les Caisses d'Épargne* (1922). See also the articles BANKING, BUILDING SOCIETIES, CO-OPERATION, FRIENDLY SOCIETIES, SCHULZE-DELITZSCH.

Savona, a seaport of Northern Italy, on the Gulf of Genoa, by rail 26 miles S. by W. of the city of that name and 91 SSE. of Turin. A handsome modern town embowered in orange-groves, it has a Renaissance cathedral (1589-1602), with a chapel containing the tomb of the parents of Pope Sixtus IV., a member of the Della Rovere family, fine choir-stalls, &c.; a castle (1542), now used as a prison, in which Mazzini was confined in 1830-31; the Della Rovere Palace, built for Pope Julius II., nephew of Sixtus IV., by Antonio da Sangallo; a picture-gallery, a marine institute, &c. The industries embrace ironworks, potteries, glass-works, tanneries, and brick-yards. Coal, wheat, and iron are imported, and chestnut staves and pottery exported. The coal is dealt with by the largest telpherage plant in Europe. The poet Chiabrera (1552-1637) was born here. The history of Savona begins in the 7th century. In the main it has been a long struggle against its successful rival Genoa, which in the 16th century filled up its harbour; it was only opened again in 1815. Pop. 58,700 (commune).

Savonarola, GIROLAMO (JEROME), religious and political reformer, was born of a noble family at Ferrara, September 21, 1452. He was educated at home, and at a very early age became deeply versed in the philosophy of the schools; but his disposition was from the first tinged with religious asceticism, and in 1474 he formally withdrew from secular affairs, and entered the Dominican order at Bologna. Having completed his novitiate and the studies of the order, he seems to have made his first public appearance as a preacher in 1482, at Florence, where he had entered the celebrated convent of his order, San Marco, and where he preached the Lent in that year. His first trial, however, was a failure; his voice was harsh and unmusical, and his simple, devout earnestness failed to interest his hearers, so that, after a time, the course of lectures was entirely deserted. Some time afterwards Savonarola was sent to a convent of his order at Brescia, where his zeal began to attract notice, and the disadvantages of manner and address ceased to be felt under the influence of his sterling genius and irresistible enthusiasm. In 1489 he was once more recalled to the convent of San Marco at Florence. His second appearance in the pulpit of San Marco was a complete success. The great subject of his declamation was the sinfulness and apostasy of the time; and in his denunciation of the vices and crimes of his age he took as his theme what has been the topic of enthusiasts in almost every age, the mystical visions of the Apocalypse. These he applied with terrible directness to the actual evils with which, as with a moral deluge, the age was inundated; and for his half-expositions, half-prophetic outpourings his followers claimed for him the character of an inspired prophet. Under the rule of the great head of the Medici family, Lorenzo the Magnificent, art, literature, and philosophy had all followed the common direction of that elegant but semi-pagan revival which the scholars of the 15th century had inaugurated; and the whole spirit of the social as well as intellectual movement of which Florence, under the Medici, was the centre was utterly at variance with the lofty Christian spirituality and severe asceticism in which Savonarola placed the very first conditions of the restoration of true religion and morality. His preaching,

therefore, in its spirit, as well as in its direct allusions, was no less antagonistic to the established system of the government than to the worldly and irreligious manners of the age; the visions and predictions ascribed to him had quite as much of political applicability as of religious significance; and thus, to the aristocratic adherents of the Medici, Savonarola early became an object of suspicion, if not of antipathy and dread. It is said by Pico de Mirandola that he refused to grant absolution to Lorenzo when the latter lay dying in 1492 as the Magnificent declined to accede to the demands made by his confessor.

Up to this time, however, Savonarola's relations with the church were, if not of harmony, at least not of antagonism; and when, in the year 1493, a reform of the Dominican order in Tuscany was proposed under his auspices, it was approved by the pope, and Savonarola was named the first vicar-general. About this date, however, his preaching had assumed a directly political character, and the predictions and denunciations which formed the staple of many of his discourses pointed plainly to a political revolution in Florence and in Italy as the divinely ordained means for the regeneration of religion and morality. In one of his discourses he pointed plainly to the advent of the French under Charles VIII.; and when this prediction was fulfilled by the triumphant appearance of the French expedition, Savonarola was one of a deputation of Florentines sent to welcome Charles VIII. as the saviour of Italy, and to invite him to Florence. Very soon, however, the French were compelled to leave Florence, and a republic was established, of which Savonarola became, although without political functions, the guiding and animating spirit, his party, who were popularly called *Piagnoni*, or 'Weepers,' from the penitential character which they professed, being completely in the ascendant. It was during this brief tenure of influence that Savonarola displayed to the fullest extent both the extraordinary powers of his genius and the full extravagance of the theories to which his enthusiastic asceticism impelled him. The republic of Florence was to be the model of a Christian commonwealth, of which God Himself was the chief ruler, and His Gospel the sovereign law; and thus the most stringent enactments were made for the repression of vice, and of all the sinful follies by which it is fomented and maintained. All the haunts of debauchery were suppressed; gambling in all its forms was prohibited; the vanities of dress were restrained by sumptuary enactments; and, under the impulse of the popular enthusiasm which the enthusiasm of the prophet engendered, women flocked in troops to the public square to fling down their costliest ornaments, and his followers made in the piazza an immense 'bonfire of vanities,' destroying in one hecatomb large numbers of cards, dice, masks, carnival costumes, and probably some books of licentious poetry and indecent pictures. There seems no ground for the charge often made that he and his disciples destroyed in indiscriminating zeal valuable statues and rare manuscripts.

Meanwhile, the extremes of his rigorism; the violence of his denunciations, which did not spare even the pope himself (Alexander VI.); the assumption by him, or attribution to him, of a supernatural gift of prophecy; and the extravagant interpretation of the Scriptures, and especially of the Apocalypse, by which he sought to maintain his views, drew upon him the displeasure of Rome. He was cited, in the year 1495, to answer a charge of heresy at Rome; and, on his failing to appear, he was forbidden to preach; the brief by which the Florentine branch of his order had been made independent was revoked; he was offered a cardi-

nal's hat on condition of his changing his style of preaching—an offer he indignantly refused; and he was again forbidden to preach. Once again Savonarola disregarded this order. But his difficulties at home now began to deepen. The measures of the new republic proved impracticable. The party of the Medici, called 'Arrabbiati' ('Enraged'), began to recover ground. A conspiracy for the recall of the exiled House was formed; and although, for the time, it failed of success, and five of the conspirators were condemned and executed, yet this very rigour served to hasten the reaction. The execution of these conspirators was afterwards laid to the charge of Savonarola, who was said to have been the chief opponent of the proposal to grant them an appeal—a charge for which there seems to be no foundation. But all circumstances seemed now to count against the once all-powerful Savonarola. At the critical point of the struggle of parties came, in 1497, a sentence of excommunication from Rome against Savonarola. Savonarola openly declared the censure invalid, because unjust, and refused to hold himself bound by it. During the plague Savonarola, precluded by the excommunication from administering the sacred offices, devoted himself zealously to ministering to the sick monks. A second 'bonfire of vanities' in 1498 led to riots. In the same year, when the new elections took place, the party opposed to Savonarola, the Arrabbiati, came into power. He was ordered to desist from preaching; and the struggle was brought to a crisis by the counter-denunciations of a preacher of the Franciscan order, long an antagonist of Savonarola, Francesco da Puglia. In the excited state of the popular mind thus produced an appeal was made by both of the contending parties to the interposition of divine providence by the ordeal of fire; and one of Savonarola's disciples agreed to make trial of the dread ordeal along with a Franciscan friar. But at the moment when the trial was to have come off (April 1498) difficulties and debates arose, and nothing was actually done. The result of this was to destroy with the populace the prestige of Savonarola's reputation, and to produce a complete revulsion of public feeling. In the midst of this reaction he was cited before the council, and brought to trial for falsely claiming to have seen visions and uttered real prophecies, for other religious errors, and for political insubordination. He denied the charges; but, put to the torture, he made avowals which he afterwards withdrew. The conclusion was a foregone one; he was declared guilty of heresy and of seditious teaching, and of being an enemy to the peace of the church. The acts of the trial were sent to Rome, where the sentence was confirmed; he, with two disciples of his order, was given up to the secular power; so on May 23, 1498, this extraordinary man and his two companions, brothers Domenico and Silvestro, were strangled, and their bodies burned by the executioner. They died professing their adherence to the Catholic Church, confessed and received absolution, and on the morning of the execution Savonarola administered the last communion to his two companions and himself. There seems no doubt that Savonarola firmly believed in the dogmas of the Roman Catholic Church; and it is only as a moral and religious reformer, and not a theological teacher, that he can in any way be regarded as a forerunner of the Reformation of the 16th century.

His works, mainly sermons, religious essays, theological treatises (of which the chief is *The Triumph of the Cross*), some poems, and a political discourse on the government of Florence, were mainly written in Latin. An edition in 6 vols. appeared at Lyons in 1633-40; and one by Baccini of his Sermons at Florence since 1889. The principal work on him is the Life by Professor

Villari (1863, Eng. trans. by Horner; 2d ed., much altered, 1887; Eng. trans. by Linda Villari, 1888). There are also English works by R. Madden (1854), W. R. Clark (1878), Herbert Lucas, S.J. (1899), and P. Villari (1918); see also Mrs Oliphant's *Makers of Florence* and George Eliot's *Romola*.

Savory (*Satureja*), a genus of plants of the family Labiate, nearly allied to Thyme (*Thymus*). The species are herbaceous and half-shrubby plants, all natives of the south of Europe and the East. The Common Savory, or Summer Savory (*S. hortensis*), is commonly cultivated in kitchen-gardens for flavouring dishes. It is an annual plant, $\frac{1}{2}$ to 1 foot high, with lilac or white flowers, has a strong and agreeable aromatic smell, and an aromatic pungent taste, and is in common use both fresh and dried for flavouring dishes, and especially for flavouring beans. It is stomachic and tonic. Winter Savory (*S. montana*) is used in exactly the same way. It is a half-shrubby plant, with prickly-pointed leaves and larger flowers. Its taste is pungently aromatic. Summer savory is propagated by seed; winter savory by slips and cuttings.

Savoy, formerly a province of the kingdom of Sardinia, was transferred to France in 1860, and divided into the two departments of Savoie and Haute-Savoie. It is an alpine region, having the Graian Alps on the eastern frontier, as the boundary next Piedmont. On that side it runs up to 15,782 feet in Mont Blanc, and to 11,792 in Mont Cenis; thence it falls away gradually to the Rhone (950 feet), which separates it on the west from the French department of Ain. The northern boundary passes through the Lake of Geneva; and on the south-west lies the French department of Isère. The area is 4162 sq. m. (2388 in Savoie and 1774 in Haute-Savoie); the total population (1891) 531,564; (1921) 560,702, of whom 225,034 were in Savoie and 235,668 in Haute-Savoie. The rivers are mostly mountain-torrents, as the Isère, Drance, Arve, and Fier, all tributaries of the Rhone, though the Drance falls into the Lake of Geneva. A large part of the surface is covered with forests (29 per cent.) of pine, fir, larch, beech, oak, elm, ash, hazel, walnut, and chestnut, and with pastures (20 per cent.), on which many cattle, sheep, and goats are kept. The vine is extensively grown, from 7 to 10 million gallons of wine being produced annually according to the season. Only 21 per cent. of the surface is cultivated. Potatoes, oats, rye, and wheat, with hemp, beet-root, tobacco, colza-seed, and maize, are the principal crops; much honey is made; butter and cheese are exported in large quantities; silk-worms are bred; and chestnuts form an article of commerce. Building-stone of various kinds, slate, iron ore, and anthracite are the most valuable of the mineral products. Mineral springs are found at Aix-les-Bains, Évian, Thonon, and other places. There is considerable manufacturing industry, especially in the making of cottons, silk stuffs, gauze, woollens, iron, clocks, leather, paper, fluff. The peasant women make rough woollen stuffs for home wear. The people are poor, thrifty, and industrious; large numbers leave home every year to fill the lower grades of domestic service in Paris and other large towns; but nearly all return home when they have made a little money. The dept. of Savoie has the four arrondissements of Albertville, Chambéry, Montiers, St Jean-de-Maurienne; capital, Chambéry. Haute-Savoie has the four arrondissements of Annecy, Bonneville, St-Julien, Thonon; capital, Annecy.

HOUSE OF SAVOY.—The territory of Savoy formed a part of ancient Gaul. After the decline of the Roman empire it was occupied by the Burgundians (437), and from them passed to the

Franks in the next century. Subsequently it formed part of the Burgundian kingdom of Arles, and towards the middle of the 11th century became a fief of the empire. The counts of Maurienne, the ancestors of the Savoy counts and dukes, are sometimes stated to have been descended from Wittekind, last king of the Saxons; it is more probable that they had a local or Provençal origin. The emperor Conrad II. invested Humbert I. (d. 1048), Count of Maurienne, with the counties of Chablais and Lower Valais. For some centuries the chief features in the history of the house are the successive additions of territory that were made to this early nucleus, until, in the beginning of the 15th century, the dominion of the Savoy rulers extended from the Lake of Geneva southwards to the Gulf of Genoa, and from the river Saône south-eastwards to Lago Maggiore, and Vercelli and Alessandria in Piedmont. Otto (1048–60) acquired by marriage the marquise of Susa and the counties of Val d'Aosta and Turin. The province of Bugey and the lordship of Tarentaise were added by the next two counts. Amadeus III. (1103–49) called himself margrave of Turin and Count of Savoy, being the first to use the latter title. Amadeus IV. (1233–53), following the traditions of the family, gave his support to the emperor, Frederick II., against the pope, and was rewarded by being created Duke of Chablais and Aosta. Peter (1263–68) before succeeding to power had spent some time in England, where he built in London the palace afterwards called the Savoy; two of his nieces married Englishmen, King Henry III. and Richard Earl of Cornwall. Amadeus V. (1285–1323), surnamed the Great, extended his territories considerably in the north-west (Geneva, Faucigny, Bresse, &c.), acquired the county of Asti in Piedmont, and was made a prince of the empire. The protectorate over Nice, Ventimiglia, Villafranca, and Barcelonnette was acquired by Amadeus VII. (1383–91). The emperor Sigismund made the eighth Amadeus (1391–1433) Duke of Savoy and of Piedmont (1416), and afterwards invested him with the county of Vercelli. But this prince resigned the title and retired to a monastery. In 1439 the Council of Basel deposed Pope Eugenius IV. and elected Amadeus of Savoy pope in his stead; he took the name of Felix V., but resigned the papal dignity in 1448, and died a cardinal in 1451.

A succession of weak rulers followed, though Charles I. (1482–90) did something towards checking internal strife. The reign of Charles III. (1504–53) was one long train of misfortunes, occasioned by the fact that he sided with the Emperor Charles V. in his great duel with Francis I. of France: Geneva and Valais put themselves (1533) under the protection of the Swiss Confederation; Bern in 1536 seized Chablais, Gex, and Vaud; and by the treaty of Nice France kept possession of Savoy (which she had seized) and the emperor garrisoned the cities of Piedmont, so that Nice only was left to the duke. Emmanuel Philibert, his son, the next duke (1553–80), obtained great renown as an imperial general in the Netherlands, where he won the great victory of St Quentin (1557); this gained him the recovery of his hereditary dominions (except Pignerol, Savigliano, and Saluzzo) in 1559, 1560, and 1564. Ten years later he received again Pignerol and Savigliano, and subsequently acquired the principality of Oneglia and the county of Tenda. His son, Charles Emmanuel (1580–1630), waged war against Henry IV. and Louis XIII. of France, and was deprived of large slices of territory and several fortresses. The succeeding dukes vacillated between the empire and France. Victor Amadeus II. (1675–1730) was at last saved from the clutches of France by the military genius of the

celebrated Prince Eugene of Savoy, a distant cousin, who routed the French before Turin in 1706. By the treaty of Utrecht (1713) the Duke of Savoy gained the principality of Montferrat, the kingdom of Sicily, and the recognition of his claim to the crown of Spain should the Bourbon family become extinct. Seven years later the emperor of Austria forced him to exchange the crown of Sicily for that of Sardinia. Henceforward, for 140 years, the sovereignty was known as the kingdom of Sardinia.

The principal immediate aim of the new kings was to get possession of Milan and its territory—i.e. virtually Lombardy. (Turin had been the capital of Savoy since the reign of Emmanuel Philibert.) Charles Emmanuel III. (1730–73) aided France against Austria in two long wars, and thereby gained accessions of territory on his eastern frontier, but he did not get Milan. Under his son and successor, Victor Amadeus III. (1773–96), Savoy, having put herself at the head of the Italian princes in opposing the French Republic and Napoleon, was along with Nice annexed to France. The next duke, who succeeded whilst the French were masters of his continental territories, took refuge in Sardinia (1798), and in 1802 Piedmont was incorporated with France. Victor Emmanuel I. (1802–21) returned to Turin in 1814, not only receiving back his patrimony, but becoming master also of Genoa. This prince left the government to his wife, an Austrian princess, and his father confessor; their efforts were directed to the extirpation of the elements of liberal sentiment and politics implanted by the French during their occupation. This policy provoked a rising of the liberal-minded in 1821, whereupon the king abdicated in favour of his brother Charles Felix (1821–31), who brought in an Austrian army and continued the oppressive and reactionary policy dictated by Austria. He was the last of the elder branch of the family; and on his death the crown passed to Charles Albert (1831–49), the head of the branch Savoy-Carignano, that had been founded by a younger son of Charles Emmanuel in the 17th century. He abdicated in favour of his son Victor Emmanuel II. during the fever of the revolution of 1848–49. From the time of the French Revolution the Sardinian monarch was one of the most influential potentates in Italy, and from the reign of Charles Felix he was singled out by Italian patriots as the man to effect the future unity of Italy. The history of the monarchy from the accession of Charles Albert has been already sufficiently told under Italy (q.v.).

See *Histories of Savoy* by Cibrario (1840–47), Frézet (1826–28), Bertolotti (1830), St-Genis (1869); *The Early History of Savoy*, by C. W. P. Orton (1912). For the Stuart connection with the House of Savoy, see STEWART, and *The Romances of Savoy*, by the Marchesa Viteleschi (1905).

Savoy, a cultivated variety of Cabbage (q.v.), forming a large close head like the true cabbages, but having wrinkled leaves. A number of sub-varieties are in cultivation. The mode of cultivation and the uses are the same as those of cabbage. Savoyes are much cultivated for winter use; they require a light, rich soil.

Savoy Palace, an ancient palace of London, situated between the Strand and what is now the Thames Embankment, was first built by Peter, Count of Savoy, uncle of Henry III.'s queen, Eleanor of Provence. It was the prison of the captive king John of France after the battle of Poitiers. Then it was the town residence of John of Gaunt, and was burned by the peasants during Wat Tyler's revolt (1381). Henry VII. rebuilt it, and in 1505 endowed it as a 'hospital' or house for one hundred poor people—'rogues and masterless men' they came to be. In its precincts was held

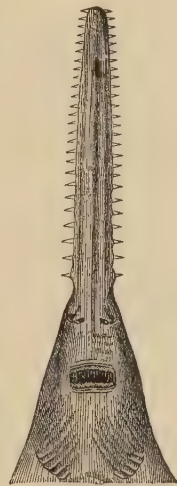
in 1661 the Savoy Conference. See PRAYER (BOOK OF COMMON). 'The Savoy' also included a chapel royal, built in 1515; it was injured by fire in 1864, but restored at the expense of Queen Victoria. The Savoy Theatre occupies part of the site.

Savu, a Dutch East Indian island W. of Timor, produces maize, tobacco, rice, cotton, and horses.

Sawdust can be turned to account in many ways. Oxalic Acid (q.v.) is got by oxidising it with a mixture of the hydrates of potash and soda. Chilled sawdust is superior to and cheaper than ice for packing fish. Carbonised sawdust makes a better filter for many purposes than ordinary charcoal. Boxwood sawdust is used for cleaning jewellery, that of mahogany for smoking fish. *Bois-durci*, of which beautiful ebony-like medallions and other ornaments are made, consists of the fine sawdust of rosewood, ebony, and other woods formed into a paste with blood and pressed into moulds or dies. The furrier finds a use for the sawdust of mahogany and rosewood in dressing his furs. It may be distilled so as to secure charcoal, alcohol, and tar. It is not serviceable for wood-pulp in paper-making. Sawdust sinks in water although the wood from which it is cut floats.

Sawfish (*Pristis*), a genus of cartilaginous

fishes distinguished by the prolongation of the snout into a formidable weapon bordered on each side by sharp teeth. The five or so species include *P. antiquorum* in the Mediterranean and in many other seas, and *P. pectinatus* off the southern coasts of North America and in the Gulf of Mexico. With its saw, which is sometimes six feet in length, the sawfish slashes or rips up its prey, and its assault is often fatal to large cetaceans. The torn-off pieces of the victim are swallowed by the sawfish, whose true teeth are small and adapted for crushing. The sawfishes are viviparous. The flesh of the sawfish is coarse and almost inedible; the shagreened skin is sometimes used for polishing. Analogous to *Pristis*, which, although it is somewhat shark-like, belongs to the order of rays, is the genus *Pristiophorus*, which is ranked among the sharks.



Lower View of Head
of Sawfish.

Sawfly, the common name of a number of Hymenopterous insects, injurious to plants. They owe their name to the saw-like ovipositors with which the females drill holes in which to lay their eggs. In one family (Tenthredinidæ) the ovipositor is like a double saw, in the other family (Siricidæ) it is rather comparable to a borer. The adults differ from bees and wasps and other Hymenoptera in having the abdomen attached to the thorax by the whole width of its base instead of by a narrow waist. The larvæ are peculiar in having three pairs of thoracic legs, with which in the Tenthredinidæ a number of abdominal appendages are also associated. They are thus somewhat like caterpillars. Indeed the larva of the Gooseberry and Currant Sawfly (*Nematus ribesii*)—a most destructive pest—is often called a caterpillar. The Corn Sawfly (*Cephus pygmeus*) lays its eggs on the young stalks of corn, which the grubs afterwards destroy. The Turnip Sawfly (*Athalia spinarum*) is a beautiful insect of an orange colour with deeper red shade behind the black head; the destructive larvæ,

which frequently ruin the turnip crop, are almost black, and are familiarly known as *Black Jacks* or *Niggers*. The larvæ of the Pine Sawfly (*Lophyrus*



Turnip Sawfly (*Athalia spinarum*) in its various stages of development.

pinii) are destructive in young fir-woods; and the young of various species of *Sirex*—e.g. *Sirex gigas*—bore galleries in the wood of various kinds of pine. See Ormerod's *Injurious Insects* (new ed. 1891).

Sawtre, or CHATRY. See HENRY IV.

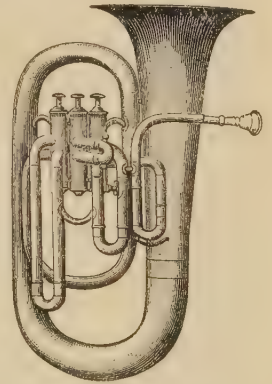
Saxe, MAURICE, Marshal, a celebrated soldier of the 18th century, was the natural son of Augustus II. (q.v.), Elector of Saxony and king of Poland, and the Countess Aurora von Königs-mark, and was born at Goslar, 28th October 1696. When only twelve years of age he ran off from home, made his way to Flanders, joined the army of Marlborough, and took part in the capture of Lille and the siege of Tournay. With a boyish love of change he joined the Russo-Polish army before Stralsund (1711), and distinguished himself under his father's own eyes. Then, returning to Dresden, he was induced by his mother to marry the young Countess Löben; but the union did not last long, being dissolved in 1721. In the meantime Maurice had fought against the Turks in Hungary under Prince Eugene, and studied the art of war in France. In 1726 he was elected Duke of Courland, and for a time maintained himself in his new possession against both Russians and Poles, but was compelled to retire to France in 1729. Joining the army on the Rhine, under the Duke of Berwick, he signalised himself at the siege of Philippsburg (1734), and decided the battle of Ettingen by a desperate charge; for these services he was made a lieutenant-general in 1736. On the breaking out of the war of the Austrian succession he was given command of the army which was appointed to invade Bohemia, and took the strongly-fortified city of Prague by storm. The capture of Eger was effected a few days afterwards, and the rest of the campaign showed that his abilities in the field were not inferior to his skill against fortifications. Heretofore known as the Comte de Saxe, he was in 1744 made a marshal of France, and appointed to command the French army in Flanders; and on this occasion he gave decisive proofs of the superiority of his system of tactics by reducing to inaction an enemy much superior in number, and taking from him, almost before his face, various important fortresses. The following year was for him more glorious still: he defeated the Duke of Cumberland in the battle of Fontenoy. In 1746 Maurice by a series of able manœuvres threw back the allies on the right bank of the Meuse, and gained (11th October) the brilliant victory of Raucoux, for which he was rewarded with the title of marshal-general, an honour which had been conferred upon none but Turenne. For the third time,

at Laufeldt (2d July 1747), the victor of Culloden suffered complete defeat at the hands of Maurice, and the brilliant capture of Bergen-op-Zoom brought the allies to peace. The Dutch, however, were still disposed to hold out, till the capture of Maestricht (1748) destroyed their hopes, and the peace of Aix-la-Chapelle followed. Saxe had previously carried on a correspondence with Frederick the Great of Prussia; he now took occasion to visit him at Berlin, and met with a brilliant reception. He then retired to his estate of Chambord, and died there of dropsy, 30th November 1750. His work on the art of war, entitled *Mes Réveries*, was published at Paris in 1751. Saxe was a gallant soldier, but no scholar. When the French Academy wanted to make him a member he declined the proffered honour in a sentence whose extraordinary orthography accidentally rebuked, more than the most cutting sarcasm could have done, the sycophancy of the Academy: '*Ils veulent me fere de la cademie; s'ela m'iret come une bage a un chas.*' His love for the actress Adrienne Lecouvreur forms the subject of one of Scribe's best-known plays; and from an illegitimate daughter of his George Sand (q.v.) was descended.

His character and genius are well, though not flatteringly, portrayed in Carlyle's *Frederick the Great*; and see also Lives by Karl von Weber (German, 2d ed. 1870); Saint-René Taillandier (French, 1865); and Vitzthum von Eckstädt (French, 1867), with the Duc de Broglie's *Maurice de Saxe et le Marquis d'Argenson* (2 vols. 1891).

Saxe-Coburg, &c. See SAXON DUCHIES, THURINGIA.

Saxhorn, the name of a series of brass wind musical instruments invented by Antoine, Joseph, or Adolphe Sax (1814-94), born at Dinant in Belgium, who settled in Paris in 1842, taught instrumental music, and died in poverty. By inventing Saxhorns and Saxophones he greatly influenced military music over the world. The saxhorn consists of a conical tube opening out to a wide bell, is sounded through a cupped mouthpiece, and is provided with valves or pistons, usually three in number, on a principle similar to the Cornet (q.v.). Saxhorns are made in several sizes, the principal being the soprano in F and E $\flat$; the contralto in C and B $\flat$; the tenor or althorn in F and E $\flat$; the baritone and euphonium in C and B $\flat$; the bass or bombardon in F and E $\flat$; and the contra-bass or contra-bombardon in B $\flat$. These have all the usual open harmonic notes of their respective tubes (see HARMONICS, HORN, &c.), the pistons providing the intermediate tones and semitones. The series have a compass of some five octaves, the soprano saxhorn more or less corresponding to the soprano voice, and the contra-bass descending an octave below the bass voice. They are all more or less like the one (the euphonium) shown in the figure, except the contra-bombardon, which, on account of its size and weight, is usually made circular, so as to go round the shoulders of the performer. Their number and variety supply all the different parts required by a brass band, and in many places very efficient bands are entirely composed of them. From the fact that their fingering is all alike, a



Euphonium.

performer, having mastered one, can by a little practice play with equal facility on any of the others.

Their compass, richness, and flexibility of tone render them peculiarly suitable for military music, especially if played in the open air, and their form renders them easy to play either on the march or on horseback. They do not, however, blend well with stringed instruments, and the bombardon, also known as the bass tuba, is the only one which has found a place in the orchestra. See BAND, SAXOPHONE.

Saxicava. See BORING-ANIMALS, HARBOUR.

Saxifragaceæ, a family of dicotyledons, comprising herbs, shrubs, and trees, so varied in character that botanists are not in agreement respecting its limits. If the Ribesiaceæ be reckoned an independent family (see CURRANT, GOOSEBERRY, RIBES), the British genera of Saxifragaceæ are three, Saxifraga (see SAXIFRAGE), Chrysosplenium (q.v.), and Parnassia (see GRASS of PARNASSUS), all of which are herbs. Diverse as these are, they yet give very little idea of the range of generic character in the family till they are compared with the ligneous or arborescent exotic genera. They are all, however, distinguished by their regular flowers; four, five, or rarely ten-lobed calyx, more or less adherent to the ovary; petals equal in number to segments of calyx or wanting; stamens also generally equal in number or twice as many, still more rarely indefinite in number; ovary either adherent or inserted in a broad base, either two or four-celled, or, if one-celled, having two or more parietal placentas often lobed at the top, with the same number of styles or stigmas as cells or placentas, rarely twice as many; fruit a capsule, with several seeds, usually many to each cell or placenta; the albumen usually copious. The family is spread over nearly the whole world, most numerous in the mountainous regions of the northern hemisphere: they are rare in tropical America, in Peru and Java, and in southern Australia. The prevailing property is astringency. But the only species of the numerous herbaceous class having any well-based reputation for medicinal virtues is the Alum-root (q.v.). Escallonia, a South American genus, found chiefly in the Andes, consists of shrubs with leathery sticky leaves, well known in our gardens. Some make it the type of a separate family. To another section belong Hydrangea (q.v.) and Philadelphus, commonly misnamed Syringa (q.v.).

Saxifrage (*Saxifraga*, 'stone-breaker,' because supposed to break stones in the bladder), a genus of Saxifragaceæ (q.v.). The genus is a numerous one, consisting of annual and perennial herbs, mostly tufted. The species are chiefly mountain or rock plants, and are most abundant in the northern hemisphere. Many species are cultivated in gardens for their pretty flowers and neat habit of growth, being especially valued for ornamenting rockeries. Some thirteen species are natives of Britain, the best known of which is *S. umbrosa*, which, under the popular names London Pride, None-so-pretty, and St Patrick's Cabbage, finds a place in nearly every cottage garden.

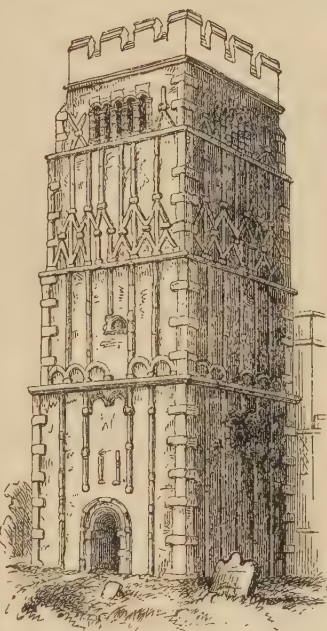


Tufted Saxifrage
(*Saxifraga moschata*).

Saxo Grammaticus (i.e. Saxo the 'Grammarians' or 'Scholar'), the most celebrated of the early Danish chroniclers, flourished in the end of

the 12th century. He was secretary to Archbishop Absalom of Roeskilde, was a Zealander by birth, and is said to have died at Roeskilde in 1208. At the request of the archbishop he wrote a chronicle of the early kings of Denmark, and brought his narrative down to the year 1185. The work is entitled *Gesta Danorum*, or *Historia Danica*. The earlier portions are uncritical, but in regard to times near his own Saxo Grammaticus is a most invaluable authority. According to his own statement, he derived his knowledge of the remoter period of Danish history from old songs, Runic inscriptions, and the historical notices and traditions of the Icelanders. The best editions are by P. E. Müller and Velschow (Copen. 1839-58) and A. Holder (Strasb. 1886). There are good translations from the original Latin into Danish by Vedel (new ed. 1851) and Grundtvig (3 vols. 1818-20). To an English translation in the Folklore Society series by O. Elton of the first nine books (1892) is prefixed a mythological commentary by York Powell.

Saxon Architecture, the style of building



Tower of Earl's Barton,
Northamptonshire.

used in England before the introduction of the Norman architecture at the Conquest. There are few specimens remaining which can be depended upon as genuine. The Saxons built chiefly in wood, and all their wooden edifices are now lost. It seems probable that a rude and simple style, in which many features resembling Norman work were introduced, was that used by the Saxons in the 11th century. But there are also more ancient structures, still partly preserved, in which more characteristic features exist. Amongst these

the towers of Earl's Barton and Barnack, Northamptonshire, a church at Bradford-on-Avon (q.v.), and the crypt at Repton are good examples. The peculiar 'long and short' work of the quoins, the projecting fillets running up the face of the walls and interlacing like woodwork, and the baluster-like shafts between the openings of the upper windows resembling the turned woodwork of the period, are all characteristic of the style. Ancient Roman bricks seem also to have been used in some of the Saxon works, as at the churches of Brixworth, Northamptonshire, and that on the Castle Hill of Dover.

Saxon Duchies, the name formerly applied to a group of federal states in the centre of Germany, lying W. of the kingdom (now republic) of Saxony, N. of Bavaria, E. of Hesse-Nassau, and S. of Prussian Saxony. The smallest, Saxe-Altenburg (capital, Altenburg), consisted of two principal portions with smaller fragments. Saxe-Coburg-

Gotha (capitals, Coburg and Gotha) was similarly divided up. Saxe-Meiningen (capital, Meiningen), in addition to a long narrow crescentic piece of territory, had some detached parcels. Saxe-Weimar-Eisenach (capital, Weimar) embraced three large divisions; it was known as the Grand-duchy of Saxony. The dukes who reigned over the four duchies had a common ancestor (see SAXONY), and were united by family compacts and agreements. The Grand-duke of Saxony ranked above the other three, and was heir to the throne of Saxony if the royal family died out. In 1918, following upon the German Revolution, the duchies were declared republics, and two years later they became part of the united state of Thuringia. Coburg, however, with the adjacent portion of Saxe-Coburg-Gotha decided to merge with Bavaria (q.v.). See THURINGIA. In all these names *Saxe* is in German *Sachsen*.

History.—Saxe-Altenburg was ruled by imperial burgraves from the 12th to the 14th century; in 1485 it became subject to the younger or Albertine branch of the Wettin family, but in 1554 was transferred to the elder or Ernestine branch. It continued in that line till the abolition of the dukedom in 1918. From 1672 to 1825 it was united (for the most part) with Gotha; from that time it formed an independent duchy. Saxe-Coburg had been ruled over by the Saxon house since 1353, as an independent duchy from 1680. In 1826 its duke became duke of Gotha too, but the two duchies were not constitutionally united until 1873. Saxe-Gotha was made a duchy in 1641, was united with Altenburg 1672–1825, and then joined to Coburg. As Duke Ernest II., brother of the Prince Consort Albert (q.v.), died childless (1893), the succession passed to the Duke of Edinburgh, and at his death (July 1900) to his nephew, the young Duke of Albany, who reigned till 1918. In Prince Albert's son, Edward VII., the Saxe-Coburg family ascended the British throne (see D'Auvergne, *The Coburgs*, 1911). In Leopold (q.v.) the house had given a king to Belgium; and in Ferdinand, in 1835, a royal consort to Portugal (q.v.). Saxe-Meiningen was a separate duchy from 1681. In 1826 the duchy of Saxe-Hildburghausen, founded in 1680, and that of Saxe-Saalfeld, which had been merged with Saxe-Coburg in 1735, were added along with some smaller districts to Saxe-Meiningen, more than doubling its area. Saxe-Weimar had been under the rule of the Saxon house since 1376. Duke Karl August (1758–1828) made Weimar (q.v.) the centre of the intellectual and artistic life of Germany by gathering round him Goethe, Schiller, Herder, Wieland, and others, and by encouraging the theatre, the university of Jena, and the fine arts.

Saxons, (Lat. *Saxones*, Ger. *Sachsen*; perhaps from *sahs*, 'a knife'), a Germanic people first mentioned by Ptolemy as dwelling in the south of the Cimbrian Peninsula. In the 3d century a 'Saxon League' or 'Confederation', to which belonged the Cherusci, the Angrivarii, the Chauci, and other tribes, was established on both sides of the estuary of the Elbe and on the islands off the adjacent coast. During the reigns of the emperors Julian and Valentinian they invaded the Roman territory; but their piratical descents on the coasts of Britain and Gaul are far more famous. In 287 Carausius, a Belgic admiral in the Roman service, made himself 'Augustus' in Britain by their help; and about 450 they, in conjunction with the Angles, established themselves permanently in the island and founded the Anglo-Saxon kingdoms. Before the 5th century they had settled along the North Sea coasts from the Elbe to the Loire, a part of what was later Flanders being called the 'Saxon Shore.' But these Saxon settlements soon became

absorbed in the kingdom of the Franks. In Roman times the coast districts of Britain from Brighton northwards to the Wash were called *Litus Saxonicum*, or Saxon Shore. These localities were particularly exposed to the attacks of the Saxons from across the North Sea, and were placed under the authority of a special officer, the Count of the Saxon Shore (see Miss J. Mothersole, *The Saxon Shore*, 1924). At home the Old Saxons enlarged their territory by conquest till it embraced all the lands between the Rhine and Elbe, the North Sea and the Harz Mountains. Along with the Franks they destroyed the kingdom of the Thuringians in 531, and obtained possession of the land between the Harz and the river Unstrut; but this region too was forced to acknowledge the Frankish sovereignty. But the Saxons having thrown off the yoke, wars between the Saxons and the Franks were constant after 719; and the latter after 772 were, under the vigorous leadership of Charlemagne, generally successful, in spite of the determined opposition offered by Wittekind (or Widukind). The desperate resistance of the Saxons was not finally broken until 804, though Wittekind submitted in 785. After the final submission the conquered people accepted Christianity, having before defended their heathen faith in conjunction with their freedom. By the treaty of Verdun (843) the Saxon districts fell to Austrasia, the nucleus of the German empire (see SAXONY). The 'Saxons' of Transylvania (q.v.) are not all of pure Saxon descent; the name is used rather as synonymous with 'German.' See HELIAND and ANGLO-SAXON.

To the Celtic Britons the English or Anglo-Saxon invaders were known only as Saxons, and *Sassenach*, or other Celtic form of the word Saxon, is still the name for Englishmen and their language alike in Wales, the Scottish Highlands, and Ireland. But the 'hated Saxon' as a political war-cry was the coinage of O'Connell.

Saxony, a republic of Germany, taking in respect of area the fifth place, but in respect of population the third place, amongst the states. It is surrounded by Bohemia (on the S.), Silesia (NE. and N.), Prussian Saxony (N. and NW.), and Thuringia (W.). It measures 130 miles from east to west, 90 miles from north to south, and has a total area of 5787 sq. m. (a little smaller than Yorkshire); in shape it roughly resembles a right-angled triangle, the right angle being in the north-west, the hypotenuse in the south, along the Erzgebirge (to 3343 feet). The greater part of the surface is diversified by the spurs (2800 feet) of this mountain-chain, with to the west the outliers (2900 feet) of the Fichtelgebirge and to the east the northern extensions (2600 feet) of the Riesengebirge. The northern districts pass over into the great North German plain. On the whole the surface is therefore elevated (nearly 60 per cent. above 800 feet); in many parts it is studded with isolated peaks of basalt and sandstone (e.g. the fantastic pinnacles of the Saxon Switzerland, skirting the Elbe just above Dresden). It lies almost wholly within the basin of the Elbe. The climate, owing to the elevation, is somewhat colder and severer than the latitude (50° 10' to 51° 29' N.) would indicate. The population grows fast: (1815) 1,178,802; (1840) 1,706,276; (1864) 2,344,094; (1880) 2,972,805; (1910) 4,802,485; (1919) 4,670,311; (1925) 4,980,689. Saxony, whose area is less than half that of Belgium, is more densely populated, having 805 inhabitants per sq. m. to Belgium's 659. In origin the majority of the people are Germanised Slavs; some 50,000 are Wends, living in Lusatia; the non-Slavonic remainder are descended from ancient immigrants from Franconia and Thuringia. Over 90 per cent.

of the population are Lutherans. The capital is Dresden; the largest towns are Leipzig, Dresden, Chemnitz, Plauen, Zwickau, Meissen, the first two having over 600,000 inhabitants.

Saxony is essentially a mining and manufacturing country. The first place amongst the manufactures is taken by the textile industries, which embrace the making of linen, damask, muslin, hosiery, ribbons, cloth and buckskin, flannel, woollen goods, and waxcloth; to these must be added numerous dyeworks and factories for printing and stamping textiles. The other branches of industry deal with machinery, pottery, porcelain and glass, potash, chemicals, beer, spirits, lace, paper, straw-plait, tobacco, artificial flowers, pianofortes and other musical instruments, hats, toys, watches, books, ornamental wooden articles, &c. The principal mineral products are coal, argentiferous lead, tin, zinc, iron, nickel, bismuth, and cobalt. Building-stones, turf, lime, slates, potter's clay, &c. are extracted in considerable quantities. Freiberg is one of the chief centres in Germany for smelting metals. Though agriculture is very highly developed in Saxony, grain and fat animals are imported annually in very considerable quantities, the home produce being insufficient for the people's wants. The greatest acreage is devoted to rye; next in importance come oats, potatoes, wheat, barley. Fruit-culture, market-gardening, the breeding and fattening of cattle and sheep, and of geese, and bee-keeping are carried on with much zeal and success. Eighty-six per cent. of the area of the land in cultivation is divided into farms ranging between 2 and 250 acres. A vast amount of trade is done in all kinds of produce, on the Elbe and on the railways (some 2000 miles). Amongst the educational institutions are the university and the conservatorium at Leipzig, famous high schools at Meissen and Grimma, a polytechnic at Dresden, a superior industrial academy at Chemnitz, a mining academy at Freiberg, a forestry school at Tharandt, and numerous inferior mining and technical schools throughout the manufacturing districts. There are about 3500 common and continuation schools; illiteracy is practically nonexistent. The *Oberlandesgericht* (Supreme Court of Justice) is situated at Dresden, and the *Reichsgericht* (High Court of Justice for the German Reich) at Leipzig. The constitution of the republic, dated 26th October 1920, provides for an assembly (*Landtag*) of ninety-six members, elected on a principle of proportional representation, and by a vote which is universal, equal, secret, and direct. There is a president with a ministry which exercises the supreme power.

To understand the history of Saxony it is necessary to go back to the Old Saxons (see SAXONS), who, before their submission to the Franks, had been accustomed to choose a 'duke' to lead them in war. After the division of the Frankish dominion into an eastern and western kingdom, in which division the Saxons and their territory passed to the eastern half or Austrasia, the Saxons were greatly exposed to the attacks of the Northmen on the north-west and of the Slav tribes on the north and north-east, and so they chose them a duke again, one Otto (880-912), who not only defended his people valiantly but extended their supremacy southwards over Thuringia. His son, Henry (912-936), was in 919 chosen king of the eastern or German kingdom, and thus the Saxon chief ruler became the head of all the peoples in the future Germany. Henry reduced the Slav tribes living beyond the Elbe, and so made himself master of all the territories included in the present republic of Saxony, the Prussian province of Saxony, part of the Thuringian state, and more besides. His son, Otto II., king of the Germans, made Count

Hermann Billung duke of the Saxons, and the dignity continued in his family down to 1106. The princes of this house, to whom the Saxon people were greatly attached, were the most difficult enemies of the German emperors, who after 1024 were again men of Frankish race. The power of the Saxon dukes was greatly increased under Henry the Proud of Bavaria, who succeeded to the dignity in 1137, and especially under his son Henry the Lion, who conquered Mecklenburg, Hither Pomerania, and Holstein. This prince was deprived of his possessions by the Emperor Frederick I. (1180), who confined the duchy of the Saxons to the territories lying east of the Elbe, and divided those to the west of it between the Archbishop of Cologne and numerous petty bishops and princes. The dignity of duke of the Saxons was given to Bernard of Ascania, son of the prince of Brandenburg. His descendant, Rudolph II. (1356-70), called himself Elector of Saxony. In 1423 the Emperor Sigismund invested Frederick, Landgrave of Meissen and of Thuringia, with the fief of Saxony. This prince, of the House of Wettin, was the ancestor of the late reigning family of Saxony and of the various dukes of the minor Saxon states. The princes and nobles of the House of Wettin frequently divided and interchanged their possessions in whole or in part, and all the sons of a deceased elector often ruled in common or in conjunction with uncles, so that the history of the house is extremely complicated down to the beginning of the 19th century. But in 1485 a division was made which in its broad features continued to hold good down to the revolution. The family split into two main branches, called, from the two brothers who divided the territories between them, the (elder) Ernestine and the (younger) Albertine line. The electoral dignity fell to Ernest, who ruled over Thuringia and the western part of modern Saxony. His son, his grandson, and his great-grandson were all zealous supporters of the Reformation, whilst the heads of the Albertine branch, who ruled in the eastern lands (beyond the Elbe), although they were Protestants, supported the pope and the emperor. In 1547 the emperor, after defeating the Elector of Saxony in battle, deprived him of the dignity and of the greater part of his lands; and gave title and lands to his own ally, the head of the younger line, and with that line they remained, the title being exchanged in 1806 for the higher dignity of king. Only the Thuringian territories (see SAXON DUCHIES) remained with the older line.

During the Thirty Years' War the reigning elector, John George I. (1611-56), remained neutral until Tilly invaded his territories; this drove him over to the Protestant side (1631). He made his peace, however, with the emperor in 1635, receiving Lusatia; but in revenge for this desertion the Swedes wrought terrible havoc in his land and amongst his people ten years long. The Elector Frederick Augustus I. (1694-1733), a vain man, fond of magnificence and eager to make a stir in the world, went over to Roman Catholicism and made an eager canvas for the throne of Poland. He was chosen king as Augustus II. (q.v.); after that the headship of the Protestant states of Germany passed to the Elector of Brandenburg (see PRUSSIA), and the court and dynasty of the Protestant kingdom of Saxony remained Catholic ever after. Saxony, in consequence of this alliance with Poland, was drawn into the war against Charles XII. of Sweden, and again suffered greatly from the Swedish armies. In the second Silesian war she sided with Austria, was beaten, and had to pay a million thalers' indemnity to Prussia. When the Seven Years'

War broke out Frederick the Great refused to recognise the neutrality of Saxony, and, capturing her army, treated her as a conquered province, and forced the elector (Frederick Augustus II.) to take refuge in Poland, to the crown of which country he had been elected in succession to his father. Frederick Augustus III. (1763-1827) bent himself energetically to the task of building up his state again and restoring the prosperity of his subjects, matters in which he was eminently successful. He took part with Prussia in the early Napoleonic wars, though not always very willingly, and in 1806 proclaimed himself king of Saxony as Frederick Augustus I. Then he went over entirely to the side of Napoleon, and sent the Saxon army to fight side by side with the French down to the battle of Leipzig (1813). After the rout of the French in that battle Frederick Augustus was taken prisoner, and his land occupied by the allies. The congress of Vienna deprived him of a large portion of his territories and subjects, namely 7720 sq. m. out of 13,510, and 864,404 inhabitants out of 2,047,148; these formed part of the new province of Prussian Saxony. This separation of lands that for centuries had been ruled over by the House of Wettin encountered the strongest opposition on the part of the people. In 1832 the old machinery of government, consisting of a secret cabinet and the two chambers of the feudal estates, was abolished to give place to a constitutional system, granted by Antony, who reigned 1827-36. But under his nephew and successor, Frederick Augustus II. (1836-54), the new system did not work well. In May 1849 the Russian Bakunin and other democratic socialists stirred up a rising in Dresden, which resulted in a week's severe barricade-fighting in the streets. John was king from 1854 to 1873; but from 1858 to 1866 the ruler *de facto* of Saxony was Count von Beust (q.v.), an open enemy of Prussia, who opposed Bismarck's policy in every way he could. In the Austro-Prussian war of 1866 Saxony sided with Austria, but, being along with her ally defeated, she joined the North German Confederation and paid an indemnity of 10 million thalers to Prussia. In the Franco-German war the Saxon army fought of course on the side of Prussia. From 1871, when the kingdom became part of the German Empire, the country was peaceful and in a wonderful degree prosperous. John was succeeded in 1873 by his son Albert, who reigned till 1902, when he was followed by his brother George. The latter died two years later, and his son and successor, Frederick Augustus III., reigned until Saxony was proclaimed a republic on 9th November 1918.

The standard history is Böttiger's (ed. Flathe, 3 vols. 1867-73). See GERMANY.

Saxony, PRUSSIAN, a province of Prussia, formed in 1815 out of districts taken from the kingdom of Saxony, part of the duchy of Magdeburg, the Altmark, the principalities of Halberstadt and Erfurt, and some smaller territories. It lies between Brandenburg, Hanover, Brunswick, Hesse-Cassel, Thuringia, and the republic of Saxony. The state of Anhalt almost divides it into two portions. Area, 9758 sq. m.; pop. (1925) 3,281,293. The greater part of the surface belongs to the North German plain, being watered by the Elbe and its subsidiary streams, the Saale, Mulde, two Elsters, Ilm, &c. The soil, except in the north and on the mountains (Harz and Thüringerwald) in the south, is extremely fertile, the valley of the Golden Meadow (*Goldene Aue*) being particularly famous. Lignite and salt are extracted and copper is mined. Wheat, beetroot, flowers, vegetables, hops, &c. are extensively grown. There are important manufactures of cloth, cottons, machinery,

oil, small-arms, beer, chemicals, and other articles. Halle is the seat of one of the first universities of Germany. The capital is Magdeburg; other large towns are Halle, Erfurt, Halberstadt, Mühlhausen, Nordhausen, and Aschersleben.

Saxophone, the name of a family of musical instruments invented by Sax (see SAXHORN). They consist of a conical brass tube, in the larger varieties curved at both ends, sounded by a mouthpiece furnished with a single reed similar to that of the Clarinet (q.v.), and are made in the following keys: soprano in E $\flat$, soprano in B $\flat$, alto in E $\flat$, tenor in B $\flat$, baritone in E $\flat$, bass in B $\flat$. They have twenty holes covered by keys and studs for the first three fingers of each hand, and are all fingered alike. The series have a compass of about three octaves, ranging from C above the treble clef to C in the bass. Sax designed the saxophone for use as an instrument in military bands, and it has obtained considerable vogue as such in Britain and in France, and has been occasionally used in orchestras. The instrument has gained an immense popularity in connection with syncopated music, its strident tone being one of the chief characteristics of the jazz band.



Alto Saxophone.

Say, JEAN BAPTISTE, a French political economist, was born at Lyons, 5th January 1767. Being destined for a commercial career, he passed a part of his youth in England, and on his return to France began his work in a life-insurance office. On the outbreak of the Revolution he made his way to Paris, and worked for Mirabeau on the *Courrier de Provence*, and a year or two later acted as secretary to Clavière, the minister of finance. From 1794 to 1800 he edited a journal called *La Décade*, in which he expounded with great effect the views of Adam Smith. After 18th Brumaire (1799) he was appointed a member of the tribunate, but at the end of a few years he began to express his disapprobation of the arbitrary tendencies of the new consular government, and in 1804 ceased to be a member of a body that had become a mere tool in the hands of Bonaparte. Under the despotism of the empire Say was forced into private life, and betook himself to industrial pursuits. In 1803 he issued the first edition of his principal book, *Traité d'Économie Politique*. In 1814 the French government sent him to England to study the economical condition of that country: he laid down the results of his journey in *De l'Angleterre et des Anglais* (1816). From 1819 he lectured on political economy at the Conservatory of Arts and Trades, and in 1831 was appointed professor of Political Economy at the Collège de France, but died 16th November 1832. A follower of Adam Smith, but an independent and sagacious writer, Say was the first to teach Frenchmen to consider rationally such questions as customs-duties, the currency, public credit, the colonies, and taxation, and to him belongs the credit of having made Adam Smith extensively known on the Continent. Besides the

books cited he also wrote *Catéchisme d'Économie Politique* (1815), *Cours Complet d'Économie Politique* (1828-30)—this merely an expansion of the *Traité*—and *Mélanges et Correspondance* (1833). His principal writings form vols. ix.-xii. in Guilaumin's *Collection des Économistes*.

Sayce, ARCHIBALD HENRY, philologist, was born at Shirehampton, near Bristol, 25th September 1846, and was educated privately and at Grosvenor College, Bath. He entered Queen's College, Oxford, in 1865, took a classical first-class in 1869, and became fellow, then tutor, of his college. He took orders in 1870, and was appointed in 1876 deputy to Max-Müller in the chair of Comparative Philology at Oxford, which office he resigned in 1890. Professor Sayce joined the Old Testament Revision Company in 1874, was elected a member of numerous home and foreign learned societies, and received the degree of LL.D. from Dublin in 1881, and D.D. from Edinburgh in 1889. He was Hibbert lecturer in 1887, Gifford lecturer in 1900-2, and Rhind lecturer in 1906.

Among his many books the most important are *The Principles of Comparative Philology* (1874), *Introduction to the Science of Language* (2 vols. 1880), *The Ancient Empires of the East* (1884), *Origin and Growth of Religion as illustrated by the Ancient Babylonians* (1887); and admirable short popular works on *Fresh Light from the Ancient Monuments, Assyria, the Hittites, and the Races of the Old Testament* (1891), in 'By-paths of Bible Knowledge.' Besides his *Assyrian Grammar* (1872) and *Lectures on the Assyrian Syllabary* (1875), he has contributed many books and papers on the subject to the learned journals, and he edited George Smith's *History of Babylonia* (1877) and *Chaldean Genesis* (1889). Further works were an edition of *Herodotus I.-III.* (1883), an *Introduction to Ezra, Nehemiah* (1885), *Records of the Past* (2d series, 1888-93), *The Times of Isaiah* (1889), *Egypt of the Hebrews* (1895), *Early History of the Hebrews* (1897), *Israel and the Surrounding Nations* (1898), *Babylonians and Assyrians* (1900), *Egyptian and Babylonian Religion* (1903), *Archæology of Cuneiform Inscriptions* (1907), and a volume of *Reminiscences* (1923). He contributed the articles ASSYRIA, BABYLONIA, and HITTITES to this work.

Sayers, TOM. See PUGILISM.

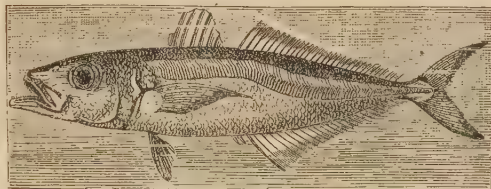
Scab, in Sheep, like itch in man, or mange in horses or dogs, depends upon the irritation of three varieties of minute acari, some of which burrow in the skin, especially if dirty and scurfy, causing much itching, roughness, and baldness. But the parasite which causes ordinary sheep scab is the *Psoroptis communis*. It readily adheres to hurdles, trees, or other objects against which the affected sheep happen to rub themselves, and hence is apt to be transferred to the skins of sound sheep. Sheep Scab is scheduled under the Diseases of Animals Acts, and as dipping is the only satisfactory method of treatment, the Board of Agriculture prescribes special dips, and the manner and times of using them, or, the Board has to be satisfied of the efficiency of the dip used. See the Sheep Scab Orders of the Board.

Scabies. See ITCH.

Scabious (*Scabiosa*), an extensive genus of herbaceous plants, exclusively natives of the eastern hemisphere, of the family Dipsacacæ (see TEASEL). The flowers are collected in terminal heads, surrounded by a many-leaved involucre, so as to resemble those of the Compositæ. The Devil's-bit Scabious (*S. Succisa*) is a very common autumnal flower in British pastures. The plant possesses great astringency, but no important medicinal virtues, although it was formerly supposed to be of great efficacy in all scaly eruptions, and hence the name scabious, from Lat. *scabies*, 'scab,' 'itch.' The end of the root appears as if abruptly bitten off, and the superstition of the middle ages regarded

it as bitten off by the devil, out of envy, because of its usefulness to mankind. The Sweet Scabious (*S. atropurpurea*, with several sub-species) is a well-known fragrant garden-flower. It is a native of the Mediterranean region.

Scad (*Caranx trachurus*, or *Trachurus trachurus*), a fish of the family Carangidæ, sometimes called the *Horse Mackerel*, because of its resemblance to the mackerel, and its comparative coarseness. It is from 12 to 16 inches long, of a dusky olive colour, changing to a resplendent green, waved with a bluish gloss, the head and lower parts silvery, the throat black. It has two dorsal fins, the first short, the second long, and one long ventral fin opposite the second dorsal. There are two small free spines in front of the anal fin. The ordinary scales are very small, but those of the lateral line are large, spiny, and strongly keeled, the keel terminating in a curved spine. The species of *Caranx* are very numerous, and it is sometimes divided into several genera; but the scad is the only species found on the British coasts. It is common on the south-western coasts of England, but comparatively rare to the north. It sometimes appears in immense shoals, pursuing the fry of herring or similar prey, and the multitudes have sometimes been so great and so



Scad (*Caranx trachurus*).

crowded together that they could be lifted out of the sea by buckets, and overloaded nets have been torn to pieces. The scad has something of the mackerel flavour. Although not much cared for when fresh, it is often salted, and in that state is esteemed as an article of food in Cornwall and the Scilly Isles. This species has a very wide range: it is rare on the west coast of Norway, but abounds along the coasts of France and Portugal and in the Mediterranean. It is found along all the Atlantic coast of Africa to the Cape of Good Hope, and is also abundant in Australia and New Zealand, and on the west coast of South America.

Scævola, the cognomen of a great Roman family. The most renowned is the patriot Gaius Mucius Scævola, who, during the siege by Porsena, tried to stab the Etrurian prince, but by mistake killed his secretary. Porsena ordered his would-be assassin to be burned alive; but when the Roman showed his contempt for pain by thrusting his right hand into a blazing fire and holding it there without flinching, Porsena ordered him to go free. By return courtesy Mucius told Porsena he was but the first of a band of 300 who had sworn to slay their country's enemy; and Porsena, startled by the prospect of having to face in succession a band of such reckless men, was, according to the legend, moved to make peace and depart. Mucius received the name of Scævola ('left-handed') in reference to his loss of the right, and proudly handed this cognomen down to his posterity.—PUBLIUS MUCIUS SCÆVOLA, lawyer and orator, was consul in 133 B.C., and became pontifex maximus three years later.—QUINTUS MUCIUS SCÆVOLA, an eminent jurist, wrote an important treatise on Roman law. He was consul in 95, pontifex maximus later, and was slain in 82 during the struggle between the fac-

tions of Sulla and Marius the younger.—**QUINTUS MUCIUS SCAEVOLA** was governor of Asia in 121, consul in 117, and was a distinguished lawyer, counting Cicero among his pupils.

Scafell, a double-peaked mountain in Cumberland, on the Westmorland border, 14½ miles SSW. of Keswick. The loftiest summit in England, it is a chief feature in the scenery of the Lake District (q.v.), in the heart and centre of which it stands. Of its two peaks, the higher, Scafell Pike, attains 3210 feet, the other 3162.

Scagliola, a composition made to imitate the more costly kinds of marble and other ornamental stones; and so successfully that it is often difficult to distinguish between the artificial and the real stone. It consists of finely-ground plaster of Paris mixed with a thin solution of fine glue, and coloured with any of the earthy colours, such as ochres, umbers, Sienna earth, Armenian bole, and sometimes chemical colours, such as the chrome yellows, &c. This is spread over the surface intended to represent marble; and whilst still soft, pieces of fibrous gypsum, marble, alabaster, and other soft but ornamental stones are pressed into it, and made level with the surface. When the composition is set hard it is rubbed down, and polished with the ordinary stone-polishing materials, which give it a very fine gloss. This kind of work is only adapted for interiors, because scagliola will not bear exposure to damp for any length of time; but its lightness, and the extreme ease with which it may be applied to walls, pillars, pilasters, and even cornices, render it very useful for the decoration of the better class of dwellings and public buildings.

Scala. See MILAN, VERONA, SCALIGER.—For the Scala Santa, see LATERAN.

Scalacronica, a Norman-French chronicle (trans. Sir Herbert Maxwell, 1907), written by Sir Thomas Gray, warden of Norham Castle, while a prisoner in Scotland; specially valuable for the Scottish wars in which he and his father (taken prisoner at Bannockburn) served. Sir Thomas died about 1369. A ladder (*scala*) was the crest of the Grays.

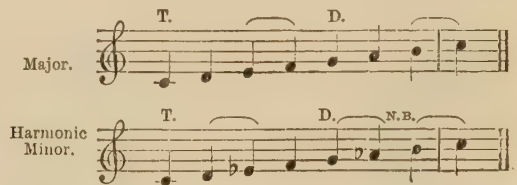
Scala Nova, or KUSCHADASSI, a seaport of Asia Minor, at the head of a gulf opposite Samos, near the ruins of Ephesus (q.v.); pop. 7000.

Scaldhead. See FAVUS.

Scalds. See BURNS.

Scale (It. *scala*, 'a ladder'; cf. Ger. *Tonleiter*, 'a ladder of sounds') is in Music any regular succession of sounds between one note and its octave which has been established by custom. The perfection of the octave interval (see HARMONICS) is the natural reason why it has been chosen as the limit, but the scale itself varies, and has varied at different periods and in different countries. The most important scales which differ from those in ordinary use are the *pentatonic*—the foundation of Chinese and other Oriental scales, as well as of Scottish and those of Celtic origin—and the Gregorian scales or 'modes' (see PLAIN-SONG). The first can easily be illustrated by playing the black notes on a pianoforte, beginning from F♯; 'Auld Lang Syne' will serve as an example of a pentatonic air. As a result of the adoption of equal Temperament (q.v.) in the 17th century, there emerged the *chromatic* and *diatonic* scales. The chromatic, proceeding by uniform degrees, includes all the twelve semitones into which the octave is divided. Diatonic scales are *major* and *minor* according to the disposition of the tones and semitones. They may begin from any note in the octave, and are, therefore, twenty-four in number—twelve major and twelve minor. In the major scale the order

of the intervals always remains the same, the scale of C being given as example. (The semitone intervals are marked by brackets, those not so distinguished being tones. T indicates the tonic, D the dominant.) There are two forms of minor scales, *harmonic* and *melodic*. In the former the seventh or 'leading' note is sharpened a semitone; and in the latter, both the sixth and seventh notes are sharpened while the scale is ascending, and both are flattened while the scale is descending. The harmonic form of C minor is given as an example. (The interval marked N.B. is a tone and a half, the other intervals being tones or semitones.) Every major scale is related to two minor scales, and every minor to two major. Thus, in relation to C major, C minor is the *tonic* minor and A minor the *relative* minor. In the former case the key-signature is changed, in the latter it remains the same. Similarly, in relation to C minor, C major is the tonic and E♭ major the relative major.



One of the characteristics of 20th-century musical development has been the employment, generally experimental, of different forms of scales, either by reviving the mediæval modes (Holst) or by proceeding by uniform degrees along the accepted divisions of the octave, such as whole tones (Debussy) or quarter tones (a feature of some Oriental music); or by selecting a series of more or less arbitrary intervals to suit the mood or form of composition (Skriabin). Atonality, another modern development, insists on the equal importance of every note of the octave, and regards none particularly as the tonic (Schönberg), while polytonality implies the usage of two or more tonalities at the same time (Stravinsky). Atonality and chromaticism are not synonymous, as the chromatic scale is entirely dependent on and is only used in conjunction with the diatonic.

See HARMONY, SOUND, and the books there cited; also the treatises of Helmholtz, Riemann, Busoni.

Scale Insect. See COCCUS.

Scale of Intelligence, BINET-SIMON, a means devised by two French doctors, Binet and Simon, for measuring the intelligence level of children. The scale, first propounded in 1905 after much careful investigation among Paris school-children and definitely formulated in 1911, consists of some fifty questions or tests arranged in groups in ascending order of difficulty to correspond to the ages of three to fifteen years. Children of normal intelligence were tested in fixing the standard of each age-group, and it was finally observed that a normal child of three could be expected to have sufficient intelligence to indicate its nose, eyes, mouth, repeat two digits, &c., while a child of four should succeed in stating its sex, in repeating three digits, naming objects, &c., and so on up to the boy or girl of fifteen, who should be able to repeat seven digits, give three rhymes, &c. Thus, on the one hand, children of exceptional intelligence; and, on the other, backward or mentally deficient children can be singled out, and their mental level discovered by referring them to the group of tests which they can satisfy. Defectiveness especially engaged the attentions of Binet and Simon, who urged that

diagnosis of such cases calls for the expert psychologist as well as for the medical man, and who recommended special classes in which defectives might be trained to be at least 'socially useful.' Their scale has created great interest in Europe and America, and several revisions of it have appeared, while its application has been extended by numerous writers to matters of delinquency, school-grading, eugenics, and other social problems. Their most important writings exist in English translations, viz. *Mentally Defective Children* (trans. 1914), *A Method of Measuring the Development of the Intelligence of Young Children* (trans. 1915), *The Intelligence of the Feeble-minded* (trans. 1916), *The Development of Intelligence in Young Children* (trans. 1916).—ALFRED BINET (1857-1911) was born at Nice, studied law and medicine at Paris, but came to interest himself principally in experimental psychology, establishing a great centre of research at the Sorbonne in 1894. His most important work *L'Étude expérimentale de l'Intelligence* appeared in 1913.—THÉOPHILE SIMON (b. 1873) was born at Dijon, and, qualifying in medicine at Paris in 1908, became physician to the mental hospital at St Yon near Rouen. He succeeded Binet as president of the 'Société libre pour l'Étude psychologique de l'Enfant.'

Scales. Besides the articles which precede and follow, see BALANCE, WEIGHTS AND MEASURES, DEGREE, GRADUATION, THERMOMETER, FAHRENHEIT, VERNIER; also EPIDERMIS, SKIN.

Scales, modifications of the skin especially characteristic of fishes and reptiles. Those of lizards and serpents are due to folds of the epidermis, the outer or horny layer of which is in various degrees hardened. So the scales of the pangolin and of the beaver's tail, or those which cover the legs and toes of many birds, are epidermic. On the other hand, the scales of most bony fishes (Teleostei) and of the Dipnoi are developed from the under skin or dermis, and are thus comparable to the little bony plates which occur in the skin of not a few lizards, to the large bony 'scutes' of the crocodilians and many extinct reptiles, and to the armature of the armadillos. A third type of scale is represented by the skin-teeth or 'dermal denticles' of Elasmobranch fishes, for in these, as in the teeth of the mouth, the epidermis forms an external coating of enamel, while the bony core and base are developed from the dermis. To this type the hard scales of some Ganoids (e.g. the sturgeon, bony pike) and a few Teleosteans are also to be referred. Dermal scales are of especial interest, for in a coalescence of these the 'investing bones' of the skull and shoulder-girdle had probably their origin. See FISHES, SKELETON.

Scales, MATHEMATICAL. Maps, estate plans, architectural, engineering, and other proportionate drawings are made to scale. An inch, for example, of the scale may represent a foot, yard, mile, or other length of the space to be shown. The first thing to be determined is the *representative fraction*, which shows the ratio between the scale and the object it represents, and should always be given with the scale. If the scale is to be of 1 inch to 8 miles, as there are 506,880 inches in 8 miles the representative fraction will be $\frac{1}{506880}$, which is usually printed on maps 1:506880. From this fraction a workable length of scale is easily found.



Fig. 1.—Simple Scale of 1:506880.

Suppose a scale showing 20 miles would be convenient to work from; as there are 1,267,200

inches in 20 miles, the proportion would be 506880:1::1267200:25. But this result is usually more readily arrived at by taking the proportion of the original lengths instead of using the representative fraction. Thus, 8:20::1:2.5. To make the scale, draw a line 2½ inches long. This line represents 20 miles. Bisect it, and each half shows 10 miles. Subdivide the half to the left into ten equal parts, and each of these tenths stands for 1 mile. This is a *simple scale* ready for use, and how it is usually drawn and figured is shown in fig 1.

The *diagonal scale* is a vertical subdivision over the simple one, and is an application of the principle in geometry that the sides about the equal

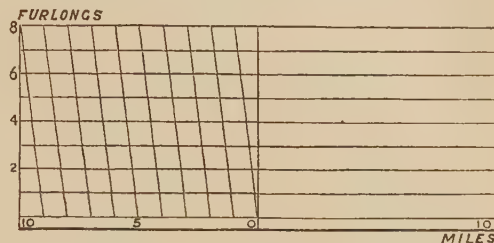


Fig. 2.—Diagonal Scale of 1:506880.

angles of equiangular triangles are proportional. Suppose the further subdivision of miles into furlongs were required. Draw above the simple scale eight parallel lines at equal distances from each other (fig. 2). From its ends and point of bisection draw perpendiculars to the eighth of these parallel lines. Subdivide the left half of the eighth line as the same half of the simple scale is subdivided. Join the first subdivision of the uppermost line from its bisection with the point of bisection of the simple scale, and draw lines parallel to this one from the other nine points of subdivision. The space between the bisecting line and the diagonal nearest it on the first parallel shows one furlong, the space above it two, and so upwards according to the geometrical principle stated. Suppose 16 miles 6 furlongs were to be measured. Put the one leg of the divider on the right end of the sixth parallel line and the other where the diagonal line sixth from the centre cuts that parallel, and the length required is found. The diagonal scales on mathematical rules are generally engraved with ten parallel lines, so as to give subdivision of tenths, this being the most generally useful proportion.

The *comparative scale* involves no new principle. It is a scale drawn in a different denomination to the same representative fraction. A scale in leagues comparative to the scale in miles would be three times as long itself and in each of its subdivisions; and if the comparative scale were drawn to the same number of units it might be inconveniently long or short. Thus, a comparative scale showing 20 leagues to the representative fraction given above would be 7.5 inches, which might be too long for working purposes or to be exhibited in print or on the plan. But it is not necessary that the same number of units in the larger or smaller denomination be taken; and the length of scale for a convenient number is easily found by proportion. Thus, in a scale 40 Russian versts are represented by 4.5 inches; draw a comparative scale in English miles. Show 20 miles. Take the verst roundly as 1167 English yards. There are 1760 yards in a mile. In 40 versts there are 46,680 yards; in 20 miles, 35,200 yards. Then 46680:35200::4.5:3.4. This line 3.4 represents 20 miles to the same representative fraction as the

Russian scale of versts, and it can be divided and subdivided like the simple and diagonal scales above.

Scalesia, a genus of composite plants related to the sunflower, consisting of ten species, each of which inhabits only one of the Galápagos islands. This pronounced endemism on so very small an area is one of the strangest phenomena of the distribution of plants. The Galápagos group furnishes an analogy in the animal world.

Scales of Notation, in Arithmetic, have to do with the representation of numbers of any magnitude by means of a few symbols. We ordinarily express numbers in terms of the first nine digit symbols and the symbol known as the cipher—i.e. ten in all. The number 'ten' is then represented by 10, a combination of the 'one' and cipher symbols, and so on in the familiar manner. Mathematically there is no reason why ten should be chosen in preference to any other number as the radix of our common scale of notation. Its convenience arises from the way in which it suits our numeration or naming of numbers. Historically the development of decimal arithmetic—of which our denary scale is the highest phase—is intimately connected with the fact that man has ten fingers. The full significance of the denary scale will be best seen if we take some other number, seven say, as the radix. Our object is now to express all numbers in terms of the cipher and the first six digits only. The number seven itself will be represented by 10, eight by 11, twelve by 15, fourteen by 20, forty-nine, or seven times seven, by 100, and so on. In other words, 49 to radix ten is the same number as 100 to radix seven. As another example take the number of days in the year, and let it be expressed in terms of scales whose radices are twelve, ten, seven, and three. Remembering that 365 to radix ten is a concise notation for $3 \times 10^2 + 6 \times 10 + 5$, we must, in order to express it in the duodenary scale, throw it into a similar form with twelve substituted for ten. We find easily

$$\begin{aligned} 365 &= 30 \times 12 + 5 \\ &= (2 \times 12 + 6) \times 12 + 5 \\ &= 2 \times 12^2 + 6 \times 12 + 5. \end{aligned}$$

Hence 365 to radix ten is the same number as 265 to radix twelve. In the other cases we get

$$\begin{aligned} 365 \text{ to radix } ten &= 265 \text{ to radix } twelve \\ &= 1 \times 7^3 + 0 \times 7^2 + 3 \times 7 + 1, \text{ or } 1031 \text{ to radix } seven \\ &= 1 \times 3^5 + 1 \times 3^4 + 1 \times 3^3 + 1 \times 3^2 + 1 \times 3 + 2, \\ &\quad \text{or } 111112 \text{ to radix } three. \end{aligned}$$

These examples show that the simplicity of having a few symbols is balanced by the disadvantage of having to use long expressions for large numbers. The attempt to work in other than the denary scale is moreover greatly hampered by our lifelong habit of thinking and naming our numbers according to a decimal system.

The fact that there are twelve pence to the shilling and twelve inches to the foot has often suggested the introduction of the duodenary scale. According to this scale twenty-four feet nine inches would be represented symbolically by 20.9. To use this scale we should be compelled to invent two new symbols for what we call ten and eleven. But unless we altered our numeration so as to be in accord with the symbolism, the method would be impracticable. For example, we should have to rename *fourteen* and *twenty-six* so as to bring them into line with their duodenary symbols 12 and 22. At present in all calculations involving shillings and pence or feet and inches we are compelled to *work* partly in the duodenary scale; but the numbers themselves are expressed both symbolically and verbally according to the denary scale

and decimal nomenclature. As a matter of history the denary scale is the only one that has ever been used purely; to establish any other would necessitate a complete revolution in modes of thought and habits of language.

Very similar to the mixture of decimals and duodecimals in the examples just given is the method of sexagesimals, which still survives in the subdivision of hours and degrees. There are sixty minutes to the hour (or degree), and sixty seconds to the minute. This method is of great antiquity, and had no doubt an astronomical origin. To the early astronomers it offered special facilities for calculation and for representation of fractions. It was used extensively by Ptolemy and the Alexandrian mathematicians, who employed for symbols the usual Greek numerals as far as the symbol for sixty (see NUMERALS). At its best, however, the sexagesimal notation must have been very cumbersome, even when assisted, as it probably was, by use of the Abacus (q.v.). It is evident that it does not form a pure scale; to do so sixty distinct symbols including the zero would be required. The Alexandrians no doubt borrowed the system from the Chaldeans. In the older Babylonian inscriptions there is found a sexagesimal notation identical, in so far as it is a notation, with that used by Ptolemy and his school. The symbolism is of course quite different, all numbers being represented by appropriate combinations of two cuneiform characters. The numbers up to nine are represented each by the proper number of the simple wedge-shaped character. *Ten* is symbolised by the angle-shaped character, two of which give twenty, three thirty, four forty, and five fifty. *Sixty*, however, is represented by the same simple character as one; five times sixty, or 300, by the same character as five, and so on. The famous tables of Senkereh contain the squares and cubes of all numbers from 1 to 60, expressed in terms of this sexagesimal notation. A few examples will suffice. Thus we find

$$\begin{array}{c} \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \\ \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \quad \text{⋈} \end{array} \text{ given as the square of } \begin{array}{c} \text{⋈} \quad \text{⋈} \quad \text{⋈} \\ \text{⋈} \quad \text{⋈} \quad \text{⋈} \end{array}$$

—i.e. $48 \times 60 + 36 = 2916 = (54)^2$.

We may most simply exhibit the Babylonian method by using heavy figures for the tens and light figures for the units. Thus the above example would be translated $4836 = \text{square of } 54$. Others from the table of Senkereh are

$$\begin{aligned} 12153 &= \text{cube of } 17 \\ (1 \times 60^2 + 21 \times 60 + 53 &= 4913 = 17^3) \\ 73 &= \text{cube of } 3 \text{ (i.e. thirty).} \end{aligned}$$

This last must mean $7 \times 60^2 + 30 \times 60$, although there is nothing in the notation to show what *place* in the sexagesimal representation is to be occupied by the 3 (or thirty). The example is instructive as showing how far short the Accadians and Assyrians fell of our modern cipher system. It is clear, however, that they were in possession of a sexagesimal scale as true and as complete as the much later Alexandrians. It was used probably only for purposes of calculation; for in simply representing numbers the Assyrians, if not the earlier Accadians, used another scale, in which a special symbol for the hundred was introduced. In this scale, however, the sexagesimal symbolism for 60, 70, 80, and 90 was retained. In the later cuneiform inscriptions of the Persians all trace of the sexagesimal scale is obliterated.

Scaliger (Ital. *Della Scala*, Fr. *De l'Escale*), JULIUS CÆSAR, according to the account given of him by the famous son Joseph Scaliger, was born in 1484 in the castle of Riva, at the head of the Lago di Garda, in the north of Italy. On the same authority we are told that Julius was the second son of

Benedetto della Scala, a descendant of the princely family of Verona of that name, which had been dispossessed of its territory by the republic of Venice. In all probability this genealogy is a pure fiction, as in Julius' letters of naturalisation as a French citizen he is styled simply 'a native of the town of Verona in Italy.' If we may trust his son's further account of him, Julius was bred to the profession of arms along with other noble youths under the immediate supervision of his kinsman the Emperor Maximilian, whom he subsequently served in his wars in different parts of Europe. The son of a fallen house, he was at one time so hopeless of his future that like other noble youths of Italy in similar circumstances he seriously thought of entering the brotherhood of St Francis. With this object he proceeded to the university of Bologna, where he devoted himself mainly to the study of Duns Scotus. His zeal for a monastic life, however, soon cooled, and 'to the last day of his life he would never willingly interchange a word with any Franciscan.' Returning to his former profession of arms, he took service in the French armies then attempting the conquest of Italy, and distinguished himself alike by his marvellous feats of strength and his adventurous courage. Having gained the command of a troop of light horse, he behaved with such gallantry as to win for him the special notice of King Francis himself. Notwithstanding his restless life Scaliger never neglected his studies, and to other attainments he added a knowledge of medicine and Greek. Such is the account of Julius Scaliger up to this point in his life which is given by his son in the epistle entitled 'De Vetustate et Splendore Gentis Scaligeræ et Jul. Cæs. Scaligeri Vita.' An account more likely to be true is that Julius was the son of a sign-painter of Verona, by name Benedetto Bordone, and that he studied at Padua, where he took the degree of doctor of medicine.

It is only from his naturalisation as a French citizen in 1528 that our knowledge of Scaliger is drawn from authentic sources. In that year, on the invitation of the Bishop of Agen, he settled in that town as a physician, and remained there for the rest of his life. Here he married a girl of nineteen, Andiette de Roques Lobejac, by whom he had fifteen children. The best-known circumstance of his later life is his attempt to gain notoriety by an unscrupulous attack on Erasmus, the foremost scholar and man of letters of the age. In ridicule of the Latin stylists of Italy Erasmus had published a satire entitled *Ciceronianus*. Construing this satire as a censure of Cicero himself, Scaliger attacked Erasmus (1531) in an oration which for sheer wantonness of abuse is unparalleled even in that age of unscrupulous controversy. As Erasmus paid no heed to this attack, Scaliger produced a second oration which in brutal scurrility surpassed even his former effort, but before its publication Erasmus was dead. Into all his work, much of which was of undoubted value, Scaliger carried the same coarse and jealous temper. Yet his son Joseph, while frankly admitting his father's faults, which, indeed, were largely his own, claimed for him an essential nobility of character, and an especial hatred of everything that suggested falsehood or hypocrisy. Engaged to the last in his labours as a scholar, Julius died in 1558, under suspicion of decided leanings towards the religious teaching of Calvin.

As a scholar Scaliger's fame has been overshadowed by that of his greater son. His vast attainments, however, and his natural force of mind have been admitted by every generation of scholars. But what Lessing said regarding one of his works (*Poetices libri septem ad Sylvium filium*) is the accepted opinion regarding them all :

'Scaliger's judgments as often show want of sanity and taste as insight and good sense.'

For the Life of Julius Scaliger, see the epistle of his son above referred to; Charles Nisard, *Les Gladiateurs de la République des Lettres* (1860); Bouroussé de Laffore, *Étude sur Jules César de Lescale* (Agen, 1860); Magen, *Documents sur Julius Cæsar Scaliger et sa famille* (Agen, 1873). Exclusive of his Latin poems, Scaliger's chief works are *De Causis Linguae Latine libri tredecim*; *Exotericarum Exercitationum liber quintus decimus de Subtilitate ad Hieronymum Cardanum*; *Poetices libri septem ad Sylvium*; *Commentarii in sex libros de causis Plantarum Theophrasti*; *Animadversiones in Theophrasti Historias plantarum*; *Aristotelis Historia de Animalibus*; *J. C. Scaligero interprete, cum ejusdem Commentariis*; *Commentarii in Hippocratis Librum de Insomniis*.

Scaliger, JOSEPH JUSTUS, the tenth child and third son of the foregoing, was born at Agen, in the district of France then known as Guyenne, in 1540. At the age of eleven he was sent to the Collège de Guyenne at Bordeaux, then, according to Montaigne (himself one of its scholars), the best institution of its kind in France. Owing to the outbreak of one of the many plagues which then devastated that part of the country, in 1555 he returned home, where he remained till his father's death some three years later. Julius Scaliger was too old to give his son methodical instruction; but indirectly the boy profited by his father's attainments. In accordance with the practice of almost all the scholars of the 16th century, the elder Scaliger was an indefatigable writer of Latin verse. Almost daily he was in the habit of dictating from 80 to 200 lines of his own composing, which it was the business of his son to copy. Daily also the boy had to present to his father a Latin theme on any subject which he himself might choose. Thus, without the regular training of other boys, Joseph early acquired that mastery of the mechanism of Latin prose and verse in which he surpassed all the scholars of his time.

Shortly after his father's death Scaliger proceeded to the university of Paris with the special purpose of acquiring the Greek language, with which he had as yet no acquaintance. The teacher whom he sought was Adrian Turnebus, since the death of Budæus the first Greek scholar in Europe. After two months' attendance in the class of Turnebus, Scaliger discovered, to his mortification, that he was too ignorant to profit by it. With the invincible resolution which was the basis of his character, he shut himself up in his own room and set himself to master the elements of the language. His method of procedure and its extraordinary result have a place among the anecdotes of scholarship. With the help of a Latin translation he read through Homer in twenty-one days, making a grammar for himself as he went along. From Homer he proceeded to the other Greek poets, and in four months he had gone through the whole series. Encouraged by his success with Greek, he next attacked Hebrew, but of Hebrew, according to his best biographer, Bernays, he never acquired that mastery which he showed in the case of Latin and Greek. Eventually he boasted that he spoke thirteen languages, ancient and modern. It is to be noted, however, that he acquired these languages, not in the vain spirit of a mere polyglot, but with the aim of a scientific scholar, who realised that the language and literature of one people are indispensable to the thorough understanding of another. Scaliger remained four years at the university of Paris, but of this period of his life only one notable circumstance is related. It was at this time that he adopted the Protestant faith, a change which eventually proved of the first importance in the subsequent direction of his life.

In 1563 he was invited by Louis Chastaigner de la Roche-Pozay to join him in the capacity of

travelling companion, and with the family of this noble he was more or less closely connected for the next thirty years. In 1565 he accompanied Roche-Pozay to Italy, of whose scholarship and religion he received the most unfavourable impression. Of England, which they next visited, Scaliger formed an equally unfavourable opinion. Scotland was also included in their tour, but of the Scots he speaks more kindly, specially mentioning the beauty of their ballads. In 1570 he settled at Valence in Dauphiné, where for about two years he studied under the great jurist Cujacius. From 1572 to 1574 he was in Geneva in the capacity of professor in the academy established there by Calvin. Returning to France, he found a home in the family of Roche-Pozay for the next twenty years. It was the period of the Huguenot wars, and Scaliger, like the rest of his countrymen, suffered from the confusions of the time. It was during these years, however, that he produced a series of works which placed him at the head of European scholars. Among them may be mentioned his editions of Catullus, Tibullus, and Propertius, his commentaries on which are equally remarkable for their learning and spirit of vainglorious assumption. But the works which definitively established his reputation were his edition of Manilius in 1579 and his *De Emendatione Temporum* in 1583. By these works he founded the science of modern chronology, an achievement unsurpassed in the history of scholarship. This labour he crowned by his edition of Eusebius in 1606.

In 1593, on an invitation from the Netherlands in the highest degree flattering to his vanity, Scaliger went as successor to Justus Lipsius in the university of Leyden, where he remained for the rest of his life. Though his connection with the university was almost nominal, it is to his example and inspiration that Holland owes her long line of scholars during the 17th and 18th centuries. Scaliger's last years were embittered by controversies which he had himself largely provoked by his indifference to the feelings of others. His chief enemies were the Jesuits, who regarded him as the most formidable foe of their order. In Gaspar Scioppius they found a match for Scaliger himself in the use of trenchant Latin, and one, moreover, who carried the qualities of a hired bravo into the domain of letters. The vulnerable point in Scaliger's coarse nature was his pride in his descent from the family of La Scala. In what is perhaps the most unscrupulous lampoon in literature, Scioppius, in his *Scaliger Hypobolimeus* ('The Supposititious Scaliger'), held the great scholar up to Europe as a baseborn impostor, a profligate, and an atheist. Scaliger wrote a reply; but it was ineffectual against the poisoned weapons of Scioppius. It is generally accepted that the attack of Scioppius hastened Scaliger's death. He still continued his labours, indeed, but his spirit was broken, and he died in 1609, in the arms of his favourite scholar Heinsius.

By his combined knowledge, sagacity, and actual achievement, Scaliger holds the first place among the scholars of all times. 'More than any one before or after him,' says Bernays, 'he approached to a complete conception of the life of antiquity.' To the same effect is the statement of Niebuhr, that 'Scaliger stood on the summit of real and universal knowledge, as no one after him has done.' In his personal character Scaliger was vainglorious, overbearing, and exacting to the verge of absurdity. It was his single-minded devotion to learning, his love of truth, his noble independence of spirit that redeemed a nature essentially coarse and unlovable.

See Jacob Bernays, *Joseph Justus Scaliger* (Berlin, 1855); Charles Nisard, *Juste Lipse, Joseph Scaliger, et*

Isaac Casaubon (Paris, 1852); Tamizey de Larroque, *Lettres françaises inédites de Joseph Scaliger* (Agen, 1881); Mark Pattison, *Essays*, edited by Henry Nettleship (vol. i. Oxford, 1889). It was Pattison's intention to write a biography of Scaliger; but the fragments that appear among these essays are all that he actually accomplished of his book. A list of Scaliger's works and their various editions is given by Bernays.

Scallop (*Pecten*), a well-known genus of bivalves, with fan-shaped valves which are closed by a single muscle. The left, which is the upper, is often more or less flat; the right is more markedly arched. Both are ornamented with sinuous radiating ribs, to which the name *Pecten* (Lat., 'a comb') refers; the brilliant colours, mostly red and yellow, are hardly surpassed by any other bivalves. The hinge-line is without teeth, it is drawn out in two lateral ears. The mantle is quite open below, with the margin folded back and bearing hundreds of highly developed sparkling eyes. The foot is



Pecten opercularis.

a small finger-like process; in some cases it secretes a little attaching byssus. Many scallops, especially when young, are able to swim by rapidly opening and closing their valves. When they become more sedentary they are often overgrown with acorn-shells, serpulid tubes, and zoophytes. Many of the large forms are called 'clams,' e.g. *P. maximus*, a British species about 6 inches broad; they are sometimes eaten, but are said to be rather indigestible. The Mediterranean *P. jacobæus* is the scallop-shell which pilgrims used to wear in front of their hat in token of having visited the shrine of St James at Compostela. Scallops are found in all seas; they are, mostly littoral, but some occur in the abysses. The genus dates back to the Palæozoic, and is represented by numerous extinct and extant species.

Scalp, the term employed to designate the outer covering of the skull or brain-case. Except in the fact that hair in both sexes grows more luxuriantly on the scalp than elsewhere, the skin of the scalp differs so slightly from ordinary skin (q.v.) that it is unnecessary to enter into any details on this point. But besides the skin the scalp is composed of the expanded tendon of the occipito-frontalis muscle, and of intermediate cellular tissue and blood-vessels. Injuries of the scalp, however slight, must be watched with great caution, for they may be followed by erysipelas, or by inflammation and suppuration under the occipito-frontal muscle, or within the cranium, or by suppuration of the veins of the cranial bones, and general pyæmia that may easily prove fatal. If dressed antiseptically at an early stage the risk of such accidents is of course greatly diminished. In the treatment of a wound of this region surgeons often make a practice of cutting out the bruised and torn edges so that smooth clean surfaces can be brought together and heal by first intention. The retention of discharges in such a wound is dangerous. The patient should be confined to the house (and in severe cases to bed), should be moderately purged, and fed upon non-stimulating but not too low diet. Burns of the scalp are very liable to be followed by erysipelas and diffuse inflammation, but the brain is comparatively seldom affected in these cases. Tumours of the scalp are

not uncommon, the most frequent being the cutaneous cysts popularly known as *Wens* (q.v.), and vascular tumours. See HAIR; and for diseases of the scalp, see BALDNESS, and other references given at HAIR.

SCALPING is the act, characteristic of North American Indian warfare, of partly cutting, partly tearing off a piece of the skin of the head, with the hair attached; whether the victim is alive or dead at the time does not affect the operation. The Indians, with whom scalps are the trophies of victory, have always left a long lock or tuft on the scalp as a challenge. Bounties have, in American history, more than once been offered for scalps: in 1724 £100 was offered by Massachusetts for Indian scalps; in 1754, during the French and Indian war, a bounty was offered by the French for British scalps, and £100 by the Colonies for Indian scalps; in 1755 Massachusetts offered £40 for every scalp of a male Indian over twelve years old, and £20 for scalps of women and children; &c.

Scamander, the ancient name of a river in the Troad (see TROY), which was also called Xanthus (Gr., 'yellow') by the gods. As a divinity Scamander took an important part in the Trojan war through its destructive floods. The river rose in Mount Ida and discharged itself into the Hellespont, after being joined by the Simois about two miles from its mouth: the two rivers, however, since the 1st century A.D. have had separate courses. There has been much controversy as to what modern river corresponds to the ancient Scamander; but recent investigators have decided in favour of the Menderes.

Scammony is a gum-resin of an ashy-gray colour, rough externally, having a resinous, splintering fracture. Few drugs are so uniformly adulterated as scammony, which, when pure, contains from 81 to 83 per cent. of resin (the active purgative ingredient), 6 or 8 of gum, with a little starch, sand, fibre, and water. Ordinary adulterants are chalk, flour, guaiacum, resin, and gum tragacanth. Scammony, when pure, is an excellent

and trustworthy cathartic of the drastic kind, well adapted for cases of habitual constipation, and as an active purgative for children. The resin of scammony, which is extracted from the crude drug by rectified spirit, possesses the advantage of being always of a nearly uniform strength, and of being almost tasteless. The *Scammony Mixture*, composed of four grains of resin of scammony, triturated with two ounces of milk, until a uniform emulsion is obtained, forms an admirable purgative for young children in doses of half an ounce or more. According to Christison, 'between 7 and 14 grains of resin, in the form of this emulsion, constitute a safe and effectual purgative' for adults. Another popular form for



Scammony (*Convolvulus Scammonia*):
a, portion of root (Bentley and Trimen).

the administration of scammony is the *Compound Powder of Scammony*, composed of scammony, jalap, and ginger, the dose for a child being from 2 to 5 grains, and for an adult from 6 to 12 grains. Scammony is often given surreptitiously in the form of biscuit to children troubled with thread-worms.

The plant which produces this valuable drug is *Convolvulus Scammonia* (see CONVOLVULUS), a native of the Levant. It is a perennial, with a thick fleshy tapering root, 3 to 4 feet long, and 3 to 4 inches in diameter, which sends up several smooth slender twining stems, with arrow-head-shaped leaves on long stalks. The root is full of an acrid milky juice, which indeed pervades the whole plant. The scammony plant is not cultivated, but the drug is collected from it where it grows wild. The ordinary mode of collecting scammony is by laying bare the upper part of the root, making incisions, and placing shells or small vessels to receive the juice as it flows, which soon dries and hardens in the air. Most scammony comes now from *Ipomæa oribazensis*.

Scandalum magnatum, in English law, means slander against the great men of the realm, an offence which consisted in spreading false reports concerning a peer, judge, or other great officer. The statute of 1275 which created this offence was repealed in 1887, and the special forms of action or criminal process formerly in use are superseded by the more general rules of the law relating to Libel (q.v.) and Slander (q.v.). A somewhat similar offence in Scotland is called Leasing-making (q.v.).

Scanderbeg, i.e. Iskander (Alexander) Beg or Bey, the patriot chief of the Albanians, was born in Albania about 1403, but his parents were both of Serbian descent. By the Christians he was commonly called George Castriot, though the Serbian family name was Branilo. Young George was carried away by the Turks when only seven years of age, and was brought up in the creed of Islam. His personal prowess and skill as a military leader made him a favourite with Sultan Murad (Amurath) II., who gave him the command of a division in the Ottoman armies. But when about forty years of age he took a momentous step, which he had some time been meditating: after the Turks were repulsed by the Hungarian forces at Nissa (Nish) in 1443, Scanderbeg deserted with three hundred Albanian followers, having first extorted from the sultan's secretary an order to the governor of the mountain fortress of Croya (Ak-hissar) that he was to hand over that stronghold to him (Scanderbeg). From that time the Albanian chief, who now renounced Islam for Christianity, the creed of his fathers and his countrymen, was an unrelenting foe to the Turks; they never beat him but once, and his name grew to be a terror to their soldiery. In less than a month after the capture of Croya the whole of Albania was up in arms, and the Turkish garrisons had been seized or compelled to retire out of the country. Early in the following year the Albanian chiefs unanimously elected Scanderbeg their leader. He collected an army of 15,000 men, and with them nearly annihilated in the defiles a Turkish force of 40,000; and other columns shared the same fate in the succeeding campaign. The years 1446-48 were chiefly occupied with a fierce war against Venice. At length Amurath II. himself took the field (1449) with 150,000 men; but the little hill-fort of Sfetigrad successfully defied him until he had lost 30,000 soldiers, and then it was only taken through treachery. And being after that effectually foiled before the walls of Croya, the sultan withdrew in disgust. These splendid achievements brought to Scanderbeg congratulations, as well as

material assistance in stores and volunteers, from the potentates of Italy and Hungary; but none of them sent the brave leader an army, or took up the war with him. The proud Albanian chiefs too began to fall away, mainly because of Scanderbeg's manifest purpose of aggrandising his own family and enlarging its power; some of them even went over to the enemy and led Turkish armies against him. But he nevertheless continued to crush every force that the Turks poured into the mountain fastnesses of Albania, or stationed near its frontiers. At length in 1461 a truce of ten years was concluded between the combatants. Two years later, however, at the instigation of Pope Pius II., who tried in vain to league the Christian princes together against the all-conquering Ottomans, Scanderbeg renewed the war, and again defeated every force that dared to attack him. Even Mohammed II., conqueror of Constantinople, conducted two campaigns in person against the invincible chief, and retired baffled both times, on the first after losing 35,000 men before Croya. Scanderbeg died at Alessio on 17th January 1468, of malarial fever, doubtless also worn out by a quarter of a century's fierce and incessant fighting. He was personally a man of tall stature and commanding appearance, terrible in battle, inflexible in resolution, of wonderful activity, and full of resource, a man whom victory did not demoralise, nor desertion dishearten; nor was natural kindness wholly destroyed by the savage nature of the strife he was engaged in. There can be no doubt that for a time he broke the force of Moslem irruption, and had he been adequately supported would have inflicted some permanent injury upon the Turkish power. After his death the Albanian opposition speedily collapsed—an incontestable proof of Scanderbeg's genius. See C. Paganel, *Histoire du Scanderbeg* (1855), and the *Edinburgh Review* (October 1881).

Scanderoon, ALEXANDRETTA, or ISKAN-
DERUN ('Alexander's town'), a port of north-western Syria, stands on the east shore of the Gulf of Scanderoon, in the extreme north-east of the Levant, 30 miles N. of Antioch, and 77 NW. of Aleppo, for which it is the port. With Aleppo it communicates by the Beilan pass (the marshes behind the mountains having been partly drained), and indirectly by a railway which joins the Bagdad line in Turkish territory. It is a poor but reviving place, of some 15,000 inhabitants, with a large but neglected harbour, for which, however, something has been done and much is contemplated. It imports goods destined for Aleppo and the towns of northern Syria, and exports cattle, liquorice root, silk cocoons, pistachios, morocco leather, and hides. It is expected that port improvements will divert much trade from Beirut and Tripoli. Alexandretta was founded by Alexander the Great to commemorate his victory of Issus (333 B.C.). Off here Sir Kenelm Digby defeated a Franco-Venetian squadron (1628); and close by the Egyptian Mehemet Ali defeated the Turkish troops in 1832.

Scandinavia, a large peninsula in the north of Europe, bounded on the N. by the Arctic Ocean, on the W. by that branch of the Atlantic now called the Norwegian Sea, and on the S. and E. by the Baltic Sea and the Gulf of Bothnia. The character of the country, its physical features, industries, &c., are given under NORWAY and SWEDEN. In a historical sense Scandinavia includes Denmark and Iceland, and in a literary sense besides these the intellectual productions of the Swedish people in Finland. For the languages and literatures of Scandinavia, see ICELAND, NORWAY, SWEDEN, DENMARK, and EDDA; and for the history in general, Nisbet Bain's *Scandinavia* (1905).

Scandinavian Mythology is largely the groundwork of Teutonic mythology, and is built up of many elements. Throughout the Scandinavian countries are found monumental stones on which runic inscriptions have been written in heathen times. Of these 'runic monuments' no less than four folio volumes were got together by George Stephens, a work of great importance to the student of mythology. From heathen Germany we have a few ancient laws, and a few glossaries containing mythological words. The *Lex Salica*, of which we have a Latin translation, was doubtless originally produced in the German tongue. Then there are formulæ by which the new converts to Christianity renounced the old gods, and in which names of heathen divinities therefore occur. But precious though it be, the amount of mythological information to be gathered from these and similar sources is very small. A richer vein of information is the tolerably well-represented collection of German heroic poems, among which the most important are the Nibelung story and Gudrun. The *Heliand* preserves a number of heathen phrases and figures of speech. Old English literature holds but scanty traces of the old religion. Iceland is the Mecca to which all must turn who would understand the Odinic religion; Iceland is the Patmos where Scandinavian mythology was recorded. There we find a large mythological literature put in writing after the introduction of Christianity (1000 A.D.), and after the people had adopted the Roman alphabet, but still written in the spirit of the asafæith, 'naught extenuating and' putting down naught in malice.' The most important of the Icelandic documents are the Elder or Poetic Edda and the Younger or Prose Edda. The *Heimskringla*, completed by Snorre Sturlason about the year 1230, contains much information concerning Scandinavian heathendom, for it gives a very elaborate account of the introduction of Christianity in the north, portraying the conflict between the old and the new religion, and begins with sketches of a number of kings who ruled Norway 140 years before the introduction of Christianity. Hence valuable information may be found in that work not only in regard to the rites and ceremonies prescribed by the Odinic ritual, but also of the morals and habits inculcated and produced by the Odinic code. Several of the Icelandic sagas are also of value in this respect. Caesar and Tacitus furnish some important data, and next after them come the Christian writers down through the foggy and dark middle ages, who wrote in Latin; but the very small amount of mythological information contained in their books is due in part to their ignorance, but mainly to their hostility to the heathen religion. Among this class of writers Denmark presents a remarkable exception in Saxo Grammaticus, who lived in Denmark in the 12th century. He wrote a *Historia Danica*, and embodied in it an outline of Scandinavian mythology based on old songs. But he presents it as history, assuming Odin, Thor, and the other deities to have been kings and potentates in the north. The first eight books of his history are exclusively mythological. Saxo had a world of valuable light, though he himself saw nothing. Finally the student of Scandinavian mythology must look for fragments of Odinism in the customs, habits, speech, traditions, ballads, folklore tales, and in the usages of the Christian churches throughout Teutondom.

It was Time's morning
When Ymer lived;
There was no sand, no sea,
Nor cooling billows;
Earth there was none,
No lofty heaven;
No spot of living green;
Only a deep profound.

Thus the Elder Edda. The beginning was this: Many ages ere the earth was made there existed two worlds. Far to the north was Niflheim—i.e. the nebulous world, and far to the south was Muspelheim—i.e. the fire world. Between them was Ginungagap, the yawning deep. In the middle of Niflheim lay the spring Hvergelmer, and from it flowed twelve ice-cold streams called the Elivogs (Elivagar), of which Gjøl was situated nearest Hel's gate. Muspelheim was so bright and hot that it burned and blazed, and could only be entered by those who had their home there. In the midst of this intense light and burning heat sat Surt, guarding its borders with a flaming sword in his hand. The Elivogs flowed far from their spring-head in Hvergelmer into Ginungagap, and the venom they carried with them hardened as does dross from a furnace, and became ice. Vapours gathered and froze to rime, and thus were formed in the yawning gap many layers of congealed vapour. But the south side of Ginungagap was lighted up by sparks from Muspelheim. Thus, while freezing cold and gathering gloom proceeded from Niflheim, the other side of the gulf was exposed to the dazzling radiance and scorching blasts from Muspelheim, and when the heated blasts met the frozen vapours they melted into drops, and, *by the might of him who sent the heat*, these drops quickened into life and took the form of a giant man. His name was Ymer, and he became the progenitor of all the evil race of giants. At the same time and in the same manner sprang into life a cow, Audhumbla, by whose milk Ymer was nourished. The cow fed herself by licking the salt rime on the rocks, and at the end of the first day she produced by licking the stones a man's hair, on the second evening a head, and on the third evening a perfect man. His name was Bure. He was fair, great, and mighty. He begat a son by name Bor. Bor married the giantess Bestla, and she bore him three sons, Odin, Vile, and Ve (Spirit, Will, and Holiness), and Odin became the father of the gods, who rule heaven and earth. The three brothers, Odin, Vile, and Ve, slew the giant Ymer, and when he fell so much blood flowed that all the race of giants were drowned excepting Bergelmer and his wife, who escaped in a boat and perpetuated their race. The three sons of Bor dragged Ymer's body into Ginungagap, and out of it they made the world: of his flesh the land, of his blood the ocean, of his bones the rocks, of his hair the forests, of his skull the vaulted sky, which they decorated with red hot flakes from Muspelheim to serve as sun, moon, and stars. Ymer's brain they scattered in the air, and made of it the melancholy clouds. Dwarfs quickened like maggots in Ymer's flesh. But there were yet no human beings upon the earth. One day Odin, Hœner, and Loder were walking by the sea, and found two trees, an ash and an elm. They made of them the first man and woman. Odin gave them the breath of life (*önd*), Hœner gave them feeling (*óð*), and Loder gave them blood and the form (image) of the gods (*lá ok líto góða*). The man they called Ask and the woman Embla, and from them are descended the whole human family.

It is worthy of note that the world does not pass from chaos to cosmos. The old Scandinavians took a step farther back into primeval time, and conceived first a *pre-chaotic* state (Muspelheim, Niflheim, and Ginungagap), then a *chaotic* epoch (Ymer, Audhumbla, Bure, Bor, Bestla, Bolthorn, Odin, Vile, and Ve), and finally *cosmos* made from Ymer slain. The gods belonging to the Asgard pantheon and also giants came into being in the chaotic epoch. Odin was born in chaos. But the Scandinavian mythology conceived living and life-giving beings in the pre-

chaotic age also. Surt guarded Muspelheim before any creation or birth had taken place. Surt is also the last figure who appears in Ragnarok, where he flings fire and flame over the world, and he is the last one who appears in that terrible act of the drama. The Edda says that Nidhug, a terrible serpent, dwelt in Hvergelmer in Niflheim. Venom flowed with the Elivogs rivers out of Hvergelmer. This points to an evil being in pre-chaotic Niflheim. This dualism in the pre-chaotic epoch is a very interesting point in Scandinavian mythology. The Odinic pantheon has twelve gods to whom divine worship is due, and there are twenty-six goddesses. The twelve gods are Odin, Thor, Balder, Hermod, Tyr, Brage, Heimdal, Hoder, Vidar, Uller, Vale, and Forsete. The asa-god Hœner disappears from the circle of gods, having been given as a hostage to the Vans. To the number of gods must however be added Njord and Frey, who originally were Vans, and also Loke, who was of giant descent, but had entered into foster-brotherhood with Odin himself, and was adopted by the gods. Chief among the goddesses is Odin's wife Frigg; Thor's wife is Sif, Balder's is Nanna, and Brage's is Idun. Freyja is the goddess of love. The gods and goddesses dwell in Asgard, but nearly every one has a separate dwelling. Odin's high-seat is in Hlidskjalf, whence he looks out upon all the nine worlds. He also has a large hall, the famous Valhal, whither he invites all men fallen in battle. Thor lives in Thrudvang, Balder in Breidablik. Concerning the different gods, and particularly about Thor, Odin, Balder, and Frey, there are a number of myths giving accounts of their exploits.

The most poetical and significant myth is that of the great world-tree, the ash Ygdrasil. It is the tree of existence, the tree of life and knowledge, the tree of grief and fate, the tree of time and space; it is the tree of the universe. This tree has three roots extending into the three principal worlds. The lowest strikes down into Niflheim into the well Hvergelmer, where it is gnawed by the ancient dragon Nidhug and all his reptile brood. The second root stretches into Jotunheim to the fountain of Mimer, where wisdom and wit lie hidden, and of whose waters Odin once purchased a draught, leaving one of his eyes as a pledge with Mimer. The third root is fixed in Asgard among the gods, near the sacred fountain of Urd the norn of the past, where the gods sit in judgment, riding thither daily over the Bifrost bridge—i.e. the rainbow. At this fountain dwell the three norns Urd (the Past), Verdande (the Present), and Skuld (the Future), and dispense the destinies of men. They weave the web of men's lives. It is a web of golden thread from east to west, from the radiant dawn to the glowing sunset of man's horizon. The woof of this web is fixed in the far north, but the web woven by Urd and Verdande is torn into pieces every evening by Skuld. The branches of Ygdrasil spread over the whole world and aspire above heaven itself. An eagle is perched on the topmost bough, and between his eyes a hawk. A squirrel called Ratatosk runs up and down the tree seeking to cause strife between the eagle and Nidhug. Four stags leap beneath its branches, and feed on its buds. Two swans swim in the Urd fountain, and everything placed therein becomes as white as the film of an egg-shell. The norns draw water from the spring, and with it they sprinkle Ygdrasil in order that the boughs may continue green in spite of the destructive agencies that constantly assail it. Honey-dew falls from Ygdrasil, and is food for the bees. Odin hung nine nights on this tree and offered himself to himself.

In Scandinavian mythology there is a very elaborate development of the evil principle. The dragon Nidhug and his brood originated in Hvergel-

mer in Nifheim. The giant descendants of Ymer were evil, and they did not all perish in his blood-deluge, for Bergelmir and his household escaped and produced a numerous offspring, with whom Thor and the other gods carried on a constant war. But the great type or representation of evil is Loke. He is the instigator of all the misfortunes that have happened both to gods and to men. He is of giant race, but was adopted by the gods, and was already in the dawn of time a foster-brother of Odin. The countenance of Loke is fair, but his disposition is thoroughly bad. Loke frequently accompanies the gods, and they make use of his strength and cunning, and when out of sight he usually plots with the giants for the purpose of bringing ruin upon the gods. He became the father of three terrible children in Jotunheim—i.e. in the home of the giants. These are (1) the Fenriswolf, (2) the Midgard-serpent, and (3) Hel, the goddess of death. The gods knew that these children of Loke were growing up, and would some day cause them great mischief. Therefore they bound the Fenriswolf on a barren island, and put a sword in his open-stretched mouth; but for this the god Tyr had to sacrifice his right hand. They cast the Midgard-serpent into the deep sea, where he encircles the whole earth and bites his own tail. Thor was at one time out fishing with the giant Hymer. He caught the Midgard-serpent on his hook, and would have slain him with his hammer Mjolner had it not been for the giant Hymer, who got frightened and cut the fishing-line just at the moment when Thor had his hammer raised to strike. The third child of Loke, Hel, goddess of death, was thrown into Nifheim, and Odin commanded that all who died of sickness or old age should go to her, while warriors slain in battle were borne on Valkyrian arms to Valhal. Hel's dwelling is called Helheim, and is large and terrible. Her realm in the lower world is divided into nine abodes, one below the other, and it is in the lowest of these that her palace is, called Anguish, her table Famine, her waiters Slowness and Delay, the threshold Precipice, and the bed Care. The English word *hell* is of course intimately connected with her name.

Loke caused the greatest sorrow to gods and men when by his cunning he brought about the death of the good Balder. Balder was the favourite of all nature, of the gods and of men. He was the son of Odin and Frigg, and the Edda says that he is the best god and that all mankind are loud in his praises. So fair and dazzling is he in form and feature that rays of light seem to issue from him, and we may form some idea of the beauty of his hair when we know that the whitest of all flowers is called Balder's brow. Balder is the mildest, the wisest, and the most eloquent of the gods; yet such is his nature that the judgment he has pronounced can never be altered. He dwells in the heavenly mansion called Breidablik ('broad-shining splendour'), into which nothing unclean can enter. Balder was tormented by terrible dreams indicating that his life was in danger. He told his dreams to his fellow-gods, who resolved to conjure all things animate and inanimate not to harm him, and accordingly Odin's wife Frigg took an oath from all things that they would do Balder no harm. But still Odin felt anxious, and having saddled his eight-footed horse Sleipner, he rode down to Nifheim, where he waked the vala or seeress, and compelled her to give him information anent the fate of Balder. When it had been made known that all things had taken a solemn oath not to hurt Balder it became a favourite pastime of the gods at their meetings to put him up as a mark and shoot at him. But it sorely vexed Loke to see that Balder was not hurt. So he took on the guise of an old woman, went to Frigg, and asked

her if all things had promised to spare Balder. From Frigg he learned that on account of its insignificance she had neglected to exact an oath from the mistletoe. So he straightway went and pulled this up, repaired to the place where the gods were assembled, and induced the blind god Hoder to throw the mistletoe at his brother, and do him honour as did the other gods. Loke himself guided Hoder's hand. The twig did not miss its shining mark, and Balder fell dead. The gods were struck speechless with terror. When they had had time to recover their senses Frigg sent Hermod to the goddess Hel to ask her to permit Balder to return to Asgard. Hel said she would release Balder if it was true that he was so universally beloved, and this she would test by observing if all things would weep for him. Messengers were despatched throughout all the world to beseech all things to weep Balder out from Hel's domain. And all things did so with alacrity, men, animals, the earth, stones, trees, and metals. The messengers were returning confident that their mission had been successful; but on their way home they found a hag crouching on the ground. She called herself Thokk, but she was none other than Loke in disguise. Thokk said she could not weep other than dry tears; and so Hel kept her prey. Soon afterwards Loke was captured and bound with strong cords to the points of rocks in a cave. A serpent was suspended over him in such a manner that the venom fell into Loke's face drop by drop. But Sigyn, Loke's wife, took pity on him. She stands by him, and receives the drops as they fall in a cup, which she empties as often as it is filled. But while she is emptying it venom falls upon Loke's face, which makes him shriek with horror and twist his body about so violently that the whole earth shakes, and thus earthquakes are produced.

But when Balder, the bright and good god, had passed from the happy family circle of the gods to the cold and gloomy abodes of Hel the awful day of doom was impending. It was a fatal thing for the gods and for the world that they united themselves with the giant race. The gods should not have admitted Loke into Asgard. Balder's death was the result, and this hastened the day when the whole world shall be destroyed, when gods and men and giants shall perish in Ragnarok, the twilight of the gods. Increasing corruption and strife in the world are the signs that this great and awful event is impending. Continuous winters rage without any intervening summer now that Balder has been slain; the air is filled with violent storms, snow, and darkness, and these are the signs that Ragnarok is at hand. The sun and moon are swallowed by giants who pursue them in the guise of wolves, and the heavens are stained with blood. The bright stars vanish, the earth trembles in the throes of the earthquake, and the mountains topple down with a tremendous crash. Then all chains and fetters are severed, and the terrible Fenriswolf gets loose. The Midgard-serpent writhes in his giant rage, and seeks land upon the tumultuous waves. The ship Naglfar, which has been built of the nail-parings of dead men, floats upon the waters, carrying the army of frost-giants and mountain-giants over the sea, and having the mighty giant Hrym as its helmsman. Loke too is now freed from his dark cave and strong chains, and comes to the scene as the leader of the hosts of Hel. The Fenriswolf advances and opens his enormous mouth. His lower jaw rests on the earth, and the upper touches the sky. It is only from want of room that he does not open his mouth still wider. Fire flashes from his mouth and nostrils. The Midgard-serpent, placing himself by the side of the Fenriswolf, vomits forth floods of venom

that fill the air and waters. In the midst of this confusion, crashing, and devastation the heavens are rent in twain and the sons of Muspel come riding down the opening in brilliant battle-array. And now Surt, the same being that sent the heated blasts from Muspelheim into Ginungagap in the pre-chaotic world, and by whose might the drops of venom sent by Nidhug in Niflheim quickened into the giant Ymer, he who is from everlasting to everlasting, appears on the scene wrapped in flames of fire. His flaming sword outshines the sun. All the hosts here described come riding over the Bifrost bridge, that is the rainbow, which breaks beneath so great a weight. All this vast and glittering array direct their course to the great battlefield called Vigrid, and thus the evil forces on their part are ready for the final struggle.

Meanwhile Heimdal, on the part of the gods, blows his Gjallarhorn to arouse the gods, who assemble without delay. In his embarrassment Odin now for the *third* time in his life goes to the giants for advice. He rides to Mimer, with whom in his youth he had pawned his eye for knowledge, to consult him as to how he and his warriors are to enter into action. The answer is not recorded, but in the meanwhile the ash Ygdrasil begins to quake and quiver, nor is there anything in heaven or on earth that does not fear and tremble in that awful hour. The gods and all the einherjes (i.e. those fallen in battle and brought to Valhal) don their armour, arm themselves and speedily sally forth to the field of battle, led by Odin, who is easily recognised by his golden helmet, resplendent cuirass, and his flashing spear Gungner. Odin places himself against the Fenriswolf as the foe most worthy of his steel. Thor stands by Odin's side, but can give him no assistance, as he must himself contend with the Midgard-serpent. Frey encounters the mighty Surt himself; but, though terrible blows are exchanged, Frey falls, and the Edda says he owes his defeat to the fact that he did not have that trusty sword which in his passion for a giantess he gave to his servant Skirner, when he sent him to ask for the hand of the charming giantess Gerd. In the last hour the dog Garm, which for ages had been chained in the Gnipa cave, also breaks loose. He is the most terrible monster of all, and he attacks the one-handed Tyr, who had sacrificed his right hand to get the Fenriswolf bound. Garm and Tyr kill each other. Thor gains great renown by dealing the deathblow to the Midgard-serpent with his mighty hammer Mjolner, but he retreats only nine paces before he too falls dead, suffocated by the flood of venom which the expiring serpent vomits forth upon him. The Fenriswolf with his enormous and wide-open mouth swallows Odin; but Vidar, Odin's son, immediately advances to avenge his father. He places his foot upon the wolf's lower jaw, the other he seizes with his hand, and thus tears and rends him till he dies. Vidar is able to do this, for he wears a shoe, for which materials have been gathered in all ages. It is made of scraps of leather cut off from the toes and heels in making patterns for shoes; hence, says the Edda, shoemakers should throw away such pieces if they desire to render assistance to the gods in the final conflict. Loke and Heimdal meet in a duel and become each other's slayers. The conflict is still raging with unabated fury, when the immortal god Surt flings fire and flame over the world. Smoke wreathes up around the ash Ygdrasil; the high flames play against the lurid heavens, and the earth consumed sinks down beneath the watery waste.

After Ragnarok comes a new world. The earth rises a second time from the sea, and is completely clothed in green. Sparkling cascades fall, over-arched by rainbows glistening in the sunbeams.

The eagle soars on lofty pinion in pursuit of his prey. The gods risen from the dead assemble on the Ida plains and talk over the strange events of the past. The fields unsown yield bountiful harvest, all ills cease, and the gods live in peace. A new sun brighter and more resplendent than the former appears, and there is naught but beauty, plenty, and happiness.

The Scandinavian mythology has two heavens and two hells for humanity, a heaven and hell before Ragnarok, and a heaven and hell after Ragnarok. Before Ragnarok those fallen in battle or by the sword went to Valhal, to become einherjes, who took part with Odin in the first conflict on the plain of Vigrid. Those who died a straw-death (that is, from sickness or old age) went after death to the domain of Hel, and, though the Edda is silent on the subject, they probably fought on the side of Loke. But after Ragnarok there is a heaven called Gimle and a hell called Nastrand. Gimle is a hall more radiant than the sun; it is the uppermost realm, and in it the virtuous shall dwell for ever and enjoy delights without end. Nastrand is a place set apart for the wicked. The word means strand of corpses. It is situated far from the sun, in the lowest region of the universe. It is a large and terrible cave, the doors of which open to the north. This cave is built of serpents wattled together, and the fanged heads of all the serpents turn into the cave, filling it with streams of venom, in which perjurers, murderers, and adulterers have to wade. Bloody hearts hang outside of the hearts of the damned. Their faces are dyed in gore. Strong-venomed serpent fangs fiercely pierce their hearts; and their hands are riveted together with red-hot stones. Their clothes wrapped in flames are not consumed, and remorseless ravens keep tearing their eyes from their heads. From this terrible cave the damned are, to increase their anguish, washed by the venomous floods into Hvergelmer, that fearful well in Niflheim, where their souls and bodies are subjected to even more terrible pains and woes; torn by countless clusters of serpents, and borne from agony to agony on the whizzing plumage of the primeval Nidhug, the dragon of the uttermost darkness. The Scandinavian mythology appears not to teach eternal punishment. There comes a mighty one to the great judgment, and makes Nidhug sink. In her last vision in Völuspa the vala points to a time when all that is evil shall be dissolved and washed away by the eternal streams of goodness. This is the last vision of the vala:

There comes the dark
Dragon flying,
The shining serpent
From the Nida-mountains
In the deep.
Over the plains he flies;
Dead bodies he drags
In his whizzing plumage.
Now must Nidhug sink.

Sophus Bugge in his elaborate work, *Studier over de nordiske gude, og heltesagns Oprindelse* (German trans. by Professor Bremner, Munich, 1889), attempted to trace the influence of Greek and Roman mythology and of Christianity on Scandinavian mythology. On the other hand, Viktor Rydberg, in his monumental work *Teutonic Mythology* (trans. Anderson, 1889), gives an account of the mythology as it existed before it came in contact with and was modified by the Christian religion. The mythological materials in a more or less changed form were largely augmented by Rydberg, particularly by his subjecting the mythic portions of the *Historia Danica* of Saxo Grammaticus to a most painstaking analysis. He found the key to Saxo's method of turning myths and traditions into history, showed that the Younger

Edda is an unreliable record of the Odinic religion, and increased our stock of mythological materials by analysing the mythic fragments in the old Norse literature outside of the Elder Edda.

See Grimm's *Deutsche Mythologie* (trans. by Stallybrass), Petersen's *Nordisk Mythologie*, Munch's *Norrøne gude*, Simrock's *Deutsche Mythologie*, Mannhardt's *Germanische Mythen*, Rasmus Anderson's *Norse Mythology* (1875), Gummere's *Germanic Origins* (1892), Chadwick's *Cult of Odin* (1899), Chantepie de la Saussaye's *Religion of the Teutons* (trans. 1902), Craigie's *Religion of Ancient Scandinavia* (1906), and Meyer's *Altgermanische Religionsgeschichte* (1910).

Scandium (Sc; at. number 21; at. wt. 44.1), an element foretold by Mendeleëf, discovered by Wilson, and recognised in the chromosphere of the sun by Lockyer.

Scania, the southernmost part of Sweden (q.v.).

Scapa Flow, an expanse of water in Orkney, sheltered by Mainland on the north, Burray and S. Ronaldshay on the east, and Hoy on the west. The two main exits are Hoy Sound on the west and Holm Sound on the east, and the main roadstead is at Longhope in Hoy. During the Great War, Scapa Flow was chosen as the chief naval base for the British Atlantic Fleet, but it was not till the end of 1914 that adequate anti-submarine defences were installed. The ships of the German High Sea Fleet, which surrendered after the Armistice, were interned here, and scuttled by their crews in June 1919. In 1924 salvage operations were begun.

Scapegoat. See AZAZEL.

Scaphoid Bone. See HAND.

Scapula. See SHOULDER.

Scapular (Lat. *scapula*, 'the shoulder'), a portion of the monastic habit, so called from its being worn upon the shoulders. It consists of a long strip of serge or stuff, the centre of which passes over the head, one flap hanging down in front, the other upon the back. The colour differs for different religious orders or congregations. Besides the scapular worn by the members of religious orders strictly so called, there exists also in the Roman Catholic Church a religious association or confraternity, the members of which, while living in the world and mixing in the ordinary life, wear, under the ordinary garb, two little pieces of cloth, connected by strings passing over the shoulders. The chief duties of this confraternity consist in the recitation of certain prayers, or the observance of certain religious or ascetical exercises in devotion to the Blessed Virgin. This pious association was founded in the first half of the 13th century by an English Carmelite friar named Simon Stock, and was said to have originated in a vision; but this story is now discredited even by Catholics, while they hold that the observance itself is an aid to piety.

Scarabæus (*Ateuchus sacer*), one of the dung-beetles (Coprophaga), well known for the zeal with which they unite in rolling balls of dung to their holes. The dung serves as food, and a beetle having secured a ball seems to gnaw at it continuously—sometimes for a fortnight—until the supply is exhausted. Sometimes an egg is laid in the ball and the parents unite in rolling this to a place of safety, above the level of the annual inundations. The genus is represented by about sixty species in the countries around the Mediterranean. By the Egyptians the scarabæus was venerated during its life, and often embalmed after death! Entomologists have recognised four distinct species sculptured on the Egyptian monuments, and gems of various kinds of stones were often fashioned in their image. Several mystical ideas were associated with the scarabæus: the number of its 'toes,'

thirty, symbolised the days of the month; the time it deposited the balls containing the eggs was supposed to refer to the lunar month; the movement of the ball referred to the action of the sun on the earth, and personified that luminary. The scarabæus was supposed to be only of the male sex, hence it signified the self-existent, self-begotten, generation or metamorphosis, and the male or paternal principle of nature. In this sense it appears on the head of the pygmean deity, Ptah-Socharis Osiris, and in astronomical and sepulchral formulas; and Khepra was a scarab-headed god. The custom of engraving scarab gems passed from Egyptians to Greeks and Etruscans. An engraved scarab of carnelian is figured at GEM.



Engraved Scarab.

Scaramouch (Ital. *Scaramuccia*, 'skirmish'), a character in the old Italian comedy, originally derived from Spain, representing a military poltroon and braggadocio. He was dressed in a sort of Hispano-Neapolitan costume, including a black *toque* and mantle, and a mask open on the forehead, cheeks, and chin, and always received an inglorious drubbing at the hands of harlequin.

Scarborough, called the 'Queen of Watering-places,' in the North Riding of Yorkshire, 54 miles N. of Hull, 21 SSE. of Whitby, 43 NE. of York, and 233 N. of London. Situated between moorland and sea and divided into two beautiful bays by the lofty promontory on which the castle ruins stand, the setting of Scarborough is magnificent. On the south side is the Spa. Originally a small retreat for taking the waters, the Spa is now a fashionable centre of attraction in the town. To the south of the Spa are the South Cliff Gardens and Italian Gardens with roseries and terraced walks, and on the north side the Alexandra Gardens and the Peasholm Park. Connecting the north and south bays is the famous Marine Drive extending round the foot of the Castle Hill. There are excellent bathing facilities, and the climate is delightful. Scarborough (O.E. *Skardeborge*, 'fortified rock') is an old place, for Harold Hardrada ravaged it in 1066, and in 1181 it received a renewal of an earlier charter; and it returned two members to parliament from Edward I.'s time till 1885, when the representation was reduced to one. The castle, now a shattered Norman keep, dates from 1136, but was rebuilt as a royal fortress by Henry II. It was captured by the Earl of Pembroke from Piers Gaveston (1312), by Bruce (1318), by the Earl of Westmorland from the insurgent Lord Stafford (1553), and twice by the parliamentarians (1644-48), besides being unsuccessfully besieged by Aske in the Pilgrimage of Grace (1536). Laid bare in the castle was a Roman signalling station (400). The house of King Richard III. on the Sandside remains to show where he stayed whilst in Scarborough. George Fox, Quaker, was martyred in Scarborough castle in 1666. During the Great War, Scarborough was thrice bombarded. Near by the castle is St Mary's, the church originally of a Cistercian priory (1320). Transition Norman and Early English in style, with later additions, it suffered much during the siege of 1644, and was restored in 1848-50. St Martin's (1862) is a good Early English structure, with windows by Morris. Lord Leighton was born here. Resident pop. (1851) 12,915; (1891) 33,776; (1921) 46,179.

See works by Gent (1735), Hinderwell (3d ed. 1832), J. Brogden Baker (1882), and Haviland (1883).

Scarf. See STOLE.

Scarlatina, or SCARLET FEVER, is one of the group of diseases called Exanthemata (q.v.). In addition to the characters common to the group,

scarlatina is almost always attended by sore throat, and the rash or eruption, which is of bright scarlet colour, commonly appears as early as the second day after the manifestation of the febrile symptoms, and is followed by very distinct desquamation of the cuticle. The period of incubation (see MEASLES) is very rarely more than a week; sometimes as little as twenty-four hours. Most writers on medicine make three varieties of this disease—viz. *S. simplex*, in which there are the fever and the rash, but only slight throat affection; *S. anginosa*, in which, in addition to the fever and the rash, the throat affection is the most prominent symptom; and *S. maligna*, a name which is applied to certain cases of extreme virulence, in which the system is at once overwhelmed by the force of the disease, or in which the symptoms disclose an extraordinary degree of weakness and want of vital power.

The disease begins with shivering, lassitude, headache, a frequent pulse, a hot dry skin, a flushed face, thirst, loss of appetite, and a furred tongue. Shortly after the appearance of the febrile symptoms the throat begins to feel irritable, and, on examination, is found to be red, and often more or less swollen. This redness becomes diffused over the interior of the mouth and the tongue. The rash on the skin begins in the form of minute red points, which soon become so numerous that the surface appears almost of a uniform red. It first appears on the neck and breast, whence it gradually spreads over the trunk and extremities. The reddened surface is smooth to the touch, and the colour temporarily disappears on pressure of the finger. The eruption, in ordinary cases, is persistent for three or four days, after which it gradually disappears, and is usually gone by the end of the seventh day. The cuticle then begins to scale off in small bran-like scurf, or in flakes of various sizes. Specimens of an almost entire epidermic covering of the hand or foot, forming a natural glove or slipper, are of common occurrence in our pathological museums; but it is comparatively seldom that such perfect moulting takes place. The desquamative process is hardly ever completed till at least five weeks from the commencement of the disease, and may last considerably longer. The fever does not abate on the appearance of the rash, but continues in a more or less decided degree till that has faded; it is often attended by delirium.

Scarlatina anginosa presents in addition to the symptoms above described much more severe affection of the throat, with great pain and swelling. The inflammation is very apt to spread from the throat to the nose and ears; to the latter it is very destructive, life-long deafness often resulting in the case of those who recover from the fever. Sometimes a form of inflammation resembling, if not identical with, diphtheria supervenes; in other cases inflammation and suppuration invade the glands or other tissues in the neck.

Malignant Scarlatina is so fatal a disease that its characteristic symptoms require a brief special notice. The rash comes out late and imperfectly, and sometimes is hardly perceptible; or, having appeared, it may suddenly recede; and sometimes it is intermixed with livid spots. The pulse is feeble, the skin is cold, and there is extreme prostration of strength. In such a case as this death may occur (apparently from blood-poisoning) in a few hours. Other cases rapidly assume a typhus-like character.

Besides the dangers connected with the severity of the fever, and the results of the throat affection, the chief risk arises from inflammation of the kidneys. It is uncertain whether they become affected in all cases; in many there is no evidence that they are. But there are none in which the risk of this complication is absent; and it

frequently supervenes in the mildest forms of the disease, if it has been unrecognised, or if due precautions have not been taken. It is essentially similar to catarrhal nephritis arising from other causes (see KIDNEYS), and may arise at any period till desquamation is completed, but most frequently in the second or third week of the disease. Rheumatic fever not unfrequently follows closely upon scarlet fever. Scarlet fever is rare in infancy and after thirty, most common between two and fifteen. But it is very apt to attack persons suffering from wounds and lying-in women exposed to the infection. It is common in Europe, whence it has been introduced into America and Australasia; but is rare in Asia, except Asia Minor, and Africa, except Algiers. In the tropical parts of these continents it is almost unknown: but in tropical America severe epidemics have often occurred.

Like all the exanthemata, scarlet fever occurs in epidemics; and nothing is more remarkable in the history of the disease than the extreme variations in severity in different outbreaks. Sometimes the mortality is almost nil; sometimes as many as 30 and 40 per cent. of those attacked succumb. It is undoubtedly caused by micro-organisms (see GERM), probably by streptococci, though this has not yet been conclusively demonstrated. It is very contagious; as, however, the contagium is given off chiefly in the discharge from the throat, &c., it is generally possible, if the patient can be isolated as soon as the disease is recognised, to prevent or greatly to limit its extension to others. On the other hand, the contagium retains its vitality with great persistence, and can be conveyed by letters, clothes, &c. Cases are on record where it has lain dormant in clothes for at least a year. Milk is a frequent vehicle for the disease; epidemics can often be traced to a dairy-worker, but it seems probable that milk may sometimes acquire its infectious properties from a form of disease affecting milch cows.

Treatment.—No specific is known which can cut short the disease; the feverish state must be treated on general principles, by rest in bed, diluents, &c.; and in simple cases little more is necessary. Severe local symptoms or complications must be met as they arise; bad sore throat by application of glycerin of carbolic acid, or some other antiseptic with a brush or as a gargle, by chlorate of potash lozenges, by poultices applied externally, &c. A severe case of scarlatina anginosa will test to the utmost the patience and resource of both nurse and doctor; while scarlatina maligna usually defies all their efforts. In ordinary cases it is of the greatest importance to guard against chills. The patient should be confined to bed for at least a fortnight, and to his room till desquamation is completed. This usually occupies about six weeks. The application occasionally of carbolised vaseline, or of olive oil with 10 per cent. of eucalyptus oil, prevents the diffusion of the infectious scales. Tonics, especially quinine and iron, are useful during convalescence. Strict isolation during the progress of the case, and careful disinfection afterwards, are absolutely essential. An anti-scarlatinal serum is sometimes used in severe cases.

In the early stage, before the appearance of the rash, scarlatina may be readily mistaken for several other febrile diseases. Even after the rash has appeared, the close resemblance between this and redness of the skin caused through irritation of the bowels as by an enema, through localised septic conditions as in quinsy, &c., often makes it difficult immediately to decide whether the patient should be isolated or whether this is unnecessary. The physician should give a very

guarded opinion as to how any special case may terminate.

The popular delusion that *scarlatina* is a mild and diminutive form of *scarlet fever* should always be corrected, as the error, if uncorrected, may do much harm by leading to a disregard of those precautions which are always necessary in this disease.

Scarlatti, ALESSANDRO, composer and teacher of music, was born at Trapani in Sicily in 1659, and is stated to have studied music under Carissimi at Rome. There too, at the court of Queen Christina of Sweden, he produced in 1680 his first opera; he remained in her service, probably, until 1688. After acting as musical director at the court of Naples from 1694 to 1703, he returned to Rome to take up the duties of musical director to the church of Santa Maria Maggiore; but two years later he went back to Naples. There he conducted, one after the other, the three musical conservatoria, and became the founder of the Neapolitan school of musical composition. He died at Naples on 24th October 1725. A man of untiring energy, Scarlatti worked as composer, teacher, director, and player, and wrote a vast number of works, including nearly 120 operas, 200 masses, 10 oratorios, 500 cantatas, and innumerable motets, madrigals, and similar pieces. But, although he was so prolific, he was not a careless composer; on the contrary, he was a master of counterpoint and a fertile inventor of melodies (see OPERA). See Life by E. J. Dent (1905). The most celebrated amongst his pupils were his son, Durante, and Hasse. This son, DOMENICO (1683-1757), early distinguished himself as a composer of church music, and lived successively in Rome, London, Lisbon, Naples, and Madrid. In the history of music he figures as a clever writer of sonatas for the pianoforte, and as the author of various technical improvements in the writing and playing of pianoforte music.

Scarlet Fever. See SCARLATINA.

Scarlet Runner. See BEAN.

Scarlett, OLD. See PETERBOROUGH.

Scarlett, SIR JAMES, BARON ABINGER, an English barrister and judge, was born in Jamaica in 1769, but sent to England to be educated. After graduating at Cambridge, from Trinity College, in 1790, he chose to follow law, and entered at the Inner Temple. His fine personal appearance, backed up by an excellent knowledge of his profession, and by a quiet unassuming manner, soon secured him a large practice, especially as his pleadings began to have an extraordinary weight with the juries. He took silk in 1816, and from that time held the front rank on the northern circuit and in the law-courts at Westminster. In 1818-31 he sat in parliament as member for Peterborough. Canning in 1827 appointed Scarlett Attorney-general, when he was also knighted. He held that office, except for fifteen months, till November 1830. In 1834 Sir James was raised to the bench as Lord Chief Baron of the Court of Exchequer, and took his seat in the House of Lords as Baron Abinger. He died 7th April 1844.—**SIR JAMES YORKE SCARLETT**, General, G.C.B., second son of the above, was born in 1799, educated at Eton and Cambridge, entered the army, and was colonel of the 5th Dragoon Guards (1840-53). He was sent to the Crimea in command of the heavy cavalry, which he led in their famous charge of 15th Oct. 1854. He afterwards commanded all the cavalry in the Crimea, and (1865-70) the Aldershot camp. He died in December 1871.

Scarpa, ANTONIA, anatomist (1747-1832), studied at Padua, and from 1783 to 1812 was professor at Pavia. He gained distinction by treatises on the anatomy of the nose, ear, and heart.

Scarpanto (anc. *Carpatho*), a long narrow island of the Dodecanese (q. v.), midway between Rhodes and Crete. It is 85 sq. m. in area, bare and mountainous. Pop. 7000.

Scarron, PAUL, the creator of French burlesque, was born at Paris in 1610, son of a counsellor of Parlement, of good family and fortune. His mother having died early, his father married again, and not happily for the children. The step-mother's dislike of Paul's epigrams forced him at fifteen to leave the house, but at seventeen he returned to Paris, became an *abbé*, and gave himself up to a life of pleasure. About 1634 he paid a long visit to Italy, and soon after his return began to suffer from that terrible malady which racked him with tortures, and ultimately left him completely paralysed in his limbs. A mythical story used to be told how that he had first caught his disease, hiding in a swamp from the populace of Mans scandalised at an *abbé* appearing tarred and feathered at the carnival; but, as he had been seized with his disease half-a-dozen years before he obtained a prebend in Mans (1643), it is much more likely he owed it to the excessive debaucheries of his youth. After trying one physician after another, and spending about three years of decorous comfort at Mans, he gave up all hope of remedy, and returned to Paris to depend upon letters for a living. From this time he began to pour forth endless complimentary epistles in verse, sonnets, madrigals, songs of drinking and of eating, and satires; in 1644 published *Typhon, ou la Gigantomachie*, a long jocose poem in five cantos describing the war of the Giants against the Gods; and next year made a still greater hit with his laughable metrical comedy, *Jodelet, ou le Maître Valet*, followed quickly by *Les Trois Dorothees, ou Jodelet souffleté* and *Les Boutades du Capitain Matamore et ses Comédies*—the last apparently never represented. The plots of these Scarron owed to the Spanish, and similarly the idea of his *Virgile Travesti* he borrowed from the Italian poet J. B. Lalli's *Eneide Travestita*. The first part of this famous work of Scarron's appeared in 1648; the whole included only eight of Virgil's books, and of these the first and fourth were translated into English, in all their coarseness and vigour, by a kindred spirit, Charles Cotton. In 1648 appeared also the popular comedy, *L'Héritier Ridicule*, which, it is said, the young king Louis XIV. liked so much that he had it performed twice in one day. During the struggle of the Fronde countless satires appeared against Mazarin, and one of the bitterest of these, entitled *La Mazarinade*, was ascribed to Scarron. On the cardinal's return to Paris in triumph the facile poet addressed him in terms of unmeasured flattery—'Jule, autrefois l'objet de l'injuste satire.' But he did not recover his pensions, although the famous Surintendant Fouquet made good the loss to the poor poet. Scarron was a consummate beggar, but he always did it like a humorist and without spleen or meanness. The exceptional sufferings of this 'living epitome of human misery' extenuate his ceaseless applications for relief, and the facility with which he accepted everything, money, books, a carriage, pies, poultry, puppies. His importunities were so jocular that they never estranged him from his friends, and he never lost his own kindness of heart, for we find him troubling his powerful friends for their good offices on behalf of others, as well as sheltering within his house two nuns thrown on the world through the bankruptcy of their convent—with one of these, Céleste Palaiseau, in earlier days he had been in love.

In 1651 appeared the first part of his famous work *Le Roman Comique* (2d part, 1657), intended as a reaction against the euphuistic and interminable

novels of Mlle. de Scudéry and Honoré d'Urfé, then at the height of popular favour. It describes the adventures of a troop of strolling players in the provinces, and, loose and ill-constructed as it is, has the one surpassing excellence of the creative faculty, of bringing before us real men and women. It inspired Gautier's not altogether superior *Capitaine Fracasse*; but more important still, gave the impulse out of which sprang the masterpieces of Le Sage, Defoe, Fielding, and Smollett. The third part, which bears the title of 'Suite d'Offray,' was not the work of Scarron. All three were translated into English by Tom Brown, Savage, and others, and an abridgment by Goldsmith was published posthumously. Other works of Scarron's that deserve mention are the comedies, *Don Japhet d'Arménie* and *La Précaution Inutile*; his *Nouvelles Tragicomiques*, from one of which (*Les Hypocrites*) Molière took the idea of Tartuffe; and the poem, *Relation des Parques et des Poètes sur la Mort de Voiture*, prefaced by a characteristically gay description of his own appearance and condition. Few men have had his sufferings, and fewer still his courage—'I hate no man, and could wish all the world had the same feelings for me; I am as blithe as a bird when I have money—and should be much more so were I in health; I am merry enough in company, and am quite happy when I am alone; I bear all my ills pretty patiently.'

The income he derived from his publisher—his 'Marquisat de Quinet'—his pensions, and the fruits of his dedications and his importunities enabled him to enjoy good living and to receive in the Hôtel d'Impécuniosité the visits of the greatest figures of the day in the world of fashion as well as letters. About 1650 he became filled with a desire to visit the islands of America, and actually journeyed as far as Tours in October—'I take my leave of burlesque verse, of comedies and comical romances,' wrote the brave-hearted cripple, 'to go to a happy climate, where there are no affected coxcombs, no canting rascals, no inquisition, no rheumatism to cripple any one, nor no confounded wars to starve me.' But this craze brought him to the strangest adventure of his life. One day a friend brought to his house a beautiful but penniless young girl of fifteen, Françoise d'Aubigné, who had been brought up at Martinique, and whose character remains one of the enigmas of history. The poet was enchanted with her, and in 1652 married her to save her from a convent. In the marriage contract, with characteristic buffoonery, he recognises her as bringing him a dowry of four louis, two large and very expressive eyes, a fine bosom, a pair of beautiful hands, and plenty of intelligence; while he on his part brought her immortality. 'The names of kings' wives die with them,' said he, 'that of the wife of Scarron will live for ever'—a strange prophecy, strangely to be fulfilled in the history of Madame de Maintenon. For eight years she waited on her poor husband with pious care, managed admirably his dubious finances, and brought an unknown decorum and refinement into his Bohemian household. Even his writings henceforward lose their grossness under that gentle influence; although indeed this can hardly be said of the earliest after the marriage, *Don Japhet*, which is prefaced by a dedication to the king, a masterpiece of begging without humiliation—'Sire, I will endeavour to persuade your Majesty it would not be very wrong to assist me a little, for if you did assist me a little I would be more jovial than I am; and if I were more jovial than I am I would write lively comedies; if I wrote lively comedies your Majesty would be amused by them; and if you were amused the money bestowed on me would not be lost. All this leads to such an inevitable conclusion that I

imagine I should be convinced by it if I were a great king instead of being what I am, a poor wretched creature.' Death came at last to relieve the sufferer in October 1660, but he saw it come with anguish; his greatest sorrow, to leave his poor young wife behind in destitution. For a heart beat warmly in that feeble and distorted frame, and in his dying words we feel a penetrating pathos hardly hidden under an effort of irony: 'If there be a hell I have nothing to fear from it, having endured it in this world.' The eight verses of his own epitaph irresistibly touch the heart. Dead, he could lay aside the mask, and confess all that he had borne in silence—'Passer-by, tread lightly here, take care not to awake him, for it is the first night that poor Scarron sleeps.'

There are editions by Bruzen de la Martinière (10 vols. 1737) and by Baume (2 vols. 1877); of the *Roman Comique*, by Victor Fournel (1857) and A. France (1881). See Christian's *Étude* (1841); Morillot, *Scarron et le genre burlesque* (1888); André Le Breton, *Le Roman au Dix-Septième Siècle* (1890); books by Boislisle (1894), Chardon (1904), and Magne (1905, 1923); and Jusserand's introduction to an edition of Tom Brown's translation of *The Comical Works of Scarron* (1892).

Scattery Island, an islet in the Shannon's estuary, 3 miles SW. of Kilrush, containing a fort, fragments of several small churches, and an ancient round tower 87 feet high. It was a sacred place in early Christianity—St Senan's retreat in the 6th century.

Scaup Duck. See POCHARD.

Scavenger's Daughter. See TORTURE.

Scawfell. See SCAPELL.

Scepticism (Gr. *skeptomai*, 'I consider') strictly denotes that condition in which the mind is before it has arrived at conclusive opinions—when it is still in the act of reflecting, examining, or pondering subjects of thought. Scepticism is therefore the opposite of dogmatism. The notion of 'disbelief' is quite a secondary meaning of the term. Among the Greeks a *skeptikos*, 'sceptic,' was a thoughtful, inquiring person. But inasmuch as the mass of men rush to conclusions with haste, and assert them with far more positiveness than their knowledge warrants, the discerning few of clearer vision are often brought into collision with popular beliefs—more especially in religion, the sphere in which popular beliefs are most numerous, most positive, and most inconsiderate—and are compelled, by the shock given to their reason, to 'doubt,' it may be to 'disbelieve' what is believed and affirmed by the multitude. Thus it is that in common parlance a sceptic has come to mean an infidel, and scepticism infidelity. But the field of thought in which scepticism properly so called exercised itself is not religion but philosophy. In philosophy too the word acquired a meaning different from doubt, or the negation of dogmatism; there was a distinct tendency on the part of those called sceptics to avoid coming to a conclusion one way or another. Philosophical sceptics in all ages and countries have not so much used doubt, like Descartes, as a philosophical instrument; they seem generally to have denied or at least doubted the trustworthiness of the senses as vehicles of absolute truth, and so have destroyed the very possibility of speculation. Pyrrho (q.v.) was the head of the first great school of professed sceptics; the Second Academy under Arcesilaus, and the Third under Carneades, were less thoroughly sceptical. The teaching of the Sophists (q.v.) was also sceptical in temper and tendency. In modern times David Hume represented advanced scepticism in philosophy (as well as in theology); and Kant's opposing philosophy, or a large part of it, has been made the foundation of

sceptical systems. The doctrine of the Relativity of Knowledge (q.v.) taught by Hamilton and Mansel may easily be pushed to a highly sceptical extreme. Comte's positivism is in the metaphysical sphere even dogmatically sceptical; in Secularism (q.v.) there is a scepticism of indifference towards all theological and religious doctrine; while Agnosticism (q.v.) may fairly be described as combining most of the characteristic features of philosophical and theological scepticism.

See the articles referred to above; the histories of philosophy; Green's *Introduction to Hume's works*; Balfour's *Defence of Philosophic Doubt*; and Rev. J. Owen's three works on the Sceptics (1881-93).

Sceptre (Gr. *skēptron*, 'staff'), originally a staff or walking-stick, hence in course of time also a weapon of assault and of defence. At a very early period the privilege of carrying an ornamental sceptre came to be connected with the idea of authority and station. Both in the Old Testament and in Homer the most solemn oaths are sworn by the sceptre, and Homer speaks of the sceptre as an attribute of kings, princes, and leaders of tribes. The sceptre was frequently an ivory truncheon pierced with gold or silver studs. The sceptre of the kings of Rome, apparently derived from Etruria, and afterwards borne by consuls, victorious generals, and emperors, was of ivory and surmounted by an eagle. The sceptre, which has varied much in form, has kept its place as a symbol of royal authority through the middle ages and down to the present time. The English Sceptre Royal, surmounted by a cross, is 2 feet 9 inches in length, and is of gold, richly adorned with precious stones. This is placed in the sovereign's hand at coronation. St Edward's staff, carried before the sovereigns at coronation, is of beaten gold, 4 feet 7½ inches long, with a foot or pike of steel, and the orb and cross at the top. There are also in the English regalia a king's sceptre with the dove, a queen's sceptre with the cross, the queen's ivory rod (the sceptre of the consort of James II.), and another found in 1814, presumably that of Mary, consort of William III. See REGALIA.

Schadow, a family of Berlin artists, of whom three must be named. (1) JOHANN GOTTFRIED SCHADOW, a sculptor, was born in Berlin on 20th May 1764, received his best training in Rome (1785 to 1788), and was, on his return home, appointed sculptor to the Prussian court, and in 1805 rector (in 1816 director) of the Academy of Arts. He died at Berlin on 27th January 1850. Among his most important works were the quadriga on the Brandenburg gate in Berlin, statues of Frederick the Great for Stettin, Blücher for Rostock, Luther for Wittenberg, numerous busts of great Germans, and monumental tombs to General Taubentzien and Von Arnim. He wrote some books dealing with his art. See his *Briefe und Aufsätze* (1864).—(2) RUDOLF, son of the preceding, born in Rome on 9th July 1786, died there on 31st January 1822, was trained as a sculptor by his father, and, following the example of his brother (see below), renounced Protestantism for Roman Catholicism. His best works were a Spinning-girl, Achilles and Penthesilea, John the Baptist, and Virgin and Child.—(3) FRIEDRICH WILHELM SCHADOW-GODENHAUS, second son of the first-named above, was a painter, one of the 'Nazarene' school, to which belonged Overbeck (q.v.), Schnorr, and Veit. Born in Berlin on 6th September 1789, he proceeded to Rome in 1810, studied there the works of the old masters, came under the influence of Cornelius, Overbeck, and their associates, went over to Roman Catholicism (1814), and executed two frescoes for Bartholdy's villa at Rome. In 1819 he was called to be professor of Painting at the Berlin Academy of Arts,

and in 1826 was appointed to succeed Cornelius as the head of the Düsseldorf school. He gathered round him enthusiastic pupils; indeed his gifts as a teacher were superior to his talents as a painter, although his 'Mignon,' the 'Wise and Foolish Virgins,' 'Heavenly and Earthly Love,' 'Heaven,' 'Purgatory,' and 'Hell' are admirable in their way. In 1859 he resigned the directorship of the Düsseldorf Academy, and on 19th March 1862 died in that town. He wrote *Über den Einfluss des Christenthums auf die bildende Kunst* (Düsseldorf, 1843) and an art romance, *Der Moderne Vasari* (1854). See Hübner, *Schadow und seine Schule* (1869).

Schafarik (*Szafarzik*), PAUL JOSEPH, Slavonic philologist and archæologist (1795-1861). See CZECHOSLOVAKIA (*Literature*).

Schaff, PHILIP (1819-93), Presbyterian theologian, born at Chur in Switzerland, was *privat-docent* in Berlin, when in 1843 he was called to a chair at the German Reformed seminary at Mercersburg, Penn. In 1869 he became professor in the Union Seminary, New York. A founder of the American branch of the Evangelical Alliance, he was president of the American Old Testament Revision Committee. Among his works are a *History of the Christian Church* (enlarged form 1882-94), *The Creeds of Christendom* (1877), *The Person of Christ* (1865), and a *Bible Dictionary* (1880). He also edited *The Religious Encyclopædia*, based on Herzog (1882-84), &c. See Life (1897) by his son, David Schley Schaff.

Schaffhausen, the most northerly canton of Switzerland, is bounded on all sides but the south by Baden. Area, 114 sq. m.; pop. (1870) 37,721; (1900) 41,514; (1920) 50,428, mostly German-speaking Protestants. The chief river is the Rhine, which forms the southern boundary, and within whose basin the canton is wholly included. The surface is hilly, especially in the north and east; of the many rich valleys that slope southward to the Rhine that of the Klettgau is famous for its fertility and for its wines. Agriculture is the principal branch of industry, while the forests prove an important source of revenue. The great council is the governing body; it embraces one representative for every 500 citizens, chosen for four years. The executive is in the hands of a ministry of five persons chosen by the people for four years. The actions of the government are controlled by the obligatory referendum. The canton is simply the territory belonging to the town, which joined the Swiss confederation in 1501.

SCHAFFHAUSEN, the capital of the above canton, is beautifully situated on the right bank of the Rhine, above the celebrated falls, 31 miles by rail WNW. of Constance. Overlooking the town stands the curious castle of Munot (1564-90), and this edifice, the cathedral (12th century), originally church of the Benedictine Abbey of All Saints, the Imthurneum (a concert and lecture hall), a library, a business exchange, and a museum are the chief buildings. The town is remarkable for the antique architecture and picturesque appearance of its houses. In the 13th century Schaffhausen was an imperial city. There is a statue to the Swiss historian Johannes von Müller, a native of the place. Pop. 20,000. The falls of Schaffhausen, about 3 miles below the town, form the grandest waterfall in the whole course of the Rhine (q.v.), and provide cheap turbine power for electric and other factories, which turn out iron and other metals, arms, oil, flour, beer, spirits, soap, candles, wool, cotton, and agricultural machines.

Schäffle, ALBERT EBERHARD FRIEDRICH (1831-1903), political economist of the historical or evolutionary school, was born at Nürtingen in

Württemberg, studied theology at Tübingen, and, after spending some time on the editorial staff of a newspaper, became professor of Political Economy at Tübingen in 1861, and in 1868 at Vienna. He had sat in the Württemberg diet, and in 1871 was for a short time Austrian minister of commerce. In that year he returned to Stuttgart, devoting himself to literary labours. His chief works are *Die Nationalökonomie* (1861; 3d ed. with a new title, *Das gesellschaftliche System der menschlichen Wirtschaft*, 1873), *Kapitalismus und Sozialismus* (1870), *Quintessenz des Sozialismus* (1874; Eng. trans. 1889), *Grundsätze der Steuerpolitik* (1880)—and that cited at POLITICAL ECONOMY. See his *Aus meinem Leben* (1905).

Schall, JOHANN ADAM VON, a Jesuit missionary to China, was born at Cologne in 1591, entered the Jesuit order in Rome in 1611, and was sent out partly in consequence of his knowledge of mathematics and astronomy to China in 1622. His fame as a scholar led to his being invited to the imperial court at Peking, where he was entrusted with the reformation of the calendar and the direction of the public mathematical school. The Emperor Shun-che, the founder of the Manchu dynasty (1644), showed him great honour and respect. Through this favour Schall obtained an edict for the building of Catholic churches and for the liberty of Christian preaching throughout the empire; and in the space of fourteen years the Jesuit missionaries are said to have made 100,000 converts. On the death of this emperor, however, a change took place; the edict was revoked, and Schall was thrown into prison and sentenced to death. He was afterwards liberated; but he was again imprisoned, and, at the end of a long incarceration, died August 15, 1669. He had acquired a perfect mastery of the Chinese language, in which he compiled numerous treatises upon scientific and religious subjects. A large MS. collection of his Chinese writings, amounting to 14 volumes in 4to, is preserved in the Vatican Library. In Latin he wrote a work *On the History of the Jesuit Missions in China* (Vienna, 1655).

See Mailly's *Histoire Générale de la Chine*, and Hue's *Le Christianisme en Chine*.

Schamyl. See SHAMYL.

Scharnhorst, GERHARD JOHANN DAVID VON, the organiser of the Prussian army, was born on 12th November 1756, at Bordenau, the son of a Hanoverian farmer. At twenty he entered the army of Hanover, and he took part in the campaigns in Flanders of the years 1793-95. In 1801 he transferred his services to Prussia and was appointed director of the training-school for Prussian officers. Five years later he was wounded at Auerstädt and taken prisoner at Lübeck, but released in time to be present at the battle of Eylau. In 1807 he began the great work of his life: he was put at the head of the commission for reorganising the armies of Prussia. He reformed the army, introduced the short-service (Krümper) system, and created a better spirit amongst both officers and men. It was principally by means of this new weapon that the great Napoleon was defeated at Leipzig six years later (1813). But before that event took place Scharnhorst was dead; he was wounded at Grossgörschen on 2d May 1813, whilst acting as chief of the staff of the Silesian army, and died on 28th June at Prague.

See *Lives* by Lehmann (2 vols. Leip. 1886-87) and Klippel (3 vols. Leip. 1869-71)—the former rather an account of his public work than a biography—and the *Erinnerungen* of Von Boyen (1891).

Scharwenka, XAVER (1850-1924), pianist and composer, was born at Santer near Posen,

and was trained at Posen and Berlin. After some concert tours as pianist, he opened his own conservatoire in Berlin in 1881. In 1891 he was invited to New York to direct a new conservatoire named after him, but in 1898 he returned to Berlin. Few of his compositions, except some *Polish Dances*, have survived. In 1922 he published an autobiography.—His brother, L. P. SCHARWENKA (1847-1917), was also a composer and teacher.

Schässburg. See SEGESVÁR.

Schaufal, RICHARD, German poet, was born at Brünn in 1874. He entered the Austrian civil service, and eventually became councillor in the Ministry of Justice at Vienna. He has made two collections of his poems (1909-1918, the second including some war poetry), has published many books on culture and æsthetics (*Ein Buch von Tod und Leben*; *Giorgione oder Dialoge über die Kunst*; *Literatur drei Gespräche*; &c.), as well as a characteristic novel *Leben des Herrn Andreas von Balthesser* (1907), and has translated much of the French symbolist poetry. Schaufal is one of the most important representatives of symbolism in German literature, and, though he never rises in his writings to the highest flights of genius, yet he never loses his cultured lyrical style.

Schaumburg-Lippe, a land of the German Reich, lying between Westphalia and Hanover. Area, 131 sq. m.; pop. (1925) 48,044. Agriculture is the chief occupation, though some coal is extracted. The people are mostly Lutherans. Capital, Bückeburg (pop. 6000). A member of the Lippe (q.v.) family founded the countship of Schaumburg in 1640. The head of this branch of the family assumed the princely title in 1807. A republic from 1918, the state adopted its present constitution in 1922.

Scheele, CARL WILHELM, chemist, was born on 19th December 1742, at Stralsund in Pomerania, then belonging to Sweden, and was apprenticed to a chemist at Gothenburg, and was afterwards chemist's assistant at Malmö, Stockholm, Uppsala, and Köping (at the western end of Lake Mälär), and died at Köping, 19th May 1786. His whole life was devoted, with the absorbing passion of the lover of science and of nature, to chemical experiment and investigation. And, although his apparatus was very primitive and his means limited, he made a great number of discoveries of the utmost importance for the advance of chemistry. He discovered hydrofluoric, tartaric, benzoic, arsenious, molybdiic, lactic, citric, malic, oxalic, gallic, and other acids. Chlorine, baryta, oxygen (1777), glycerine (1783), and sulphuretted hydrogen gas were all separated by him independently. He obtained the salts of manganese, and showed how manganese colours glass. The green pigment called Scheele's green, the arsenite of copper, derives its name from the chemist who first described it (see GREEN PIGMENTS), as does also the mineral scheelite or tungsten. He demonstrated in 1777 that the atmosphere consists chiefly of two gases, one, empyreal or fire-air (i.e. oxygen), supporting combustion, the other preventing it. This discovery of oxygen was made independently of Priestley's discovery three years before. In 1783 Scheele described prussic acid, which he proved to be the determining cause of the colouring matter in Prussian blue. He was a worker of wonderful accuracy, perseverance, and genius, and worked both analytically and synthetically. His papers were published in English by T. Beddoes (Lond. 1786), there being corresponding Latin, German, French, &c. editions; and in 1892 Baron Nordenskiöld published a number of his unedited letters and papers.

Scheer, REINHOLD VON, German admiral, was born in 1863 at Obernkirchen, Hesse-Nassau. At

the beginning of the Great War he commanded a battle squadron, and in 1916 was appointed commander-in-chief of the German High Sea Fleet, a command which he held at the battle of Jutland. For a short time in 1918 he was chief of the Admiralty staff, and shortly after the Armistice was placed on the retired list. He published *Germany's High Sea Fleet in the Great War* (Eng. trans. 1920). See TACTICS, WAR (GREAT).

Scheffel, JOSEPH VIKTOR VON, German poet, was born at Carlsruhe on 16th February 1826, and was educated at Heidelberg, Munich, and Berlin, to follow the law. But he always had a dislike to this pursuit, and after five years' work at it he gave it up. His interest was fixed upon the life of early and mediæval Germany, and his inclination towards literature was irresistible. As soon as he had shaken off the trammels of routine work, he hurried away to Italy and began to write. His first book, which he never surpassed, was *Der Trompeter von Säckingen, ein Sang vom Oberrhein* (1854), a tale in verse of the time of the Thirty Years' War, steeped in the spirit of German romance, as fresh in feeling as a May morning, and lightened with sly, genial humour; not the least charming features of the book are its many songs and the humorous reflections of Hiddigeigei the Tom-cat. Scheffel's second book, a prose story of the 10th century, *Ekkhard* (1855), telling how the young monk of Sankt Gallen fell in love with the Duchess of Swabia whilst teaching her to read Virgil, also enjoys extraordinary popularity. In 1867 Scheffel sent out *Gaudeamus*, a collection of songs and ballads, which are known to all German students, and sung everywhere throughout the Fatherland. Yet, curiously enough, Scheffel himself had no ear for music, and is said never to have been present at a concert in his life. His remaining books include two romances—*Hugideo* (1884), a tale of the 5th century, and *Juniperus* (1868), placed in the end of the 12th century, the era of the crusades and the heyday of chivalry—three collections of poems—*Frau Aventure, Lieder aus Heinrich von Ofterdingens Zeit* (1863); *Bergpsalmen* (1870), the visions of St Wolfgang, bishop of Ratisbon, seen in the solitude of his hermit's hut on the Salzburg Alps; and *Waldeinsamkeit* (1880), a dozen word-landscapes—and three or four short collections of posthumous *Gedichte* (1887–91). After his return from Italy Scheffel settled down in his native town, and died there on 9th April 1886.

See *Lives* by J. Prölss (1887; 1902), by Ruhemann (1886), and Sallwürk (1920); also the *Erinnerungen* by Zernin (1886) and by Dahn (1892).

Scheffer, ARY (1795–1858), painter, was the son of a German painter settled at Dordrecht in Holland, and was born there, studied under Guérin in Paris, lived mostly in France, and began his artistic career as a painter of genre pictures. Under the influence of the Romanticism of the early 19th century he produced numerous pieces illustrative of Goethe's, Byron's, and Dante's works, and also painted several portraits. Shortly after 1835 he turned to religious subjects. His pictures, characterised rather by an excessive sentimentality, have not stood the test of time. See *Memoir* by Mrs Grote (1860).

Scheidemann, PHILIPP, German politician, was born in 1865 at Kassel, was successively a printer, editor of a Socialist paper, member of the Reichstag (1903), and during the Great War leader of the (majority) Social-Democratic party. He was a member of the last imperial ministry of Prince Max of Baden (October 1918), of the provisional government of Ebert and Haase (November 1918), and from February to July 1919 was chan-

cellor of the first duly constituted Republican ministry. He refused to sign the Treaty of Versailles, and resigned. See his *Reminiscences, Der Zusammenbruch* (1920).

Scheldt (Lat. *Scaldis*, Dut. *Schelde*, Fr. *Escaut*), a river that rises in the French dept. of Aisne, flows north past Cambrai and Valenciennes, and, entering Belgium, passes Tournai, Oudenarde, Ghent, Dendermonde, and Antwerp, having received among other tributaries the Lys, Dender, and Rupel. Arrived opposite the island of South Beveland, it divides into two arms. The left or southern, called the Wester Schelde, flows south of the islands of Beveland and Walcheren, and meets the North Sea at Flushing; the northern or right arm, called the Ooster Schelde, passes to the north of the same two islands. The river is navigable to Cambrai, 211 miles from its mouth and 56 from its source. From the middle of the 17th to the end of the 18th century the Dutch monopolised the navigation of the lower Scheldt and levied tolls upon all foreign vessels sailing on its waters. When Belgium was separated from Holland in 1831 the Dutch reimposed slight dues, but abandoned them in 1863, for an indemnity paid in proportion to tonnage by the various nations that used the river. During the Great War, Holland, in virtue of her sovereignty over the lower Scheldt, closed it to the belligerents, but the divided command of the river was the source of much dissatisfaction to both Belgium and Holland. After negotiations a board of control for common management was established (1920), which stipulated that the Scheldt should be free, in event of war, for all nations up to Antwerp.

Schellenberg, a fortified height commanding Donauwörth (q.v.) on the Danube, and the scene of one of the early engagements in the war of the Spanish succession, in which the English took part, 2d July 1704, Marlborough defeating the Bavarians, with severe loss of life to his own troops.

Schelling, FRIEDRICH WILHELM JOSEPH (afterwards von Schelling), was born at Leonberg in Württemberg, 27th January 1775; studied theology and philosophy at Tübingen; then (1796) science and mathematics at Leipzig; began his career as a teacher of philosophy in the university of Jena in 1798 as successor to Fichte, from which time he was, with Fichte and Hegel, one of the pioneers of post-Kantian speculative thought. In 1803 he married Karoline (1763–1809), the divorced wife of A. W. von Schlegel (q.v.). From 1803 to 1808 he was professor at Würzburg; then until 1820 secretary of the Royal Academy of Arts at Munich; again professor at Erlangen until 1827, when he returned to Munich to the new university there; and was finally called in 1841 by Frederick-William IV. to Berlin amid great expectation of results from his long-promised final, positive philosophy. He died at the baths of Ragaz in Switzerland, 20th August 1854.

Schelling's significance consists not in his being the founder of a philosophical system, but in his having by the force of his genius and prolonged fervid activity lived into and through the speculative questions of his day, condensing them into profound intuitions and thoughts which not only excited others to systematic thinking, but entered into the philosophical development as landmarks of speculation. His manifold productions may be grouped around the leading ideas of three distinct periods, the first of which extends from 1797 to 1800, when Schelling was under the influence chiefly of Fichte, and embraces the so-called 'Philosophy of Nature' and 'Transcendental Philosophy'; the second culminates in the 'Philosophy of Identity,'

and falls between 1801 and 1803, Schelling's lights being then Spinoza and Boehme; the third and least valuable of the three represents the growth of what Schelling called his Positive (in opposition to the previous Critical or Negative) Philosophy, and may be traced as far back as 1809, when *The Inquiry into the Nature of Human Freedom* appeared. Schelling began as an adherent of Fichte's principle of the Ego as the supreme principle of philosophy: the Ego alone cannot be explained by anything outside itself; it posits itself and is conditioned only by itself—i.e. in its *form* and *matter* coincide; such are the ideas of his first production, *On the Possibility of any Form of Philosophy* (1795). In the next work, *On the Ego as Principle of Philosophy*, Schelling seems to make the transition to the Absolute Ego as the ground of the opposition between the Ego and Non-Ego, and thus arrives at the pantheism characteristic of the idealism of Fichte and Hegel. In the *Letters on Dogmatism and Criticism* (1796-98) he sets at naught Kant's arguments for the limitation of knowledge to phenomena, in laying claim to a 'secret wonderful faculty which dwells in us all' of beholding the transcendental ground of all reality, which he calls 'Intellectual Intuition'—a conception to be associated with the Reason or faculty of ideas of Spinoza and Kant and Plato, and with the intuition of the mystics. This notable doctrine, though resting on some basis of psychological experience (such, for example, as the 'Consensus Gentium' talked of in theistic proof or the 'Faith' of Jacobi), is apt to be either vague or presumptuous; the former as it hardly admits of exact definition, and the latter as it is apt to look like a claim to a private view of truth which may not be enjoyed by everybody.

In the *Philosophy of Nature* writings, and in *The World-Soul* (1797-99), we find Schelling supplementing the Fichtian doctrine of the Ego or Absolute Ego, by showing that the whole of Nature may be regarded as an embodiment of a process by which Spirit tends to rise to a consciousness of itself—that in fact we may supplement Subjective Idealism by an Objective Idealism in which Nature is seen to be the other pole of Spirit, slumbering or petrified intelligence. We might therefore say: 'I is everything, because everything is I.' Because of this affinity with Spirit that Nature has we may, thought Schelling, construct a 'Philosophy of Nature'—i.e. we can say what Nature is prior to actual empirical research—and we find him trying to explain Nature by a logical manipulation of such opposites as Self and Not-Self, attraction and repulsion, and such principles as polarity, excitability, light, &c. The *System of Transcendental Idealism* (1800), one of the most important of Schelling's works, speaks of the two fundamental and complementary sciences, Transcendental Philosophy and Speculative Physics, which together constitute the whole of knowledge; the one starts with the Subjective and shows how the Objective belongs thereto, while the other shows how the Objective must become Subjective. Schelling about this time edited two journals, the one for *Speculative Physics*, and the other (with Hegel) the *Critical Journal of Philosophy*, which not only contain some important articles of his own, but express at a stage of white heat the movement of thought which can only be said to culminate in the stupendous system of Hegel. It is easy to see in the *Transcendental Idealism* the germs of the 'Philosophy of Identity.' If either Spirit or Nature conduct us to the unity which Philosophy seeks, the metaphysical ground of Being may be viewed as a supra-sensuous Identity that is above all difference: the Absolute as the unity of the Ideal and the Real is higher than

either Spirit in itself or Nature in itself, and Spirit Philosophy and Nature Philosophy merge in Identity Philosophy, the theory of the One which is above dualism and multiplicity. Following Spinoza, Schelling teaches (*Method of Academical Study*, 1803; Bruno, 1803, &c.) that it is only the imagination and the reflecting Understanding which cause us to separate things or conceive them separately; Reason beholds all things in their totality or oneness; the Absolute is not only the unity of all contradictions, but the unity of unity and itself unendingness. We here see the roots of the Dialectic or Logic of Hegel, who, however, is careful to avoid, as the grave of thought, a mere formal identity (i.e. to say that the Absolute is that which is one with itself is to say practically nothing about it) and to set forth a unity which is concrete (i.e. a unity in which all variety persists and is not lost). Schelling differs though from Spinoza in keeping the process of development strongly to the fore as indeed the truth of the world ('In the beginning was the *Act*,' in Goethe's words), a most valuable side of his philosophy, linking it through disciples of his with the tremendous development of the historic method in the 19th century; and again in tending to make *Spirit* the chief factor in the world process. In the Identity Philosophy Schelling repeats a good deal of the Natural Philosophy, and the weakest part of his system (only possible in the infancy of science) is his partly rational and partly fantastical and merely verbal construction of nature in the so-called *a priori* way.

The fact that Schelling could never describe to himself his Absolute save in the most formal way left his mind open to the influence of mystical speculation; he could never think exactly to himself how the finite arose out of its dark, infinite background, a question with which he occupied himself in the *Investigations into the Essence of Human Freedom*. The promised Positive Philosophy which was to advance beyond merely negative or critical philosophy came to be simply the philosophy of Mythology and Revelation. What Schelling objected to in the philosophy of Hegel was its attempt to extract all out of the Idea or Reason; there must be thought be something like Will, or Tendency, or Process to account for the illogical and finite aspect of some things, a fact which turned his mind to Nature as the forefront to Spirit, and connects his philosophy with the strange system of Schopenhauer, which is a pantheism of the Will, as Hegel's philosophy may be called a pantheism of the Idea, and Schelling's of the Spirit. It was in keeping with the mystical character of Schelling's mind that he should look forward to a Johannine church of the future rising over the ruins of Petrinism and Paulinism.

A full account of Schelling will be found in any of the larger histories of Philosophy, such as those of Erdmann (Eng. trans. by Hough, 3 vols. 1889) and Kuno Fischer. Morell, in his *History of Modern Philosophy*, is largely influenced throughout by Schelling, and gives, of course, an account of him. See also Watson's *Schelling's Transcendental Idealism* (Grigg's Classics, Chicago, 1883); A. Seth (Pringle-Pattison), *Kant to Hegel*; Frantz, *Schellings Positive Philosophie*; Hartmann, *Studien u. Aufsätze*; D. Marheineke, *Criticism of Schelling's Philosophy of Revelation* (1843); Pfeiderer, *Philosophy of Religion*, vol. ii.; works on Schelling by Noack (1859), H. Becker (1875); and the biographical *Aus Schellings Leben: in Briefen*, ed. by Plitt (3 vols. 1870).

Schemnitz (Slovak *Ban Stiavnica*, Magyar *Selmeczbánya*), an old and famous mining town of Czechoslovakia, stands in a narrow mountain gorge, 65 miles N. by W. of Budapest. Together with Dilln it has 13,000 inhabitants, mostly Slovaks. The academy for mining and forestry, embracing collections of minerals and a chemical laboratory,

is the principal building; there are also two castles and a pilgrimage church. A highly-esteemed tobacco-pipe is manufactured here and exported to America. The mines have been worked since Roman times, and produce gold and silver, copper and lead. The families of the miners make lace. Tobacco and violin strings are also made.

Schenectady, a city and county-seat of New York, on the Barge Canal and the south bank of the Mohawk River, 15 miles by rail NW. of Albany. It is the seat of Union College (1795; since 1873, in virtue of the affiliation to it of law and medical schools at Albany, Union University), has some fine public buildings, and contains important electrical and locomotive works, stove-foundries, factories, &c. Schenectady was settled by the Dutch in 1661. In 1690 the place was burnt, sixty inhabitants massacred, and ninety carried off by French and Indians. Pop. (1900) 31,685; (1920) 92,786.

Schenkel, DANIEL (1813-85), born at Dägerlen in Zürich, was appointed professor of Theology at Heidelberg in 1851. In his youth almost orthodox, he became a champion of ecclesiastical liberalism. Among his works were *Das Wesen des Protestantismus* (1846-51), *Der Unionsberuf* (1855), *Christliche Dogmatik* (1858-59), and *Charakterbild Jesu* (1864), an attempt to construct the human character of Jesus and entirely eliminate the supernatural.

Scherer, EDMOND-HENRI-ADOLPHE, French critic, was born in Paris in 1815, of Swiss and English extraction. During his two years' residence in England with a dissenting minister, the Rev. Thomas Loader of Monmouth, Scherer acquired a knowledge of the English language, which he turned to excellent account in his subsequent career as a literary critic. After studying literature and law in Paris he went in 1836 to Strasburg, where he qualified himself for the ministry of the Protestant Church. Professor of Exegesis in the Oratory at Geneva (1845), he was closely associated with Vinet in his advocacy of a severance between church and state, expounding his views in *La Réformation au XIX^{me} Siècle*, a journal of which Scherer himself was editor. Gradually he drifted away from his early faith, and in 1850 he was finally expelled from the church. For the next ten years he still lived in Geneva, mainly occupied in religious controversy. In 1860 he left Geneva for Paris, where he at once found ample scope for his powers in literary and political criticism. Besides being a regular contributor to *Le Temps*, he was also correspondent to the *Daily News*. In 1871 he was elected representative for the department of Oise-et-Marne, and attained considerable distinction as a practical politician. He died in Paris, 16th March 1889.

His distinctive character as a critic lies in his combination of the qualities of the trained thinker and scholar with a keen susceptibility to the most diverse products of creative effort. His defects appear in a certain lack of elasticity and flexibility, partly due to his early training and partly to a naturally rigorous cast of mind, which disposes him to undue severity where he cannot sympathise.

See *Edmond Scherer*, par Octave Gréard (1890), and the Introduction by Saintsbury to Scherer's *Essays on English Literature* (1891). Scherer's chief works are *Mélanges de Critique Religieuse*; *De l'État actuel de l'Église Réformée en France*; *Alexandre Vinet et ses Œuvres*; *Études Critiques sur la Littérature Contemporaine* (9 vols.); *Mélanges d'Histoire Religieuse*; *Melchior Grimm*.

Scherzo (Ital., 'jest,' 'sport'), a movement of a lively and sportive character, forming part of a symphony, sonata, or the like. Beethoven developed it out of the minuet.

Scheveningen, an ancient Dutch fishing-village on the North Sea, about two miles from the Hague, with which it is connected by a beautiful avenue through pine woods. It was first visited as a bathing-resort in 1818, and has now become the most fashionable watering-place in Holland. There are numerous villas, hotels, promenades, &c., with a large Kurhaus. Pop. 27,000. Off Scheveningen the Dutch fleet was defeated, and its admiral Tromp killed by the British under Monk on 8-10th August 1653.

Schiaparelli, GIOVANNI VIRGINIO (1835-1910), born at Savigliano, Piedmont, was head of Brera observatory, studied meteors and double stars, and discovered the canals of Mars.

Schickele, RENÉ, German writer, was born at Oberehnheim in Alsace in 1886, was educated at the Gymnasium and University of Strasburg, and lived first in Paris, then in Berlin. He has published poems, *Der Ritt ins Leben* (3 vols. 1906), and a later volume of selections, *Mein Herz, mein Land*, and many novels, including *Meine Freundin Lo*, *Das Glück*, and *Aissé*, the latter dealing with a journey in India. After the Great War Schickele turned his attention to the drama, and produced *Am Glockenturm*, *Menschliche Gedichte und Krieg*, *Genfer Reise*, &c. For his vivacity of writing and depth of intellect, he has been called the greatest Alsatian poet since Gottfried von Strassburg. His novel, *Ein Erbe am Rhein* (1926), the first part of a trilogy, has been placed among 20th-century Germany's highest achievements in imagination. He is an exponent of Expressionism (q.v.).

Schiedam, a town in South Holland, on the Schie, 2½ miles W. of Rotterdam, and close to the Maas. It is known the world over as the place where Hollands gin is made, but in diminishing quantity. Large numbers of pigs and cattle are fed on the refuse grain in the surrounding country. There is a large shipping trade, some shipbuilding, candle-making, and cooperages. Pop. 43,000.

Schiehallion. See PERTSHIRE, and MASKELYNE.

Schiller, FERDINAND CANNING SCOTT, philosopher, was born in 1864, was educated at Rugby and Balliol, Oxford, taught philosophy at Cornell University, and since 1897 has been a tutor at Corpus Christi College, Oxford. His chief books are *Riddles of the Sphinx* (rev. ed. 1910), *Humanism* (enlarged ed. 1912), *Studies in Humanism* (2d ed. 1912), *Formal Logic* (1912), and *Problems of Belief* (1924). He has associated himself largely with the pragmatism of William James, besides interesting himself in eugenics and psychology. The article PRAGMATISM deals with Schiller's special contribution to the subject.

Schiller, JOHANN CHRISTOPH FRIEDRICH VON, German poet and dramatist, was the son of an army surgeon, a man of deep religious feeling and strict conscientiousness. His mother was a woman of gentle disposition, true humility and piety, and some poetic feeling. Fritz was born at Marbach on the Neckar on 10th November 1759, and inherited the distinguishing traits of both his parents. He was brought up amid the vine-clad hills of Marbach, beneath the ancestral castle and monastery of the Hohenstaufens at Lorch, and at Ludwigsburg, the Versailles of the Dukes of Württemberg. Besides learning Latin and Greek at the grammar-school of Ludwigsburg, Schiller was carefully educated, especially in religious matters, by his father, whose ambition it was to make him a pastor. But destiny in the person of Duke Carl Eugen decreed otherwise. This Württembergian imitator of the 'Grand Monarch,' who set up to be the father of his people, established in

1773 a school at his castle of the Solitude, near Ludwigsburg, for the purpose of training army officers and servants for the public service. Captain Schiller, who was at that date superintendent of the ducal forests and gardens around the Solitude, was given to understand that the duke wished to enrol his clever son Fritz amongst the first pupils of his new institution. Accordingly the boy turned to law instead of to theology; and at the ducal school (moved to Stuttgart in 1775) was kept under a rigid discipline, partly military, partly monastic. About 1776 Schiller, tired of law, which he never liked, threw it up for medicine, which he liked very little better. It was not long after this that, principally through reading Klopstock's *Messias*, he became conscious of his own poetic powers. From the first he conceived a decided fancy for tragedy; and now, instead of studying medicine, he spent most of his time in reading and writing poetry and tragedies, although both occupations were strictly forbidden by the duke. In philosophy also he took a more than ordinary interest, and this taste remained with him to the end of his days. The duke was very proud of his clever *protégé*, and on 14th December 1779, in the presence of Goethe and Duke Carl August of Weimar, was delighted to bestow upon him three medals for excellence in his medical studies; for Schiller had at last worked hard to qualify himself for leaving the Carl's School, and so becoming master of himself.

Exactly one year after Goethe's visit Schiller left school, and was appointed surgeon to a Württemberg regiment. One month later (13th January 1782) his play *Die Räuber*, begun in 1777, was put on the stage at Mannheim. People took their seats at noon, five hours before the performance began, and the piece made a tremendous sensation—being full of the revolutionary sentiments with which the air was charged previous to the outbreak of the French Revolution. Young Schiller had breathed the spirit of such 'storm and stress' productions as Goethe's *Götz*, and the ideas of the eccentric C. F. D. Schubart; moreover he had drunk deeply at the wells of Plutarch's hero-worship and Rousseau's overwrought sentimentalism. The play itself, however, in spite of the gravest faults—gross crudities, improbabilities, exaggerated and unreal sentiment, inflated and bombastic diction—literally throbbed with energy and passion, and contained many passages of remarkable tragic force. Schiller himself was present at the performance; but because he quitted Stuttgart a second time without his ducal leave Carl Eugen had the aspiring dramatist arrested, and on his release forbade him both to write plays and to leave Württemberg. This treatment Schiller's pride, as writer and as man, would not brook; so on the night of 22d September he fled from the capital in disguise, and under an assumed name (Dr Ritter). He lay concealed at Mannheim and at Oggersheim, and latterly on Frau von Wolzogen's estate of Bauerbach near Meiningen. In that quiet retreat he finished two more plays, *Die Verschwörung des Fiesco zu Genua* and *Kabale und Liebe*. The structural idea of the former, Schiller's first historical play, printed in 1783, is that of nearly all his historical works, a revolt against some constituted authority that has degenerated into tyranny and become an enemy of freedom. The latter (1783) is a protest, dramatically a more successful work than *Fiesco*, against the tyrannies of social convenience, involving an attack upon the court life of the typical German ruler of the epoch.

On 1st September Schiller was appointed dramatist to the Mannheim theatre, and thought he had reached his port. But at the end of the year the engagement was not renewed; neither intendant,

nor dramatist, nor actors were satisfied one with another. Thus Schiller was again thrown on his own resources; and from the time he left Stuttgart until he settled in Weimar he was always in debt and always struggling with narrow means. One of his plans of self-support was the issue of a sort of theatrical journal, *Die Rheinische Thalia*, begun in November 1784, and written almost entirely by his own hand. In this journal were first printed most of his *Don Carlos*, many of his best poems (e.g. *An die Freude*), and the stories *Verbrecher aus Verlorener Ehre* and *Der Geisterseher*. In 1785 he resolved to depart from Mannheim, and to accept a warm invitation from a circle of admirers in Leipzig, which included, he found, Götschen the publisher (grandfather of the English statesman) and Körner, father of the poet.

Schiller had not been without his love affairs: he had known the pangs of jealousy in connection with Frau von Wolzogen's daughter, he had paid suit to Margareta Schwann, the publisher's daughter in Mannheim, and he had been half fascinated by Charlotte von Kalb, perhaps the most remarkable woman of her generation in Germany. At Dresden, where Körner was living, Schiller found the rest he so much needed, rest from emotional excitement and rest from pecuniary worries. And this rest, which he owed in great part to Körner's generosity, he turned to good account. He finished *Don Carlos* (1787), which may be called his first mature play, in that the enthusiasm is more chastened, the language more sober and disciplined, the plot better elaborated, and the knowledge much ripper. Nevertheless it suffers artistically from its excessive length, from its inherent lack of unity, and more especially from the shifting of the interest from Carlos to the Marquis Posa. The play was written in blank verse, as being more appropriate to the dignity of the subject; and besides embodying Schiller's ideas of a perfect political society, it presents a most noble type of the true friend of man in Posa. From the day he first saw Körner he shared with him nearly all his thoughts, and continued to do so after he left Dresden and became intimate with Wilhelm von Humboldt and Goethe. Amongst the finest fruits of his discussions with Körner and his circle are the poems *An die Freude* and *Die Künstler*. Under the stimulus of the same society he went back to his old love philosophy, and at the same time began to study history in a serious and systematic way. After two years in Dresden something of the old restlessness took possession of him again, caused in part by another unhappy love affair (with Henriette von Arnim), and he thought to allay it by a visit to Weimar and elsewhere. But of Weimar and its court circles the truth-loving poet soon grew tired—Goethe and Duke Carl August were both absent at the time. Nevertheless he stayed on awhile, finding society in Charlotte von Kalb, in Herder, and certain of the professors at Jena near by. One of these, Reinhold (Wieland's son-in-law), brought Kant to his notice; and Schiller steeped himself in the thoughts of the Königsberg recluse with his usual ardour, though he greatly modified Kant's system ere he adapted it for his own use. About the same time he met his future wife, Charlotte von Lengefeld; and, getting some hints of a possible chair at Jena, he resolutely bent his mind to the writing of a work of more practical value, and began his history of the revolt of the Netherlands. In the end of 1788 he was appointed to a professorship at Jena, and, being further granted a small pension by the Duke of Saxe-Weimar, he married Lotte von Lengefeld. In order to meet the responsibilities entailed by these changes Schiller worked terribly hard, so hard in fact that he eventually broke down his health.

Besides lecturing, he wrote a number of minor papers and the greater work, the history of the Thirty Years' War. These productions are not of course the outcome of a prolonged or exhaustive course of special studies; but they rank high amongst German historical writings by virtue of their great merits of style, the warm human interest the writer has breathed into them, and the broad philosophic ideas that form their life and substance.

Towards the end of the year 1792 Schiller was agreeably surprised by the offer, brought about chiefly by his admirer, the Danish poet Baggesen, of a free gift of 3000 gulden from the Duke of Augustenburg and his friend Count Schimmelmann. The first use the now invalid poet made of his freedom was to finish the Thirty Years' War, and his next to pay a visit to his old father and mother, whom he had not seen for eleven years. In the year of this visit (1793) he began the *Briefe über die ästhetische Erziehung des Menschen*, letters of noble and weighty import concerning the function of art as the supreme educative agent. At this period, in the irony of circumstances, it came into the heads of the French revolutionists to nominate Schiller (M. Gille) an honorary member of the republic, a distinction which, although himself a man of democratic sentiments, he spurned with horror on learning of the execution of the king. The diploma of citizenship took five years to reach him (1798).

The year 1794 is in some respect the most important in the whole course of Schiller's life: he made the acquaintance of Fichte, he formed an intimacy with Wilhelm von Humboldt, and began his wonderful friendship with Goethe. He was introduced to the great poet at his future mother-in-law's house in the summer of 1788; but for a while they were both distant and reserved, and it was only in the course of a chance conversation at Jena in the summer of 1794 that they discovered common ground of sympathy. The ice once broken, however, they soon drew together; the dreamer and idealist and the man of universal human interests had both worked their way from entirely opposite starting-points to pretty nearly the same conclusions. Both regarded art as the crowning-stone of human culture, as in fact the best practical religion, and both thought and wrote in the spirit of that conviction. The year 1794 is marked in Schiller's career by two other events: he composed the essay *Ueber Naïve und Sentimentale Dichtung*, in which the respective characters of ancient (classic) and modern poetry were for the first time clearly defined and discriminated; and he started the magazine *Die Horen*, which died after a precarious existence of three years. But it gave birth to the much more celebrated *Xenien* (1797), a collection of satirical epigrams, written by Schiller and Goethe conjointly, and aimed at all who, in their estimation, did not pay fit and proper reverence to Art, and its object Beauty. Schiller's intercourse with Goethe had reawakened his poetic instincts, and he once more began to write poems, at first pieces of a reflective and lyric character, principally for his annual *Der Musenalmanach* (another bread-winning project), such as *Die Macht des Gesanges*, *Die Ideale*, *Würde der Frauen*, *Der Spaziergang*, and so forth, and later, mostly in his garden-house at Jena during the years 1797 and 1798, the matchless ballads (*Kraniche des Ibykus*, *Der Handschuh*, *Der Taucher*, *Ritter Toggenburg*, &c.) that in the estimation of many constitute his principal contribution to literature, and that certainly make him the favourite beyond all other poets of the German people. And, under the same stimulus, he went back to the drama, and spent many a long night on the finishing of *Wallen-*

stein (1798-99), in spite of the fact that every hour's writing cost him several hours' suffering. This play (embracing the trilogy *Wallenstein's Lager*, *Die Piccolomini*, and *Wallenstein's Tod*), which Carlyle declares to have been 'the greatest dramatic work of which the 18th century can boast,' is in every way a remarkable advance on *Don Carlos*. It is built on a wider and truer estimate of human nature, displays a juster conception of the limits and possibilities of dramatic composition, and attains a happier, loftier harmony of the poetic and dramatic ideals; and, especially on account of the magnitude and masterly arrangement of the action, the character of Wallenstein, and the pathetic love-story of Max Piccolomini and Thekla, ranks as one of the greatest, if not the very greatest, of all plays in German literature.

In 1799 Schiller settled in Weimar—he had never lectured since 1793—in order to be nearer the theatre and close to Goethe, whom he zealously supported in his efforts to elevate the German stage into an influential engine of culture. In quick succession he finished *Maria Stuart* (1800), *Die Jungfrau von Orleans* (1801), *Die Braut von Messina* (1803), and *Wilhelm Tell* (1804). The first named, whilst not exactly answering the expectations of the English reader, is nevertheless an admirable drama. Mary, the heroine, is represented as an erring, but repentant and lovable woman, whose character shines out all the more beautiful from contrast with her cold and selfish cousin, Elizabeth; and the play contains several fine passages, descriptive and dramatic. *Die Jungfrau* is artistically one of Schiller's most successful performances; Joan of Arc, the principal character, is drawn as a lovely and innocent maiden inspired with the spirit of the prophetic—a deeply religious and ideally beautiful conception well carried out. *Die Braut von Messina* was confessedly an experiment, and, it is universally admitted, an unsuccessful experiment, at combining the ancient and the modern ideals of dramatic excellence, more especially by the introduction of the chorus as the principal supporter of the action. *Tell*, however, is a noble piece of work, in spite of some technical defects (principally the lack of a central character and of a progressive concentration of the dramatic interest). All the *dramatis personæ* are thoroughly human and are cleverly put before us, and there are many fine descriptions of Swiss landscapes; but the finest thing of all is the unquenchable spirit of freedom that pulses in every line. This was the last drama Schiller lived to finish, though he left others in various stages of completion, *Warbeck* and *Demetrius* being the most advanced. His health, long enfeebled, finally and suddenly broke down; he died on the 9th May 1805, still a comparatively young man, in the prime of his intellectual activity.

Schiller's life was one long struggle against pecuniary difficulties, greatly aggravated at times by the most uncongenial surroundings, and latterly by ill-health. Yet through all he remained true to himself and to his high calling. He pressed ever strenuously forward along the path of knowledge and self-culture, and his literary career is an advance from crude elemental strength to finished and matured art. Personally, in spite of the drawbacks and hindrances of his outward situation, his character and conduct were of the noblest: he made it his constant end, deliberately chosen, to try and carry out in his own daily life the loftiest ideals he believed in, and strove to 'live like a man whom the world would be sorry to lose.' The key to his speculative ideas, especially with respect to art, is contained in the high and reverential regard he paid to moral beauty. That is the chief cornerstone of his æsthetic creed and of his principles

of action. He had an enthusiastic admiration for what is noble and grand and magnificent, and this passion enters into the structure and substance of nearly all his writings. Two other great qualities ring through his works, an incorruptible love of truth and a lofty spirit of freedom. His poetic strength lay in a peculiar blending of moral and intellectual force. As a lyric poet he can hardly be accounted as of the first rank: he lacked not only the spontaneity but also the immediate insight and sympathy with the actual world, and the living men and women in it, that in so eminent a degree distinguished his greater friend and contemporary Goethe. As a dramatist, however, he undoubtedly stands first of the Germans, and must justly take a high rank amongst the dramatic writers of the world.

Standard complete editions are those of Goedeke (17 vols. 1867-76), Kurz (9 vols. 1868-69), and Boxberger (8 vols. 1882). The older biographies, the best of which was that of Palleske (1859), have been superseded by the works of R. Weltrich (1885 *et seq.*), Otto Brahm (1888 *et seq.*), Jakob Minor (1890 *et seq.*), and K. Berger (1905 *et seq.*). See the Life by O. Harnack (1905), books on Schiller's philosophy by Überweg (1884) and Fischer (1891), on his aesthetics by Montargis (1890), and on his poetry by Basch (1902), the last two being in French. See also Hecker and Petersen, *Schiller's Persönlichkeit: Urtheile der Zeitgenossen* (1904-09), and Walter von Molo's *Schiller Roman* (1913-15) forming a trilogy, more a biography vivified by imagination than a novel. Schiller's *Briefe* (1846) and his Correspondence with Goethe, Körner, W. von Humboldt, Schlegel, Fichte, his wife and her sister contain abundance of biographical matter. In English there are Lives by Carlyle (1825), Bulwer-Lytton (1844), Nevinson (1889), and Lee (1905), and various translations, including versions of poems by Bulwer-Lytton and Arnold-Foster, and Coleridge's *Piccolomini and Wallenstein's Death*. See also Robertson, *Schiller after a Hundred Years* (1905); and Rea, *Schiller's Plays in England* (1906).

Schilling, JOHANNES, German sculptor, was born at Mittweida in Saxony, on 23d June 1828, and was trained in Dresden and Berlin. In 1853 he went to Italy, having won a three years' travelling scholarship. In 1863-1906 he was a professor of the Academy of Fine Art in Dresden, where he had been settled since his return from Italy. His first great work was the four groups of the Seasons for Dresden; for that city he also executed monuments of Rietschel the sculptor and King John of Saxony, and the colossal Dionysus and Ariadne in bronze for the Royal theatre. His masterpiece is the national monument of Germania on the Niederwald (q.v.), commemorative of the war of 1870-71. Besides numbers of frescoes and similar ornamental works, he also turned out monuments of Schiller (for Vienna) and the Emperor Maximilian (for Trieste), and a war memorial for Hamburg. He died, blind, in 1910.

Schimmelpenninck, MARY ANN, was born in Staffordshire, 25th November 1788, the daughter of a Quaker manufacturer named Galton. After her marriage in 1805 to Mr Lambert Schimmelpenninck, she lived at or near Bristol; in 1818 joined the Moravian body; and, having suffered from paralysis since 1837, died at Clifton in August 1856. Her nine works, published between 1813 and 1860, include two on Port Royal, a *Theory of Beauty*, *Sacred Musings*, and an *Autobiography*.

Schinkel, KARL FRIEDRICH, a German architect, was born at Neuruppin in Brandenburg, March 13, 1781, and studied the principles of drawing and design at Berlin. In May 1811 he was elected a member of, and in 1820 a professor at, the Berlin Royal Academy. He died October 9, 1841. The designs to which he chiefly owes his reputation are those of the Museum, the Royal Guard-house, the Memorial of the War of Liberation, the New

Theatre, the New Potsdam Gate, the Observatory, the Artillery and Engineers' School, all in Berlin, the Casino in Potsdam, another at Glienicke near Potsdam, and a great number of castles, country-houses, churches, and public buildings. His designs are classic in feeling, noble, harmonious, and dignified. He also excelled as a painter, and as a designer of monuments and of furniture. His designs and sketches were published in *Sammlung architektonischer Entwürfe* (174 plates, 1857-58), *Werke der höheren Baukunst* (25 plates, 1873), *Grundlage der praktischen Baukunst* (2 vols. 1835), and *Sammlung von Möbelentwürfen* (16 plates, 1852). See Life by Kugler (1842), by Quast (1866), and by Dohme (1882).

Schinus, a genus of trees and shrubs of the family Anacardiaceæ, natives of South America. The leaves so abound in a resinous or turpentine-like fluid that upon the least swelling of the other portions of the leaf by moisture it is discharged from the sacs which contain it. Thus they fill the air with fragrance after rain, or if thrown into water start and jump about as if alive, discharging jets of this peculiar fluid. A sort of honey and also a kind of vinegar is made by the Peruvians of the red berries of *Schinus Molle* (Peruvian mastic; also called False Pepper-tree, though not akin to the peppers), and they also make a vinous drink from it by boiling. A resinous gum exudes from the stem which is of the nature of mastic. The fresh bark of *S. terebinthifolius* is employed by the Brazilians to coat newly-made ropes with, to which it gives a very durable dark-brown covering. It is said to be dangerous to sleep under its shade, causing painful swellings.

Schipka. See SHIPKA.

Schipperke (Flemish, 'little skipper'), the name of a breed of dogs belonging to the same group as the Eskimo and Pomeranian dogs, but with almost no tail. They are favourites of the Belgian barges, and from them have derived their name.

Schism, ecclesiastical division in a church or separation from a church; as also the tendency to promote such division. The Great Schism or Greek Schism is the separation of the Greek Church (q.v.) from the Latin: the temporary Western Schism is dealt with at ANTIPOPE, POPE.

Schist (Gr. *schistos*, 'split') is a term properly applied to crystalline rocks with a foliated structure (see FOLIATION), as mica-schist, hornblende-schist, &c. Indurated clay-rocks with a fissile structure are sometimes erroneously described as schists. For the schistose rocks, see PETROGRAPHY and GEOLOGY.

Schizomycetes ('fission-fungi'), a botanical term for Bacteria. It refers to their commonest mode of reproduction—by transverse division. The term Schizophyte is also synonymous with Bacteria. The advantage of the term Schizomycetes is its harmony with similar terms—Saccharomycetes, Zygomycetes, Ascomycetes, &c.—applied to other sets of fungoid plants. See BACTERIA, and Bergey's *Manual of Determinative Bacteriology* (Baltimore, 1923).

Schlaf, JOHANNES, German novelist and dramatist, was born in 1862 at Querfurt, Prussian Saxony, but since 1904 has lived in Weimar. With Holz (q.v.) he published a collection of short stories, *Papa Hamlet* (1889), but thereafter wrote alone, turning to a kind of mystic symbolism in his prose lyrics such as *Frühling*, then to 'intimate psychological' drama such as *Die Feindlichen*, then to a series of naturalist novels, including *Der Kleine*, *Am toten Punkt*, and collections of short stories, *Tantchen Mohnhaupt* and *Miele*. His *Fall Nietzsche, eine Überwindung* is remarkable.

Schlagintweit, the name of five brothers who all distinguished themselves as travellers or as writers on sciences allied to geography. Three of them—**HERMANN VON SCHLAGINTWEIT**, born at Munich on 13th May 1826; **ADOLF**, born at Munich 9th January 1829; and **ROBERT**, born on 27th October 1833—worked for the most part in company, and in the same departments of inquiry. Hermann and Adolf first made themselves known as investigators of the physical geography of the Alps, through two books—*Untersuchungen über die physikalische Geographie der Alpen* (1850) and a continuation, *Neue Untersuchungen* (1854). Shortly after the publication of the last named Wilhelm von Humboldt got them, along with Robert, recommended to the British East India Company, who sent them out to India to make observations on terrestrial magnetism, to measure mountain altitudes, and carry on meteorological and geostonic investigations. They spent nearly two years and a half in executing their commission, and in the course of it traversed great part of the Deccan, and crossed the main chains of the Himalayas, and penetrated into Tibet. Hermann also made his way alone into Sikkim and Assam, and then in company with Robert explored parts of Ladakh, and crossed, the first of all Europeans, the Kuen-Lun Mountains, for which feat Hermann was in later years nicknamed 'Sakünlinski.' Adolf in the meantime examined the geological structure of the Nilgiris in the south, explored parts of Balti in western Tibet, and in the summer of 1857 crossed the Karakorum and Kuen-Lun Mountains and reached Yarkand; there, however, he was seized by Yakub Beg, emir of East Turkestan, and put to death on 26th August. Hermann on his return to Europe settled down to private life, and gave his energies chiefly to the publication of scientific papers. He died at Munich on 19th January 1882. Robert was in 1863 appointed professor of Geography at Giessen, where he died on 6th June 1885. The Schlagintweits' travels in India are recorded in their *Results of a Scientific Mission to India and High Asia* (4 vols. Leip. 1860-66). During two long journeys through the United States in 1869 and 1880, Robert gathered materials for works on the Pacific railways (1870, 1884, 1886), California (1871), the Mormons (1877), &c.

A fourth brother, **EDUARD**, born on 23d March 1831, took part in the Spanish invasion of Morocco of 1859-60 and wrote an account of it. He was killed in the battle of Kissingen, fighting in the Bavarian army, on 10th July 1866. **EMIL**, the fifth brother, born 7th July 1835, chose law for his calling, and the study of Tibetan and Indian languages for his amusement during leisure hours. He wrote *Buddhism in Tibet* (1860), *Die Könige von Tibet* (1865), *Die Gottesurteile der Inder* (1866), and other books, and died 29th October 1904.

Schlagenbad, one of the best-known spas of Germany, in the Rheingau district, stands in a beautiful wooded valley of the Taunus Mountains, 5 miles W. of Wiesbaden. The water (82°-90° F.) is of the character called 'indifferent,' is used for the most part externally, in baths, and is helpful in nervous diseases, for women's complaints, and for purifying the skin. The place gets its name from a harmless snake (*Coluber flavescens*) which is found there.

Schlegel, **AUGUST WILHELM VON**, German critic, poet, and translator, was born at Hanover on 8th September 1767, and began to study theology at Göttingen, but, like his younger brother, Friedrich (see below), soon turned to literature, writing poems for two magazines edited by the poet Bürger, and later for Schiller's *Horen*, and contributing to the *Göttinger Gelehrte Anzeigen*

and other periodicals. In 1795 he settled in Jena, and in 1796 married a widow lady, Caroline Böhmer (1763-1809), the clever, restless daughter of Professor Michaelis, who separated from him in 1803, and at once married Schelling. In 1798 Schlegel was appointed professor of Literature and Fine Art in that university; and the years 1801-4 he spent in Berlin, lecturing on the subjects he had taught at Jena. The greater part of the following fourteen years he lived in the house of Madame de Staël at Coppet on the Lake of Geneva; the chief incidents that mark this period of his life were the delivery of *Lectures on Dramatic Art and Literature* (Eng. trans. 1815) at Vienna in 1808, and his officiating as secretary to the Crown-prince of Sweden during the war of liberation (1813-14). In 1818 he was appointed professor of Literature in the university of Bonn, a post he filled down to his death there on 12th May 1845. He had already, years before going to Bonn, done what has proved to be his best work: gifted with considerable feeling for poetic form and much fine taste, he translated into German verse most of the works of Shakespeare, and followed up the success he thereby achieved by publishing admirable translations of Dante, Calderon, Cervantes, Camoens, and other foreign masters of literature. The translation of Shakespeare, afterwards revised and continued by Tieck, is still the classic German version. Along with his brother Friedrich he enjoyed great influence throughout Germany as one of the most active leaders of the Romantic movement, his critical papers in *Das Athenaeum* and in the volume of *Charakteristiken und Kritiken* (1801) being greatly valued in their day. In Bonn he devoted his attention principally to Indian studies, and issued editions of the *Bhagavad-Gita* and the *Ramayana*. Heine attended his lectures at Bonn, and learned from him many of the secrets of poetic workmanship; for A. W. Schlegel's own poems, lifeless and cold as they are, show no little finish as to form. Heine's picture of the vain old dictator of letters coming to lecture to his class is worth quoting: 'He wore kid gloves and was dressed after the latest Paris fashion; he still had about him the perfume of elegant society and *eau de mille fleurs*; he was the *beau-ideal* of elegance and politeness, and when he spoke of the English Lord of the Treasury he always began with the words "My friend." Beside him stood his servant, dressed in the grand livery of the noble house of Schlegel; his business was to snuff the wax candles in the silver candlesticks that stood, along with a glass of sugared water, on the desk before him, the "genius of the age." His inordinate self-esteem, and the unwarranted influence he enjoyed, led him to pass severe censure upon the literary work of men like Schiller, Wieland, and Kotzebue, and involved him in unseemly polemics. Apart from this feature, his judgment as a critic in matters of pure literary taste makes his lectures still worthy of consideration, especially the set already named and another series, *Ueber Theorie und Geschichte der bildenden Künste*, delivered at Berlin in 1827. His writings were published in three separate collections—*Sämmtliche Werke* (12 vols. Leip. 1846-47), *Œuvres écrites en Français* (3 vols. 1846), and *Opuscula quæ Latine scripta reliquit* (1848).

See the books quoted under **FRIEDRICH SCHLEGEL**; the letters of his first wife, edited by Waitz under the title *Karoline* (3 vols. 1871-82); and Mrs Alfred Sidgwick's *Caroline Schlegel and her Friends* (1889).

Schlegel, **FRIEDRICH VON**, German critic and writer, was born at Hanover on 10th March 1772. After receiving a classical education at Göttingen and Leipzig, he took to his pen for a livelihood. He abducted the wife of the Jewish merchant Veit

(a daughter of Moses Mendelssohn and mother of Veit the religious painter), thus putting into practice views as to free love which he enounced in a notorious romance, *Lucinde*. He then joined his brother August Wilhelm at Jena, and along with him wrote and edited the journal *Das Athenaeum*, in which they laid down the characteristic principles or features of Romanticism (q.v.). His zeal for these principles was so strong that he has ever been accounted the head of the Romantic school. With him too Friedrich wrote *Charakteristiken und Kritiken* (1801), a set of longer critical essays, which gave a real stimulus to good work in German literature and contain some of both brothers' best writing. Friedrich Schlegel at length sought relief for his romantic yearnings, and refuge from the harsh realities of actual life, by becoming a faithful son of the Roman Catholic Church. From 1808 down to his death, which occurred during a lecture-tour at Dresden on 11th January 1829, he was employed in the public service of Austria. It was he who penned the proclamations of that empire against Napoleon in 1809. The best known of his books, at least in Britain, are lectures on the *Philosophy of History*, first delivered at Vienna in 1827 (Eng. trans. 1835), and *History of Literature*, delivered at Vienna in 1814 (Eng. trans. 1859); both are clever, but one-sided, the Roman Catholic tendencies of the writer being too strongly pronounced. There are also English versions of his *Philosophy of Life* (1847) and *Lectures on Modern History* (1849). The book the Germans esteem most highly of his is *Ueber Sprache und Weisheit der Indier* (1808), which was a pioneer for the study of Sanskrit in Europe. The best edition of his *Sämmtliche Werke* is Feuchterleben's (15 vols. Vienna, 1846).

See his *Briefe an A. W. Schlegel* (1889); Haym, *Die Romantische Schule* (Berlin, 1869); G. Brandes, *Den Romantiske Skole i Tydskland* (Copenhagen, 1873); and J. W. Scholl, *Friedrich Schlegel und Goethe* (1906).

Schleicher, AUGUST, philologist, was born at Meiningen on 19th February 1821, studied at Leipzig, Tübingen, and Bonn, and began to lecture on comparative philology at the last-named university in 1846. Four years later he was called to the chair of Slavonic Languages at Prague. From 1857 to 1868 he lived at Jena as an honorary professor; and there he died on 6th December 1868. With him the comparative study of the Indo-Germanic languages took a decided step forward. In his *Kompendium der vergleichenden Grammatik der indogermanischen Sprachen* (1861; 4th ed. 1876; Eng. trans. 1874-77) he showed clearly the relations of the members of the group, not only one to another, but of each to the original parent language, which he made a gallant attempt to reconstruct, and laid down the phonetic laws that had governed their respective developments. Schleicher did first-rate service also in advancing the scientific study of the Slavonic family of tongues and the Lithuanian language; for instance, in the *Handbuch der litauischen Sprache* (1857). Further labours were embodied in *Die Sprachen Europas* (1850), *Die deutsche Sprache* (1860; 5th ed. 1888), *Indogermanische Chrestomathie* (1869), and *Litauische Märchen und Lieder* (1857). There is a Memoir by Lefmann (1870).

Schleiden, MATTHIAS JAKOB, botanist, was born at Hamburg, 5th April 1804, studied law at Heidelberg, practised at Hamburg as advocate, but in 1833 went to Göttingen and devoted himself to the study of physiology and botany. In 1839 he was called to the chair of Botany at Jena, and in 1863 at Dorpat. In 1866 he retired. He died at Frankfurt, 23d June 1881. He contributed greatly to establish the cell-theory (see CELL); and of

his numerous works, including two collections of poems, books on materialism, the sense of sight, the age of man, a *Life of Linnæus*, &c., the most important is his *Grundzüge der wissenschaftlichen Botanik* (1842-43; Eng. trans. *Principles of Scientific Botany*, 1849). See BOTANY.

Schleiermacher, FRIEDRICH ERNST DANIEL, was the founder of that modern theology which seeks to understand Christianity without doing despite to the reasonable convictions of the human mind. What marked him out as reformer was first and foremost his mental constitution, in which a profoundly religious temperament was happily blended with an acute intelligence, and an unhesitating independence of thought and feeling with an exceptional susceptibility to the most various impressions from without. Then he was fortunate in having his various gifts developed by the course of his education and the experiences of his life.

He was born on the 21st November 1768 at Breslau, the son of an army chaplain belonging to the Reformed confession. The pious atmosphere of his home awakened vivid religious feelings in the boy, which attained fuller growth at the Moravian educational institutes of Niesky and Barby, where he studied from 1783 till 1787. But deep as was the impression made upon him by the godliness of social life amongst the brethren, the narrow and rigid dogmatic form of religion as taught by them was simply intolerable to the eager mind of Schleiermacher, already leavened by the wisdom of classical antiquity; and he felt that he could no longer profess this faith without a lie against his own nature. There was a painful conflict of opinion between him and his rigorously orthodox father ere the son forsook the theological seminary of Barby to study philosophy and theology at Halle. Of the philosophers it was mainly Plato, Spinoza, and Leibniz, and afterwards also Kant, Fichte, and Schelling, who made a permanent impression on him and moulded his mental development. A powerful influence was also exerted from 1797 onwards by the intimacy into which, now a preacher in Berlin, he was drawn with the devotees of Romanticism (q.v.). He thoroughly sympathised with that cultus of personal feeling and that contempt for mere intellectual *Aufklärung* which the romanticists carried to an extreme; but he was saved from the excesses of the romanticists by the anchor which his character had found in personal piety, and by the scientific prudence and breadth that came of his constant study of philosophy, ancient and modern. To this first sojourn in Berlin belong the earliest of those publications which made Schleiermacher known to the learned world: the *Reden über Religion* (1799), the *Monologen* (1800), and the ethical work, the *Grundlinien einer Kritik der bisherigen Sittenlehre* (1803). In these he expounded in scientific form that hostility to the traditional moral philosophy and the Kantian ethic of the categorical imperative to which he had already (1801) given audacious expression in the 'Confidential Letters on Schlegel's *Lucinde*,' where he attempted a defence of the notorious romance of his friend Friedrich Schlegel. A more valuable undertaking was the translation of Plato, which the two friends set about jointly, but which was ultimately carried through in 1804-10 by Schleiermacher alone. This work, epoch-making for the comprehension of Plato's philosophy, was in great part the fruit of the involuntary idleness imposed upon the translator by Napoleon, when in 1806 he closed the university of Halle, at which since 1804 Schleiermacher had been extra-ordinary professor. Returning to Berlin, he entered into close relations with Stein and Humboldt, with the philosopher Fichte, and with other patriots; and he took an active share in all the efforts which were

being made to bring about the moral regeneration and the political restoration of the German Fatherland, especially of Prussia. One scheme with this aim was the establishment of the new Frederick-William university of Berlin, in which Schleiermacher took part; and in the theological faculty of this university he became professor in 1810. The fame of his academic lectures on all branches of theology and philosophy attracted yearly increasing crowds of enthusiastic students; and as preacher at the *Dreifaltigkeitskirche* he exercised a profound religious influence by his sermons, both on hearers and readers. Equally influential were his labours in the sphere of church politics; he was the soul of the movement which led to the union in 1817 of the Lutheran and Reformed Churches in Prussia; and it was not his fault that his far-sighted proposals for the preparation of a new constitution and forms of ritual suited to the wants of the united church were not adopted. His resolute bearing in these controversies was the more to his honour, inasmuch as it made him so unpopular with the government that for years he ran the risk of losing his university chair.

Yet all these public labours—some of them trying and ungrateful—could not prevent the indefatigable scholar from devoting concentrated energy to the advancement of learning. The outcome of these studies was on the one hand short essays which were published in the transactions of the Berlin Academy; and on the other the theological works *Die Weihnachtsfeier* (1806); a critical treatise on the first epistle to Timothy (1807); *Kurze Darstellung des theologischen Studiums* (1811); and finally his most important work, *Der christliche Glaube nach den Grundsätzen der Evangelischen Kirche im Zusammenhang dargestellt* (1821). He died 12th February 1834; and after his death friends published several other works from his manuscripts or from notes of his lectures taken by students. Of these the most important are *Die christliche Sitte* (1823), *Leben Jesu*, Sermons, a work on Dialectic, and a sketch of a system of Ethics. A collection of letters, of great importance for understanding Schleiermacher's very singular personality, was edited by Dilthey in four volumes (1860-64), and in 1910 Braun and Bauer published a selection from his works in four volumes. A multitude of larger and smaller books and articles dealing with the man and his work appeared on occasion of the centenary of his birth, 1868. In 1825 Thirlwall published a translation of his *Essay on St Luke*; his *Introduction to Plato's Dialogues* was translated into English by Dobson in 1836; and a volume of *Selected Sermons* was issued in England in 1890.

Schleiermacher has been for theology what Kant was for philosophy. Kant submitted the theoretical and practical reason to a critical analysis, in order to distinguish the primordial and perennial laws of thought and will from the ever-changing sensations which supply the materials of experience. In like manner Schleiermacher undertook a critical analysis of religion, in order to discover what in it was the original essence and what were the derivative forms. Dogma, he taught, is not religion, but a statement about religion which is the product of reflection; religion itself is feeling, the immediate sense of our dependence on the divine source of all things, on God. But devout feeling, though the inmost part of individual life, is not itself merely individual; the individual man is conditioned by the community he belongs to, and the mode in which that community experiences the religious emotion, in a manner common to its members, rests on and is conditioned by the historical and fundamental fact of the establishment of the community. In

this fact we may recognise a 'revelation,' inasmuch as a creative religious personality communicates to others its own peculiar religious feeling, its consciousness of God. Every historical religion rests in this sense on a revelation, on the communication of the original religious life of creative personalities, such as could not be thought out *a priori* or deduced from universal truths. This is especially true of Christianity, which is peculiarly a *positive* religion, one to be realised through experience, inasmuch as it has for its very centre the relation to the historical person of Jesus Christ as the redeemer; and by this fact all statements of doctrine as to God and the world and mankind must be regulated. The Christian church recognises that it has received 'Redemption'—liberation and strengthening of the consciousness of God heretofore trammelled by nature—as the influence of the person of Christ, and that it continues to receive the same by means of the spirit of the church, which has proceeded from Christ. From this experience the church is led upwards to its cause in the person of Christ, and for that reason believes in the typical perfection of Christ; this distinguishes Christ from all other men, yet without abrogating his true humanity. Similarly our faith in Christ rests only on that quickening of the pious disposition which we experience through and from him, and which in a sense is common to us with him. But this faith is independent of all historical reports of miraculous events that took place in him or by him. It is not because of the Bible and its miracles that we believe in Christ; it is because of Christ, whose influence we experience in our consciousness of redemption, that we believe in the Bible. That is, we ascribe to the Bible a normative dignity, as containing a substantially true picture of Christ; while it must not, however, prevent us from submitting its story in detail to the same critical tests as we apply to all historical traditions whatsoever. Schleiermacher did not expressly deny all miracle; but he laid down the general principle that it is not to the advantage of piety to hold, in the case of any single events, that their connection with the order of nature is interrupted by their dependence upon God. His general conception of the relation of God to the world, of the mutual correspondence of the infinite with the many finite causes (which approximates very closely to Spinoza's view), excludes the possibility of miracles in the fully supernaturalistic sense of the word. In this reference Schleiermacher has avoided and superseded alike supra-naturalism and rationalism, by emphasising Christian experience, and insisting on the historical character of the Christian religion in the person and influence of Christ. He has interpenetrated theology with philosophical idealism by taking as its basis the human self-consciousness. On the other hand, he set philosophy free from the un-historical individualism and rationalism which had clung to it even in Kant's hands by widening the religious and ethical consciousness into the social consciousness of the community; in the common consciousness of ethical beings he discovered reason historically developing itself, and saw in the individual reason no more than the special form of manifestation, the organ which is but its servant. By means of his dogmatics and his ethics Schleiermacher did more than any other thinker to solve the great problem—the reconciliation of the individual with the community, of private conscience with the claims of historical tradition.

See Lichtenberger, *History of German Theology in the Nineteenth Century* (1873; Eng. trans. by Hastie); Pfleiderer (author of the above article), *Development of Theologie Since Kant* (1890); Bender, *Schleiermacher's Theology* (1876-78); the Life by Dilthey (1870), the Study by Fischer (1899), and books in English by R. Munro (1903) and W. B. Selbie (1913).

Schleswig. See SLESWICK.

Schlettstadt, a town of Lower Alsace (Bas Rhin), on the left bank of the Ill, 27 miles by rail SSW. of Strasburg. It manufactures wire-gauze. In the 13th century it was made a free imperial town, and in the 15th was chosen by Agricola as the seat of a higher school that greatly helped to foster humanistic studies; Erasmus was a pupil. In 1634 the town became French; it was fortified by Vauban in 1676. The Germans, after capturing the town in 1870, razed the fortifications. Here Martin Bucer (q.v.), the Reformer, was born. The French call the town *Sélestat*, or *Schlestadt*. Pop. 10,000.

Schliemann, HEINRICH, the excavator of the sites of Troy and Mycenæ, was a native of Mecklenburg-Schwerin, born at Neubuckow on 6th January 1822. Whilst working in a merchant's office and afterwards trading on his own account in St Petersburg, he acquired a knowledge of the principal languages of modern Europe and of ancient Greek. Having in the meantime become possessed of a large fortune, he began in 1870 to explore and excavate at his own cost the ruins of Hissarlik in the Troad (Asia Minor), and continued the work for twelve years. Schliemann maintained that it was the site of ancient Troy (q.v.). For carrying off, contrary to his agreement with the Turkish government, all the spoils he unearthed, he was compelled, through a judgment of the Greek courts, to pay the Ottoman Porte the sum of £2000. But he retained possession of his collections, and in 1882 presented them to the German nation; they are now preserved in the Ethnological Museum at Berlin. In 1876 Schliemann commenced, in like manner, to excavate the site of ancient Mycenæ in Greece; and there he discovered invaluable treasures (now in the Polytechnic at Athens), and exposed buildings of great antiquity and interest (see MYCENÆ). He also carried on explorations in the island of Ithaca (1869 and 1878), at Orchomenus (1881-82), and at Tiryns (1884-85). The results of his labours are described in the monographs on *Mykenæ* (1877; Eng. trans. 1877); *Ilios*, with an autobiography of the author, and notes, &c. by Professors Virchow and Max-Müller (1880; Eng. trans. 1880); *Orchomenos* (1881); *Troja* (1883; Eng. trans. 1883); *Tiryns* (1886; Eng. trans. 1886); and *Bericht über die Ausgrabungen in Troja im Jahre 1890* (1891). He wrote also *Ithaka, der Peloponnes, und Troja* (1869); *Trojanische Alterthümer* (1874); and *Reise in der Troas* (1881). Schliemann died at Naples on 27th December 1890, and was buried at Athens. See Dr Schuchhardt's *Schliemann's Ausgrabungen* (1890; Eng. trans. 1891), and his own *Selbstbiographie* (1891).

Schlosser, FRIEDRICH CHRISTOPH, a German historian, born at Jever in Oldenburg, 17th November 1776, was educated at Göttingen, and, after spending many years as a private tutor and academic teacher, was (1819) called to Heidelberg as professor of History, and died there, 23d September 1861. Schlosser's ideal of the historian's art was ethical: he wrote neither from the literary standpoint, nor yet from the critical, but from the moral. Yet he is not uncritical; for he exercised the critical intelligence of a widely-read historian with a stern love of truth. His books had great influence with the middle classes of Germany. There are German Lives by Gervinus (1861) and O. Lorenz (1878).

Schlüsselburg, a town and prison-fortress of Russia, the fortress being on a rocky islet in the Neva where it issues from Lake Ladoga, and the town on the right bank of the river. Here the de-throned Tsar Ivan VI. was murdered by authority,

after twenty-three years' imprisonment in this and other fortresses.

Schmalkalden, an old town of Hesse-Nassau, Prussia, stands 19 miles SW. of Gotha, is surrounded with double walls, contains the town-house in which the historic 'articles' were signed. There are saline baths. Pop. 10,000. It is the birthplace of Karl Wilhelm (1815-73), composer of 'Die Wacht am Rhein.'

LEAGUE OF SCHMALKALD, a defensive alliance concluded at Schmalkalden on 4th April 1531 between nine Protestant princes and eleven imperial cities, with whom other princes and imperial cities subsequently made common cause. The Elector of Saxony and the Landgrave of Hesse were appointed chiefs of the league. The object of this formidable alliance, which included nearly all the Protestant states from Denmark to Switzerland, was the common defence of the religion and political freedom of the Protestants against the Emperor Charles V. and the Catholic states. The confederation was consolidated by the *Articles of Schmalkald*, drawn up by Luther at Wittenberg in 1536. A conflict was of course inevitable. In the war of Schmalkald that ensued (1546) when the emperor got leisure to turn his attention to the matter the strength of the Protestants was crippled and dissipated by jealousies, but especially by the defection of Duke Maurice of Saxony, so that in the battle of Mühlberg (24th April 1547) the Elector of Saxony (the head of the elder branch of the Saxon house, Duke Maurice being the head of the younger branch), Philip of Hesse, and other Protestant chiefs were taken prisoners and their army routed. This caused the league to break up. The Protestant cause was, however, revived five years later by Duke Maurice, who had in the meantime been made Elector instead of his unfortunate kinsman, and who in 1552 returned to his old allegiance to Luther's teaching.

Schmiedel, PAUL WILHELM, born near Dresden in 1851, studied at Leipzig and Jena, taught at Jena, and became professor of New Testament studies at Zurich in 1893. An 'advanced' theologian, he wrote on many of the New Testament books, especially the Gospel of St John and the Apocalypse, and on the person of Jesus (*Jesus in Modern Criticism*, 1907). He re-edited Winer's Grammar of New Testament Greek, and contributed to many of the important theological serials and encyclopædias.

Schmitz, LEONHARD (1807-90), studied at the university of Bonn. His translations of Niebuhr and his own manuals of ancient history gave him standing in England, where he settled. He edited the *Classical Museum* for some years, and was a large contributor to the *Penny Cyclopædia* and Smith's *Dictionaries of Greek and Roman Antiquities*, of *Biography and Mythology*, and of *Geography*. He translated Zumpt's *Latin Grammar*, and edited a popular series of Latin class-books for W. & R. Chambers. In 1846 he became Rector of Edinburgh High School, and in 1866 head of the International College at Isleworth.

Schnapper, or SNAPPER, a highly-esteemed food-fish of the Sea-bream family, frequenting rocky shoals on the coasts of southern Australia and of New Zealand. Old examples have a fleshy nose and a bony protuberance behind the head.

Schneeberg, a town of west Saxony, 20 miles SW. of Chemnitz, producing lace, embroidery, and a kind of snuff made of aromatic herbs, reputed as a remedy for cold in the head.

Schneekoppe, the highest point (5260 feet) of the Riesengebirge (q.v.).

Schneidemühl, capital of the Grenzmark in Prussia, 150 miles NE. of Berlin, with important glass and other manufactures, a deaf and dumb asylum, a catholic seminary, and a population of 38,000.

Schneidewin, FRIEDRICH WILHELM (1810-56), classical scholar, born at Helmstedt, and was educated at Göttingen, where he became professor in 1837. He edited a delectus of Greek poetry, wrote on the Greek lyric poets; but his great works were editions of Martial and Sophocles.

Schnitzer, EDUARD, better known as **EMIN PASHA**, was born of Jewish parents at Oppeln in Silesia, on the 28th of March 1840, and removed two years later to Neisse. He studied medicine at Breslau and Berlin. He settled in practice in Turkey, and had till 1873 an appointment at Scutari. He gained an intimate acquaintance with Armenia, Syria, and Arabia, and adopted the name of Emin and the habits and customs of the Turks. In 1876 he entered the Egyptian medical service as Dr Emin Effendi, and was appointed by Gordon Pasha chief medical officer of the Equatorial Province, and in 1878 its governor, which position he held until the arrival of Stanley's expedition in 1889. In 1879 he was raised to the rank of Bey, in 1887 to that of Pasha. In December 1889 Emin Pasha arrived at Zanzibar with Stanley. He met with an accident there from which he nearly lost his life, but instead of going back to Europe entered the service of the German government, and returned at the head of a large expedition to central Africa. He was energetic in extending the German sphere of influence, made favourable treaties with native chiefs, and founded German stations on Lake Victoria; besides sending large zoological and ethnographical collections to Berlin. But he never regained his old influence, and seems, defeated in his hopes, to have been marching for the west coast when, apparently on the 23d October 1892, he was slain by the Arabs at Kinena, 100 miles E. of Stanley Falls.

An extraordinary linguist, a skilful medical man, an able administrator, cut off from all communication with the outside world, he maintained his position single-handed at the farthest outpost of civilisation. Emin gained a wonderful insight into the habits and customs of his people, and added enormously to our anthropological knowledge. His meteorological investigations made Lado the standard of reference for all barometrical observations in East Equatorial Africa. His route surveys extend over more than 4000 miles, and he made a triangulation survey of the country from Lakes Victoria and Albert in the south to Lado in the north, to the river Djur in the north-west, to Mombuttu and the river Welle in the south-west. Between 1878 and 1883 eleven geographical papers of extreme value were published by him in *Petermann's Mittheilungen*. An intelligent and painstaking collector, he elucidated the distribution of the flora and fauna of central Africa, made valuable collections and cultivation experiments. He collected numerous and valuable vocabularies.

Emin Pasha was no military genius, but he proved himself to be an enlightened ruler, and managed to abolish slave-dealing throughout his province. He constantly endeavoured to civilise the people committed to his charge, and in this he succeeded to a very large extent.

See Stuhlmann, *Mit Emin Pascha ins Herz von Afrika* (1894); Vita Hassan, *Die Wahrheit über Emin Pascha* (1893); *Emin Pasha in Central Africa: his Letters and Journals* (trans. by Mrs Felkin, 1888); Stanley, *In Darkest Africa* (1890); Casati, *Ten Years in Equatoria with Emin Pasha* (trans. 1891); and the standard Life

by G. Schweitzer, *Emin Pasha: his Life and Work* (trans. 1898).

Schnitzler, ARTHUR, German writer, was born 15th May 1862 in Vienna, a physician's son, and himself graduated in medicine in 1885. From *Anatol* (1892; adapted in English by Granville Barker) and *Liebelei* (1896) on he wrote many one-act plays and some longer ones, depicting the frivolous society of Vienna in light yet brilliant satirical verse. Of later plays *Der grüne Kakadu*, *Professor Bernhardt*, *Fink und Fliederbusch*, *Die Schwestern* deserve separate mention. Besides comedy of manners, Dr Schnitzler has been successful in the novel and tale, as in *Der Weg ins Freie*.

Schnorr von Carolsfeld, BARON JULIUS, painter, was born at Leipzig on 26th March 1794, and was trained as a painter by his father (likewise an artist) and at the Vienna Academy. In Vienna he became associated with the German school of Cornelius, Overbeck, Schadow, and Veit, who went back for their inspiration to the old masters anterior to the days of Raphael, and in 1818 he followed them to Rome. But though he agreed with them in principle, he avoided their extremes, and was the only one of them who remained a Protestant. For the walls of the Villa Massimi at Rome he executed, as his share of the work, nearly 20 lozen frescoes from Ariosto's *Orlando* (1820-26). The year after the completion of this labour he was called by King Louis of Bavaria to fill the chair of Historical Painting in the Academy of Munich, and was besides commissioned to paint for the king's new palace and other royal apartments a series of frescoes illustrative of the *Nibelungenlied* and of the lives of Charlemagne, Frederick Barbarossa, and Rudolph of Hapsburg. In 1846 he accepted the appointment of professor at the Fine Art Academy in Dresden, coupled with the directorship of the royal picture-gallery. Schnorr's designs for 180 pictures to illustrate the narratives of the Bible (*Bible Pictures*, Lond. 1860) are accounted by many authorities the best things he did. The illustrations for Cotta's great edition of the *Nibelungen* *Not* were also designed by him; and his skill as a draughtsman and designer are further exhibited in stained-glass windows in St Paul's Cathedral, London, and in Glasgow Cathedral. Amongst his representative easel-pictures may be quoted the 'Marriage at Cana,' 'Jacob and Rachel,' 'Three Christian and Three Heathen Knights of Ariosto,' 'Ruth in Boaz's Wheat-field,' 'Christ Bearing the Cross,' 'Siegfried and Kriemhild,' and 'Luther at Worms.' His best qualities are balance of arrangement, freedom of design, and vivacity, together with many happy inspirations; in fact, he had too many ideas, and did not give himself time to mature them properly. Besides, his work is frequently too decorative in effect, and the figures lack individuality and dignity. Schnorr died in Dresden, 24th May 1872.

Schöffer. See GUTENBERG.

Scholasticism. The term scholasticism specially designates the aims, methods, and products of thought which constitute the main endeavour of the intellectual life of the middle ages. As under the names of its leading representatives special accounts have been given of their distinctive teaching, it will here be sufficient to indicate the conditions from which scholasticism arose, the general course of its history, and the causes that wrought its decay. In the case of no other great development of human thought can we mark with such precision its beginning, process, and end.

It was with the reign of Charlemagne (died 814) that the start was fairly made towards a new

civilisation with the Christian religion and theology for its basis, and with a character and aim of its own essentially distinct from the civilisation of antiquity which had died with the ruin of the empire of Rome. In the political confusions that followed the dismemberment of the Carolingian empire much was lost that had been recently gained, yet the tradition was never again lost of those ideals of a higher culture inaugurated in the schools founded by Charlemagne. In John Scotus Erigena (died 875) we have the first great thinker of the early middle ages. As he drew his inspiration from Plato rather than from Aristotle, however, and as his methods are not those of the schoolmen proper, he does not in strictness belong to the scholastic philosophy. It is by his translation of the writings of the Pseudo-Dionysius, a work which exercised the profoundest influence on the religious life of the middle ages, that he holds his place among the thinkers who have determined the development of Christian Europe. In the 10th century the tradition of higher studies was represented by one who, though also not a schoolman, cannot be passed over in any history of the origins of the new civilisation. By his great school at Rheims, Gerbert, afterwards Pope Sylvester II. (died 1003), kept alive in France that intellectual eagerness which it had mainly owed to the genius of Charlemagne, and which eventually justified the saying of the middle ages—'To the Germans the empire, to the Italians the pope, to France studies!'

During the 11th century western Europe grew to a clearer consciousness of the aims it had to follow in the development of the ideas on which the Christian society must be based. Till the year 1000 all endeavour had been paralysed by the belief that with that year God's account with men must close. As the dreaded hour was left behind, however, the sense of relief and gratitude showed itself in a quickened life in every field of human activity. The first crusade (1096) is conclusive proof that the church now confidently reckoned on a renewed term of terrestrial existence, and that it felt the duty of signalling the unexpected respite. In the sphere of thought, also, that movement now began which, in spite of its fatuities and eventual stultification, had for its essential aim the reasoned account of the ideas on which the new order was founded. In this endeavour there were initial conditions which at once determined the nature and direction of men's reasonings and vitiated at the source the value of their results. It is the essential distinction between the schoolmen and the thinkers of antiquity that the former were not left free to question the subject-matter on which their ingenuity was expended. Of all ultimate questions the church provided a solution ready to hand and beyond appeal. The liberty to choose or reject that solution would have nullified the very principle of the church's existence. Moreover, the intellectual life of the middle ages directly proceeded from the organisation of the church, and individual thinkers were but the organs of its doctrine and tradition. The mediæval university was as essentially a religious institution as a monastery or a cathedral, and its members held their place solely on condition of their acceptance of the church's standard of faith. But it was exclusively in the universities that intellectual life was then possible. With their thought thus fettered in its fundamental process, a natural development, following every indication of truth to its legitimate conclusion, could not be looked for in the schoolmen. The most daring conclusion they could reach was to question whether the teaching of the church could be made good to the mind by any process of merely human reasoning. Uniformity of method, and futile distinctions or

petrifying routine, were thus the inevitable outcome of the mediæval philosophy.

According to the statement of Victor Cousin, now generally accepted as true, the fundamental problem of scholasticism had its first suggestion in a remark of Porphyry (died 304) regarding the difficulty of settling the question whether *genera* and *species* have a real objective existence or are merely abstractions of the mind. Put in as simple language as its nature admits, the problem is this: Is there or is there not an objective reality corresponding to our general notion, say of *man*, *horse*, *flower*, &c.? Those who answered the question in the affirmative came to be known as *realists*, their opponents as *nominalists*. Trifling as the question may appear in itself, for the schoolmen it lay at the root of every attempt to render account to human reason of divinely revealed truth. An abstract question assumed vital importance when the disputants saw behind it the doctrines of the Trinity, the Incarnation, the Immaculate Conception, and the nature and existence of angels. It was especially in its bearing on the doctrine of the Trinity that the question of Nominalism *versus* Realism for more than four centuries exercised the acutest intellects the world has perhaps seen. It was the contention of the Realists that on the principle of Nominalism (q.v.) the doctrine of the Trinity was irrational and inconceivable. Grant, they argued, that our general notions have objective reality, then, just as from the totality of men we have an objective unity in the notion *man*, so from the Divine Trinity of Persons we can conceive a Divine Unity of Substance. On the other hand, if general notions be mere names, the doctrine of the Trinity in Unity is absurd on the face of it. Of the two theories it was Realism which had the approval of the church, and which was associated with the pious feeling of the middle ages. Till its final triumph in William of Ockham Nominalism had to fight for its existence against the main current of the religious and speculative tendency of the mediæval church. The history of scholasticism is in large degree the history of the varying fortunes of these two rival theories and their rival champions.

An event of the first importance divides this history into two periods so distinctly marked that they have come to be known as the periods of the earlier and the later scholasticism. This event was the introduction into the Christian schools through the medium of the Arabian commentators (chiefly Avicenna and Averroes) of the writings of Aristotle on natural science, metaphysics, and ethics. Till the beginning of the 13th century Aristotle had been known to the schoolmen only by his writings on logic. From the knowledge of Aristotle's complete work, therefore, they received an impulse which led the way to bolder speculation, and gave birth to questionings that stirred the deepest consciousness of the later middle age. On the one hand, the new Aristotle ministered to the intellectual want of the time in supplying the material it needed to exercise those faculties which had been so assiduously trained by Aristotle's own dialectic. But Aristotle was a pagan, and many points in his teaching ran counter to Christian doctrine. To give him that place in the schools which many now wished would be a standing menace to the authority of the church. From the first appearance of the new writings, therefore, Rome steadily set its face against the 'Grecian Doctor,' and in a succession of anathemas forbade certain parts of his writings to be used in the universities. In the relation of thinkers to Aristotle we have thus the distinction between the earlier and the later scholasticism. Of the first period the great names are Roscellinus, Anselm,

William of Champeaux, Abelard, and Peter Lombard; of the second, Albertus Magnus, Alexander of Hales, Thomas Aquinas, Duns Scotus, William of Ockham, and Jean Gerson.

The name of Anselm (1033-1109) is chiefly remembered in connection with his attempt to prove the existence of God from the innate idea which he supposed to be common to all mankind. His place in the line of the schoolmen, however, is not due to this argument, famous as it is in the history of thought. It was in his controversy with his contemporary Roscellinus (born near Soissons about 1050) on the burning question of universals that he entered the peculiar domain of scholasticism. Though not the first to renew the old controversy, Roscellinus, by the notoriety which he gave to it, may be regarded as the founder of the scholastic philosophy. With a skill and success that alarmed the authorities of the church he argued for the theory of Nominalism, Anselm taking up the contrary position with equal subtlety and persistence. It proves the importance assigned to the question at issue that in 1092 a council held at Soissons condemned the teaching of Roscellinus as implicitly involving the negation of the doctrine of the Trinity. As Roscellinus was the founder of Nominalism, William of Champeaux (1070-1122), the head of a famous school of logic in Paris, was the founder of Realism. It was in refuting his teaching that his pupil Abelard (1079-1142) gained the first triumphs of his extraordinary career. In Abelard we have the boldest thinker and one of the most striking figures in the history of the middle ages. His celebrated pamphlet *Sic et Non* was a manifesto of rationalism, which sent a shudder through the conservatism of the time. Selecting 153 points of Christian doctrine he arrayed the opinions of the most revered authorities on each. Presented in this startling fashion, the opinions of St Paul, Augustine, Gregory, Jerome, Athanasius, and others were seen to be so essentially self-contradictory that no doctrine was left on which an intelligent believer could rest. On the main question of the schools he rejected the orthodox Realism, and adopted an eclectic theory which was neither Realism nor Nominalism, but a middle position between each. A thinker like Abelard striking at the very root of the Christian tradition could not in the reason of things be tolerated by the church; and by a great assembly at Sens in 1140, and afterwards at Rome, his writings were ordered to be burned and himself prohibited from teaching. But the spirit of Abelard was never completely exorcised during the subsequent centuries, and he has always been regarded as the brilliant precursor of the modern time. By his 'Four Books of Sentences' (i.e. right rules) Peter Lombard (c. 1100-60), a pupil of Abelard, came to hold a place in the history of scholasticism hardly second to any other thinker. The object of his book was to be the antidote of *Sic et Non*; and in a different spirit from Abelard the Lombard brought together the opinions of the Latin fathers Augustine, Ambrose, and Hilary, as also of Cassiodorus. To each article he annexed a series of 'Distinctions,' in which he sought to define more precisely the doctrine under consideration. Though conceived in a spirit of orthodoxy, the 'Sentences' did not escape the leaven of Abelard's scepticism. Regarded with suspicion on its first appearance, it yet became the great text-book of the universities to the close of the middle ages, and was itself made the subject of interminable commentaries by subsequent schoolmen.

In the second period of scholasticism larger interests and more various problems quickened the speculations of the successive thinkers. During the 13th and 14th centuries the rivalries of the two

mendicant orders, the Dominicans and the Franciscans, divided the schools, and introduced a polemical element into philosophical discussion unknown in a similar degree to the earlier period. Generally the Franciscans, as the body of democratic origin, counted in their ranks the bolder thinkers among the schoolmen. Thus, Roger Bacon, Duns Scotus, William of Ockham were Franciscans, Albertus Magnus and Thomas Aquinas Dominicans. The new Aristotle was the battle-ground of the two rival camps of thinkers, and specially the Aristotelian doctrine of the soul. As that doctrine had been expounded by the Arabian commentator Averrhoes, it involved the negation of the Christian doctrine of the resurrection and of the immortality of the soul. It is mainly by their attitude towards Averrhoes that we distinguish the different tendencies of the schoolmen of the 13th and 14th centuries.

An eclectic in his view of universals, Albertus Magnus (1193-1280) accepted Aristotle through the commentator Avicenna in preference to Averrhoes. The task of the later schoolmen was to harmonise the newly-received teaching of Aristotle with the doctrines of the church, and Albert was the first to bring together the materials for the furthering of this end. To effect this harmony was the life's endeavour of the most constructive mind of all the schoolmen, Thomas Aquinas (c. 1226-74). In his *Summa Theologiae* Aquinas sought to supply a complete repertory of human thought on all subjects touching religion and philosophy, the fundamental principle of his work being that as faith and reason have two distinct spheres, neither can conflict with the other. On the subject of universals he was an eclectic like his master Albertus. Even Aquinas did not escape the charge of heresy, and through the efforts of the Franciscans his teaching on the nature of the soul was formally condemned by the church. Eventually, however, he came to hold the first place as the oracle of divine and human wisdom, so that a pope could say of him that 'the articles of Thomas were so many miracles.' What Aquinas was to the Dominicans Duns Scotus (c. 1265-1308) was to the Franciscans. Roger Bacon (c. 1214-94), also a Franciscan, holds a place apart from the other thinkers of the middle ages by his contempt for the studies of the schoolmen. The introduction into the western schools of what is known as the Byzantine logic by Petrus Hispanus (1226-77) is a turning-point in the history of the scholastic philosophy. Through its influence logic in the teaching of Duns Scotus and William of Ockham assumed an importance which had the most disastrous results on the entire scholastic system. With an acumen which gained for him the title of 'The Subtle Doctor,' Duns applied the new logic to the main position of Aquinas that reason and revelation are two distinct sources of knowledge, and sought to prove that there is, in truth, no knowledge apart from the Christian teaching. On the question of universals he shows all his subtlety, but his position is virtually that of Aquinas himself. It was in the hands of William of Ockham (c. 1270-1349), a pupil of Duns Scotus, that the scholastic philosophy assumed a form which speedily led to its disintegration. By his triumphant demonstration of the theory of Nominalism scholasticism ceased to have a reason for its existence, and the foundation was laid for that method of experiment and induction which was the outcome of the long travail of the schools of the middle ages. With Ockham closes the line of the great schoolmen; and of the thinkers who followed him Jean Gerson (1363-1429) alone deserves to be mentioned as one of the representative figures of the later scholasticism. In certain of the great universities, indeed, the scholastic methods continued to

prevail long after a better way had been opened up for the freer development of the human spirit. In the university of Paris scholasticism held its place into the 17th century; and in Spain, till comparatively recent years, it was still the only philosophy that could be learned by her students. By the close of the 15th century, however, scholasticism was dead as a vital phase of human thought. In itself it was an exhausted movement, and the revival of antiquity and the religious reformation of the 16th century supplied a fresh stream of ideas, which opened up a larger scope of the possible development of humanity.

It was natural that the humanists and the reformers should do their utmost to discredit the system from which they were seeking to emancipate their contemporaries; and so effectually did they do their work that not till within recent years has scholasticism been thought worthy of a serious attempt to understand it. At present the tendency is to recognise in it for its own time and place a perfectly rational system, yielding healthy exercise to the best minds of the middle ages. The ridicule of the humanists is seen to be true only of its later phases. While, therefore, from the very conditions of its origin and growth, scholasticism was debarred from that free and direct questioning of things which is the distinctive characteristic of ancient and modern times, it nevertheless, as in Dante and Thomas Aquinas, produced certain types of thought and feeling which could have sprung from no other system, and for the absence of which the world would have been emphatically the poorer.

See the general histories of Philosophy (q.v.); the histories of mediæval philosophy by Stöckl (1861-67), Bäumker (1909), and Deussen (1915) in German, and by Hauréau (1872-80), Picavat (1904), and de Wulf (trans. 1926) in French; see also Townsend, *Great Schoolmen* (1881); Poole, *Illustrations of the History of Mediæval Thought* (1884); Littlejohn, *Political Theory of the Schoolmen* (1896); Rickaby, *Scholasticism* (1900); Taylor, *The Mediæval Mind* (1911-14); and the contribution of Little to *Mediæval France* (ed. Tilley, 1922). See also the separate articles on the different schoolmen and mediæval philosophers, with the books cited there.

Scholiasts, ancient grammarians, for the most part anonymous and known only by their short annotations written on the margins of the MSS. of the ancient classics, Greek and Roman. These remarks concern the language more frequently than the substance, and are sometimes feeble and pedantic, but often tend to elucidate the text or even critically amend it. The earliest scholiasts were those of the Alexandrian School (q.v.); many are as late as the Byzantine period. A Gloss (q.v.) was one of the merely verbal scholia.

Scholten, JAN HENDRIK (1811-84), the chief of the modern school of Dutch critical theologians, was born at Vleuter near Utrecht. He studied for the church at Utrecht, and became in 1840 professor of Theology at Franeker, in 1843 extraordinary, and in 1845 ordinary professor at Leyden, where he died 10th April 1885, four years after his retirement. His writings were either in Dutch or Latin, but French and German translations carried them far beyond their country. The chief were *Principles of the Theology of the Reformed Church* (2 vols. 1848-50), *Historical and Critical Introduction to the New Testament* (1853), *A Critical Study of the Gospel of John* (1864), *The Oldest Witnesses to the Writings of the New Testament* (1866), *The Oldest Gospel* (1868), and *The Pauline Gospel* (1870). The school of which he was the most conspicuous leader eliminates the supernatural element from Christianity, evolving the religion from the religious consciousness of Jesus.

Scholten gave an interesting sketch of his own religious development in his *Afscheidsrede bij het Neerleggen van het Hoogleerarsambt* (1881). See also Kuenen's *Levensbericht*, with a complete list of his writings (1885).

Schomberg, FREDERICK HERMANN, DUKE OF, was born about 1615 of an ancient house taking its name from its castle of Schönburg on the Rhine, and fought against the Imperialists in the Thirty Years' War. Entering the French service in 1650, he conducted a successful campaign in Spain, was naturalised in France, and, though a Protestant, obtained a marshal's baton in 1675. On the revocation of the Edict of Nantes in 1685, after some unimportant work done for the House of Brandenburg and the Elector Palatine, he accepted the post of second in command under the Prince of Orange in the English expedition. The new king made him K.G., duke, and master of the ordnance, and gave him command of the army in Ireland in 1689. Wintering in Ulster, he joined William III. in 1690, and fought and fell in the battle of the Boyne (1st July). His son Meinhard commanded the right wing, and was made Duke of Leinster. But in the war of the Spanish succession he was recalled as inefficient for his command, and died childless in 1709, the title dying with him. The fourth Marquis of Lothian married a granddaughter of the first Duke of Schomberg.

Schomburgk, SIR ROBERT HERMANN, a traveller, was born at Freiburg in Prussian Saxony, June 5, 1804. He was trained for the mercantile profession, and went out to the United States in 1829, but in the following year he removed to Anegada, one of the Virgin Isles. Having surveyed the island and laid a report before the Royal Geographical Society, he was charged by that body to lead an exploring expedition to British Guiana in 1835. This enterprise, which was surrounded with formidable difficulties, he satisfactorily achieved, and from time to time laid the results of his investigations before the society, in whose *Journal* they were regularly published. It was during this exploration, and while he was ascending the Berbice River, that he discovered, January 1, 1837, the magnificent aquatic plant, the *Victoria regia* (q.v.), described in his *Description of British Guiana* (Lond. 1840), and his magnificent *Views in the Interior of Guiana* (folio, 1841). In 1840 he returned to Guiana to survey the colony for government, and to draw the long controverted 'Schomburgk-line' as a provisional boundary with Venezuela (q.v.) and Brazil, and was knighted. He was accompanied by his brother Richard, whose *Reisen in Britisch-Guiana, 1840-44* (Leip. 1847-48) embody the results of this expedition. In 1847 the former published an excellent and elaborate *History of Barbadoes*, and in the following year departed for San Domingo, whither he had been accredited as British consul and representative. In this new sphere he continued to pursue his geographical and scientific researches, the results of which he communicated to the Geographical Society till 1853. In 1857 he was appointed British representative to the Siamese court, but returned to Europe ill in 1864, and died 11th March 1865 at Schöneberg near Berlin.

Schönbein, CHRISTIAN FRIEDRICH, chemist, was born at Metzingen in Württemberg, 18th October 1799, studied natural science at Tübingen and Erlangen, and visited England in 1826, and after that Paris. In 1828 he was called to a chair in the university of Basel. In 1839 he discovered Ozone (q.v.), and he invented *Gun-cotton* (q.v.) in 1845, obtaining from it by solution in ether the material called Collodion (q.v.). In his later years he confined himself chiefly to experiments

with oxygen. Of his works the chief are *Das Verhalten des Eisens zum Sauerstoff* (Basel, 1837), *Beiträge zur physikalischen Chemie* (1844), *Ueber die Erzeugung des Ozons* (1844), *Ueber die Verbrennung der Körper in atmosphärischer Luft* (1845). He died on 29th August 1868. See Lives by Hagenbach (1869), and Stahlbaum and Schaefer (1901).

Schönberg, ARNOLD, a striking Austrian composer, born in Vienna, 13th September 1874, was largely self-taught in music; he has resided mostly in Berlin and Mödling, near Vienna. His earlier compositions are either late Wagnerian, such as the sextet *Verklärte Nacht* (1899) and the *Gurrelieder* (1900), or severely contrapuntal, such as the *Kammersinfonie* (1906) and the two string quartets (1905, 1907). His later works—*Three Piano Pieces* (1909), *Pierrot Lunaire*, a series of twenty-one short songs (1912), the monodrama *Erwartung*, the quintet (1925)—are characterised by the development of principles of atonality, where each of the twelve notes of the octave is considered of equal importance, and the different relations of tonic, dominant, &c. are eliminated. Schönberg published a *Harmonielehre* (1911; rev. ed. 1922). See the Study by Wellesz (1921; trans. 1924).

Schönbrunn, a palace in the outskirts of Vienna, was the summer residence of the imperial family. It was built by Maria Theresa in 1744, and has attached to it a zoological and a botanical garden. The treaty of Vienna was signed within.

Schönebeck, a town of Prussia, 9 miles by rail south of Magdeburg, on the left bank of the Elbe. Great quantities of salt are made, and there are manufactures of machinery, chemicals, starch, &c. Pop. 21,400.

Schöneberg, a town of Prussia, now incorporated in Berlin.

Schönherr, KARL, dramatist, novelist, and poet, was born at Axams in Tirol in 1868, and for some years practised as a doctor in Vienna. His career as a dramatist has been very successful, his best-known plays being *Der Bildschnitzer* (1900), *Erde* (1907), *Glaube und Heimat* (1910; perhaps his most powerful effort), *Der Weibsteufel* (1915), and *Der Kampf* (1920). Schönherr has never lost the robust directness and elemental simplicity of his early peasant environment. He has published some dialect poetry, while one of his novels, *Aus meinem Werkbuch*, is partly autobiographical.

Schönlein, JOHANN LUKAS, professor of medicine, was born at Bamberg on 30th November 1793, studied medicine at Landshut, Würzburg, Jena, and Göttingen, and began to lecture at Würzburg in 1819. In the following year he was appointed professor of Clinics and Therapeutics there; in 1833 he removed to a similar chair at Zurich; and in 1839 he was called to Berlin to be professor of Pathology and Therapeutics, and to preside over the clinical instruction given in the Charité hospital. He retired in 1859, and died at Bamberg on 23d January 1864. His principal merit is that he introduced into Germany the exact methods of study which were in vogue in England and France, and thus founded what was called the Natural History School of Würzburg (see MEDICINE). See Life by Rothlauf (1874).

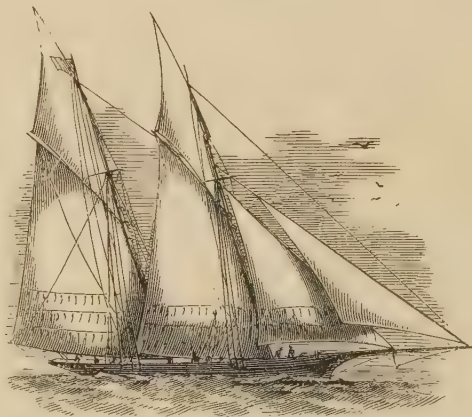
Schoodic Lakes (pron. SKOODIK), a group of twelve lakes in the east of Maine, U.S., drained by the Schoodic, or west branch of the St Croix.

Schoolcraft, HENRY ROWE, American ethnologist, was born in New York state, 28th March 1793, studied at Union College, and in 1817-18 visited the mining region west of the Mississippi,

afterwards publishing a *Journal* (1819; revised 1853). He also published a narrative of General Cass's exploring expedition to Lake Superior and the Upper Mississippi (1820), of which he was geologist. In 1822 he became Indian agent for the tribes about the lakes, and in 1823 he married the granddaughter of an Ojibway chief, who had been educated in Europe. From 1828 to 1832 he was an active member of the legislature of Michigan territory, and founded its Historical Society, and the Algic Society of Detroit. In 1832 he commanded an expedition which discovered the sources of the Mississippi (*Narrative*, 1834). While superintendent and disbursing agent for the Indians, he negotiated treaties by which the government acquired lands to the extent of 16,000,000 acres. In 1845 he collected the statistics of the Six Nations (*Notes on the Iroquois*, &c. 1848). In 1847 congress authorised him to gather, collate, and edit all accessible information relating to the Indians. The result is to be found in his *Historical and Statistical Information respecting the History, Condition, and Prospects of the Indian Tribes of the United States* (5 vols. 1851-55, published by congress at a cost of nearly \$30,000 per vol., with over 300 illustrations; a sixth was added by Schoolcraft in 1857). His numerous other works include many poems, a Life of Cass, *Algic Researches* (1839), *The Red Race of America* (1847), *Thirty Years with the Indian Tribes* (1851), *The Indian in his Wigwam*, &c. He died 10th December 1864.

Schools. See EDUCATION, ARMY, MILITARY SCHOOLS, ART, CHRISTIAN BROTHERS, CHRISTIAN SCHOOLS (BROTHERS OF); the articles on the great English public schools; and for the Schoolmen, SCHOLASTICISM.

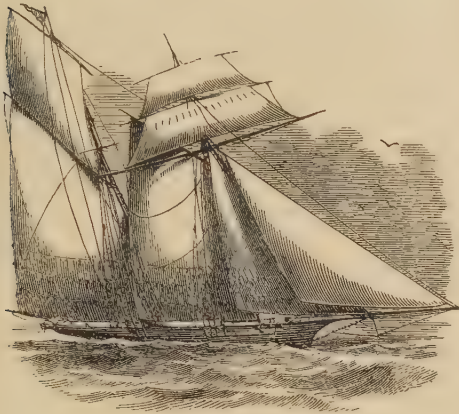
Schooner. A swift vessel, originally with two masts, though now frequently with a greater number. The schooner proper is supposed to have been introduced at the beginning of the 18th century, and was rigged 'fore-and-aft' fashion,



Fore-and-aft Rigged Schooner.

but 'topsail schooners' are very common. In the former, both foremast and mainmast are rigged like a cutter, with fore-and-aft sails. In the latter the foremast usually carries square topsail and topgallant sails. Topsail schooners, though carrying no square foresail, have a sail on a yard for running free which is set 'flying,' that is, hoisted from the deck. On a wind the fore-and-aft rig has a great advantage; but before the wind the 'squaresails' are superior. The schooner is a favourite type for the larger class of yachts, and before the introduction of steam was employed much in the packet service.

Schooners are still employed in the merchant service for running small cargoes and for coast-



Topsail Schooner.

trading. They are easily managed by a small crew. See SAIL, YACHT.

Schopenhauer. ARTHUR, the founder of systematic modern Pessimism (q.v.), was born at Danzig, 22d February 1788. His father was a banker; his mother, Johanna Trosina (1766-1838), wrote twenty-four volumes of novels and novelettes, and on her husband's death settled in 1806 at Weimar, where she saw much of Goethe. Schopenhauer, after resigning the business career for which his father had trained him by travel and residence in foreign countries (France, England), acquired a classical education at the schools of Gotha and Weimar; and having after his father's death inherited a patrimony of £150 a year, entered the university of Göttingen in 1809, heard later Fichte and Schleiermacher, and devoted much attention to physical and medical science in Berlin. He graduated at Jena with his first work, *On the Fourfold Root of the Principle of Sufficient Reason*, a treatise in which he seeks to classify the principles which determine respectively the provinces of Physics, Logic, Mathematics, and Ethics. Schopenhauer's philosophy, although not devoid of elements of objective value, is a perfect expression of his most unique personality, and cannot be fully understood save in connection with his character. He inherited from his father an unbreakable energy of character (some friends of his youth called him a *Jupiter Tonans*) and cosmopolitan, freethinking sympathies, and from his mother a brilliant polish of mind and facility of literary expression. His mind was not formed by years of patient acquisition but by the society of his seniors and by a congeries of vivid sights and experiences of travel, and retained to the end its habit of seizing at a conclusion through the force of intuition or apprehension rather than of reasoning. Inner discord was the keynote of his life in that in him the subjective and the objective, feeling and reason, were in perpetual conflict; he believed the tendency of life to be to separate more and more the heart and the head. His disposition was heavy and severe, dark, mistrustful and suspicious, preventing him from entering into permanent trustful relations with men or women: his mother desired him to live apart from her after the death of her husband, and he could hardly think seriously of marriage as he saw only in woman a wayward, mindless animal—ugly too he said—existing solely for the propagation of the species, an end which perpetuated the woe of the world. Lastly he

believed that he had brought to the birth a philosophy which made himself the successor of Socrates, since whose time nothing had been done in philosophy save Kant's undoing of the mass of traditional error; and he saw himself and his thinking passed over until he was sixty, and what he regarded as fatuous ravings (the Fichte-Schelling-Hegel philosophy) praised as the highest wisdom, so that he was tempted to believe there was a conspiracy of professors of philosophy against him and his truth. The cardinal articles of his philosophical creed, which he seized as it were by intuition early in life, were: first, Idealism (Idealism is of course more likely to lead to Pessimism than Realism, as it believes the world to be illusory)—Subjective Idealism—i.e. that the world is my idea, a mere phantasmagoria of my brain, and therefore in itself nothing; secondly, that the way of knowledge or speculation to the centre of things, to the 'thing-in-itself,' was demolished for ever by the immortal criticism of Kant (it simply galled him to fury to hear Schelling talking of *knowing* God by '*Intellectual Intuition*'); and thirdly, that there was accessible to the mind, to the intuition of genius, the contemplation of the Platonic ideas—that is, the ideas of Art, the only knowledge not subservient to the Will and to the needs of practical life.

His own contribution to the sum of human knowledge, as he thought, was the truth that Will, the active side of our nature, or Impulse, was the key to the one thing we did know directly and from the inside—i.e. the self (all else of course we know from without and through the self), and therefore the key to the understanding of all things from the atom up through plants and animals to the starry systems. His philosophy thus is, as he puts it, that the world is through and through Will, and also (but secondarily) through and through Idea: Will is the creative, the primary, while Idea is the secondary, the receptive factor in things—a mere offshoot from the brain. There is thus a pronounced Materialistic side to Schopenhauer's philosophy which is inconsistent with his Idealism; he always taught too the descent of man from some lower form of life—the basis of his theory that what animals wanted from man was not compassion but justice and equality, although of course as a metaphysician he deprecates a natural as opposed to a philosophical explanation of the world. Time, as he said, is only in us a form of our thought; and Schopenhauer had no sense for history. His chief book, *The World as Will and Idea* (1819), expounds in four books the Logic, the Metaphysic, the Æsthetic, and the Ethic of his view; it teaches a pantheism of the Will (Pantheism), and defends the extension of the word Will as blind irresistible energy or impulse (it is essential to remember the irrationality of the Will in Schopenhauer) to include all processes from attraction and gravitation to motivation, which last is simply 'causality seen from within.' He collected in the *Will in Nature* what he deemed the scientific confirmations of his doctrine. The first meed of praise which fell to him was the crowning by the Norwegian Academy in 1839 of his prize essay on the *Freedom of the Will*, in which he defends the phenomenal necessity or determinism of the Will and its supra-sensible freedom. His ethical theory rests on sympathy, the treatment of self and others as not two or many but as one and the same, as both the manifestation of the All-Will which rises to a feeling of hunger in the stomach, gnawing in the teeth, thinking in the brain, &c. Sympathy, however, is only a 'civic virtue;' the highest virtue is asceticism, the denial of the Will to live, in which the Intellect through contemplation of the idea of Art frees itself from desire and willing and pierces the 'Veil of Mâyâ'

(Illusion) which hides from us the supra-sensible, and the Will is reduced to its original state of quiescence or potency. Remove the Will from life and there is no more: 'before us there is certainly Nothing.' Schopenhauer preferred Buddhism and Mysticism and Anchoretic Christianity to the reigning forms of religion and to Rationalistic Theism. He gave out his occasional papers in the *Parerga and Paralipomena* (1851), which more than the other works express the man himself, illustrate the eloquence of his pen, and perhaps have led people to his shrine who know next to nothing of his strict theory. In an appendix to *The World as Will and Idea* he criticises the Kantian theory of knowledge as laying too much weight on the Reflective or Indirect Method as opposed to the Intuitive or Direct. His essay on *Seeing and Colours* (1816) contains practically Goethe's theory of colours; Goethe had been pleased to get Schopenhauer's help in his optical researches, and had predicted for Schopenhauer a hearing in the world. From Weimar and university circles Schopenhauer had gone to Dresden (1814-18) for the writing of *The World as Will and Idea*; thence he had gone to Italy; his unsuccessful attempt as lecturer in Berlin University was made in 1820. Of two lawsuits one concerning money matters was settled in his favour through his own legal acumen; the other ended in his having to pay £9 a year to a seamstress as compensation for injuries received by her when the irate philosopher ejected her with violence from his rooms as an intruder. After renewed travel and residence in the south he finally in 1831 left Berlin for Frankfort-on-the-Main, where he chose to live as an isolated thinker until his death there, 21st September 1860. Frauenstädt, his literary executor, was the chief of his 'evangelists' and 'apostles'—as he called the most enthusiastic of his admirers.

The complete works of Schopenhauer were edited by Frauenstädt (6 vols. with introduction, 1876), who also edited his Letters (1854) and published a *Schopenhauer Lexikon* (1871). There is an English translation of *The World as Will and Idea*, by Lord Haldane and Kemp (1883-86), and of the *Fourfold Root and Will in Nature* (1888); B. Saunders made several translations from the *Parerga*, with introductions, and wrote a separate Essay (1901); a volume of *Selected Essays*, by E. B. Bax, appeared in 1891, and another selection, *The Wisdom of Schopenhauer*, by W. Jekyll in 1911. One of the most important German Lives is by Gwinner (1862), but there are others by Haym (1864), Meyer (1872), and Völkelt (1907). In English there are Lives by Zimmern (1876), Wallace (1890), and Whittaker (1909), and a study by Caldwell (1896). In French there are books by Ruyssen (1911) and Seillière (1911). See PESSIMISM, and the works cited there.

Schorl-rock, a compound of quartz and schorl or black Tourmaline (q.v.). It may be fine or coarse grained. Sometimes it consists principally of quartz with prisms of schorl scattered irregularly through it; at other times it may be so fine grained as to form a blackish-gray mass in which the naked eye cannot distinguish the separate ingredients. The rock occurs associated with granite and the crystalline schists.

Schottische (a Frenchified form of the German word for *Scottish*), a somewhat fanciful name given to a slow dance in $\frac{3}{4}$ time.

Schouwen, an island of Holland, in the province of Zeeland, with an area of 62 sq. m. Chief town, Zierikzee.

Schrader, EBERHARD (1836-1908), a learned Assyriologist, was born at Brunswick, studied at Göttingen, where his bent towards oriental studies was confirmed by Ewald, and became ordinary professor of Theology at Zurich in 1863, Giessen in

1870, and Jena in 1873. In 1875 he obeyed a call from Berlin to the chair of Oriental Languages, with a seat in the Academy of Sciences.

His earliest books were devoted to Old Testament criticism—*Studien zur Kritik und Erklärung der biblischen Urgeschichte* (1863), and a fresh edition—the eighth—of *De Wette's Einleitung* (1869). Turning next to Assyriology, he quickly placed himself at the head of German scholars by an unrivalled combination of wide erudition and critical sagacity. His books are *Die Assyrisch-Babylonischen Keilinschriften* (1872); *Die Keilinschriften und das Alte Testament* (1872; 2d ed. 1883; Eng. trans. 2 vols. 1885-86); *Die Höllenfahrt der Istar* (1874); *Keilinschriften und Geschichtsforschung* (1878), in which he combats in masterly fashion the attack of the historian Gutschmid on the method and result of work in the cuneiform inscriptions; and *Zur Frage nach dem Ursprung der Babylon. Kultur* (1884). There is a translation by F. B. Jevons of his important *Prehistoric Antiquities of the Aryan Peoples* (1890).

Schreiner, OLIVE (1859-1920), a gifted South African authoress, daughter of a Lutheran clergyman at Capetown, who startled the conventional English world of letters in 1883 by '*The Story of an African Farm*': a Novel. By Ralph Iron, a description in simple yet forcible style of rough life on a Boer farm, and of the spiritual problems that rend an inquiring soul. *Dreams* (1890), a group of spiritual allegories, was followed by *Dream Life and Real Life* (1893), *Trooper Peter Halket of Mashonaland* (1897), and *Women and Labour* (1911). She opposed the policy of Rhodes, and during the war of 1899-1901 was an active pro-Boer. Her husband, Mr Cronwright-Schreiner, wrote her life (1924) and edited her letters (1924) and her unfinished novel *From Man to Man* (1926).

Schreker, FRANZ, Austrian composer, was born at Monaco in 1878. In 1911 he founded the Philharmonic Choir in Vienna, becoming its first conductor, and in 1920 he was appointed director of the Berlin High School of Music. His principal works—the operas *Der Ferne Klang* (1912), *Das Spielwerk und die Prinzessin* (1913), *Die Gezeichneten* (1918), and *Der Schatzgräber* (1920), and the Chamber Symphony (1923)—are characterised by a certain eroticism, a thickness of texture, a love of colour, and rather a daring choice of subjects.

Schrevelius, CORNELIUS, born at Haarlem in 1615, became in 1642 rector of the university of Leyden, and died 11th September 1664. He was a laborious and erudite man, but possessed little critical discernment. His most notable performance was a *Lexicon Græco-Latinum et Latino-Græcum* (Leyden, 1654), of which there have been innumerable editions. He also executed between 1648 and 1665 many *variorum* editions of the classics—Juvenal, Hesiod, Terence, Virgil, Horace, Homer, Martial, Lucan, Cicero, Ovid, and Claudian.

Schubart, CHRISTIAN DANIEL, poet, was born 13th April 1739 at Sontheim in Swabia, and studied theology, afterwards becoming school-master and organist, first at Geisslingen and then at Ludwigsburg. But he wrote satirical poems and spoke unadvisedly, lost his post, and then led a wandering life in various cities and countries, giving poetical readings and piano performances. He got into difficulty in Austrian territory near Ulm, was enticed back to Württemberg by the prince, whom he had greatly irritated by a stinging epigram, was carried to the fortress-prison of Hohen-Asperg (1777), and there pined for ten years. Then he was set free by intervention of the Prussian court, and straightway appointed court musician and theatre-director at Stuttgart to the same prince who had kept him all these years in prison. But he was utterly broken in health, and died 10th October 1791. His poetry is very unequal in value;

he was an effective satirist of abuses in church and state, and some of his patriotic pieces, odes and hymns, have real poetic worth; but he is chiefly remembered for his tragic fate, and for the influence his work exercised on Schiller. His *Gesammelte Schriften* (including essays and newspaper articles) fill 8 volumes.

See the autobiographical *Schuberts Leben* (1793), and monographs on the man by D. F. Strauss (1849), Hauff (1885), and Nägele (1888).

Schubert, FRANZ PETER, the celebrated composer, was born in Vienna on January 31, 1797. His father, who came of a Moravian peasant stock, had settled some years previously as a school-master in a district of the city called the Lichtenthal; his mother before her marriage had been a cook. Their two elder sons, Ignaz and Ferdinand, adopted the father's calling. Franz's musical gifts very early declared themselves. At first he was taught the violin by his father, and the piano-forte by his brother Ignaz; but he very soon outstripped their powers of instruction. His training was therefore entrusted to Holzer, organist of the parish church, whose raptures over the boy's talents were a poor substitute for the conscientious care which they demanded. Before he was eleven years of age young Schubert was leading soprano in the Lichtenthal choir, whence he was soon transferred to the Konvikt or choristers' school of the Court-chapel. Franz at once took his place as one of the violin-players in the school band, where he soon became leader. The constant practice thus afforded him was doubtless an inestimable advantage, though it must always be regretted that his theoretical training was practically left to take care of itself; for Ruzicka, the music-master at the Konvikt, seems to have taken much the same line with Schubert as Holzer had done before him. The circumstances of the school were not favourable to study. The boys were allowed to go hungry, and in winter without fire, so that even practice was carried on under difficulties. But Schubert's thirst for composition triumphed over all such obstacles, and in its endeavour to be satisfied interfered seriously with his progress in the ordinary curriculum. He made many friends at this time, for his schoolfellows were all proud of his gifts and were delighted to take part in the performance of his compositions; while in Spaun, one of the senior choristers, he found a benefactor who kept him supplied with music-paper, a luxury beyond the reach of his own very slender resources. During the five years thus spent Schubert tried his hand at almost every kind of composition, the work which marks the completion of this period being a symphony in D (October 28, 1813).

On his departure from the Konvikt he became an under-teacher in his father's school in order to avoid the conscription. Even at this early date he wrote some of his most enduring compositions. Of these may be mentioned that immortal song the *Erl King*, truly marvellous as the work of a youth of eighteen, and the Mass in F, first performed by the Lichtenthal choir under the direction of the composer. Among those who congratulated him on this occasion was Salieri, under whose guidance his more recent studies had been made. Schubert's delivery from the drudgery of his father's school was brought about by Franz von Schober, a young man of his own age, who had met with some of his songs, and who, on coming to the university of Vienna, lost no time in finding out the composer. As soon as he became aware of Schubert's anomalous position, he proposed that he should share his lodging and be free to devote himself entirely to his art. Franz fell in with the arrangement, which, however,

was put an end to by the interference of Schober's brother after a few months, when Schubert was doubtless laid under a similar obligation to other friends; for, with the exception of £4 paid to him for a cantata written for a Herr Watteroth, his work as yet had brought him in nothing. His short residence with Schober was marked by an event which had a lasting influence on his career—his acquaintance with Vogl, the eminent singer and actor, who very soon appreciated his genius, and became his firm and most valued friend. Vogl's fine literary taste enabled him to curb that omnivorous instinct of Schubert's which impelled him to lavish his treasures of melody on words altogether unworthy of them. To him also Schubert owed the recognition (inadequate as it was) of his talents by the Viennese, for Vogl constantly sang his songs at the houses of people of influence in the first instance, and eventually in public.

In 1818 Schubert became teacher of music in the family of Count Johann Esterhazy at his country seat at Zelész, in Hungary, where he passed several months, finding in the beauty of his surroundings a new stimulus to composition. The end of the year, however, saw him back in Vienna and installed in lodgings with the poet Mayrhofer. The two would often work together in the same room, the one writing verses which the other as rapidly set to music. On February 28, 1819, Schubert was first brought before the public as a composer by the performance of one of his songs, the *Schäfers Klagelied*, at a concert in Vienna. In the summer he made an extended tour with Vogl, and found time to compose, during a halt at Steyr, his well-known pianoforte quintet (op. 114). His comic operetta, the *Zwillingbrüder*, finished 19th January 1819, was produced at the Kärnthnertheater on June 14, 1820, and two months later came the first performance of the *Zauberharfe* at the Theater-an-der-Wien. His appearance in print was delayed until April 1821, when his old schoolfellow Leopold Sonnleithner and another friend named Gymnich had the *Erl King* engraved at their own cost. But as Schubert's songs began to be heard more frequently the enthusiasm with which they were received at length overcame the hesitation of publishers in accepting his MSS. As many as twenty songs were issued in eight months, but unfortunately no permanent pecuniary benefit was secured to the composer. In 1822 Schubert completed his opera *Alfonso und Estrella*, the libretto of which was furnished by Schober. It was rehearsed at Gratz, but was not brought to performance during the composer's lifetime. Liszt produced it at Weimar in 1854; but it did not meet with any real success until March 1881, when with a new libretto and considerable curtailment it was produced at Carlsruhe. To 1822 belong also the two movements of the unfinished symphony in B minor, in which for the first time in his orchestral writings Schubert displays a complete individuality. His first acquaintance with Weber and his formal introduction to Beethoven are also noteworthy among the events of this year.

During 1823 Schubert devoted much attention to dramatic music, writing with great rapidity the three-act opera of *Fierabras*; but to himself these labours resulted only in intense disappointment and depression, although we owe to his efforts in this direction the beautiful *Rosamunde* music, the orchestral parts of which were discovered at Vienna in 1867 by Sir George Grove in a cupboard where they had remained untouched for forty-four years. A stored long stay with the Esterhazys at Zelész restored Schubert from his state of extreme dejection, the visit being marked by the composition of many important works, including some pianoforte

duets written for his two pupils, the daughters of Count Esterhazy. Of these the best known is probably the *Divertissement à la Hongroise*, inspired by Hungarian airs which Schubert heard sung by a servant as he passed the door of the kitchen. The summer of 1825 was devoted to a pleasant tour with Vogl, the two friends delighting every one with their performance of Schubert's new songs from Walter Scott's *Lady of the Lake*, to which he referred when he wrote 'The way in which Vogl sings and I accompany, so that for the moment we appear to be one, is something quite new and unexpected to these good people.' And yet the seven songs which proved so successful were sold on his return to Vienna for the paltry sum of £20!

The compositions of 1826 included a quartett in D minor and the pianoforte sonata in G, usually known as the *Fantasia*. One of Schubert's happiest inspirations, the song *Hark! Hark! the lark*, came suddenly upon him as he sat in a beer-garden one Sunday afternoon in July; his other Shakespearian songs, *Who is Sylvia?* and the 'drinking song' in *Antony and Cleopatra*, being also attributable to this date. In the autumn he missed a probable appointment as director of the music at the Court Theatre of Vienna through his refusal to alter certain pieces which he had composed as a test of his fitness for the post. Some months later Schubert's songs were brought under the notice of Beethoven. They were put into his hands during his last illness by his devoted attendant Schindler, who had Schubert's welfare much at heart. The perusal of them was a revelation to him, and drew from him the exclamation: 'Truly Schubert has the divine fire!' A recurrence of his malady prevented his acquaintance with Schubert's other works, but he often spoke of him and foretold the stir which he was destined to make in the musical world. During these days Schubert twice visited the man whom of all others he admired, and, when the end had come, was one of the torch-bearers at Beethoven's funeral.

In 1827 Schubert was elected a member of the representative body of the Musical Society of Vienna, an honour which he greatly appreciated, while his prospects were further brightened by advantageous proposals from foreign publishers, the best possible proof of his growing reputation. He was thus spurred on to surpass his former achievements in the composition of his noblest symphony (No. 9 in C), begun in March 1828, and if possible more characteristic of him than the earlier one in B minor. His rate of production during this his last year was truly prodigious, for besides the symphony he wrote his Mass in E flat, the oratorio *Miriam's War-song*, the string quintett in C, and three pianoforte sonatas. He also composed several songs, the words of which his friend Schindler had found among Beethoven's papers. One of these, *Die Taubenpost*, is dated October 1828, and is probably the last piece written by Schubert. He gave his first and, as it proved, his only concert in the hall of the Musik-Verein at Vienna on the evening of March 26. The venture was extremely successful, so that for the time being the needy composer was placed beyond want, although he had to abandon his usual summer excursion on account of his poverty, which must indeed have been extreme, since he was driven to dispose of some of his finest songs for a few pence apiece.

At the end of August he took up his abode with his brother Ferdinand in a new house in the suburb of Neue Wieden, but the change seems to have had a bad effect upon his already weak state of health. He recovered sufficiently to join some friends in a short walking tour; but his illness soon returned, bringing with it complete loss of appetite. Yet he was as active as ever, both in

body and in mind. He walked much, and talked of his plans for a proposed new opera, *Graf von Gleichen*. He was able to go to hear Beethoven's quartett in C sharp minor, which greatly moved him, and to attend the first performance of a Requiem composed by Ferdinand Schubert. At the same time a study of Handel's scores caused him to reflect upon his own deficiencies in counterpoint, and to determine to remedy them by a course of lessons with Sechter, the best-known authority on the subject. The dates of the lessons were fixed and the text-book chosen. But Schubert's time for work was now over. On November 11 he wrote to Schober telling him that for eleven days he had taken neither food nor drink, and asking for some of Cooper's novels to read. A few days later he became delirious and was found to be suffering from an attack of typhus fever, to which he succumbed on Wednesday, November 19, 1828, in the thirty-second year of his age. In accordance with his latest wish his remains were buried near Beethoven's grave in the cemetery of Währung; they were reinterred in the central cemetery of Vienna on September 23, 1888.

Among composers Schubert is remarkable for the apparently ceaseless impulse to compose which possessed him; and, as a consequence, for the vast and, considering the shortness of his life, almost incredible quantity of music with which he has enriched the world. He is still more renowned for the absolute spontaneity of his writings and for the poetic spirit with which he has imbued them. But his special and peculiar eminence lies in the department of song-writing, in which he reached the highest limit of excellence, the earliest of his lyrical productions affording perfectly mature examples of artistic musical form applied to song. In other branches of composition the deficiencies of his theoretical training are often evident, but here his instincts were never at fault. There were occasions when the torrent of inspiration rushed upon him with irresistible force. At such times the recitation or perusal of a poem seemed to touch some hidden spring in him, and in a few moments he had wedded it to music in such perfect accord with the words that the finest poems of the greatest poets were by this means not so much enhanced as transcended. His usual custom, however, was to write steadily for a long time every morning; and he would sometimes compose six or seven songs in his best manner in less than as many hours. But the lyrical spirit was by no means confined to his songs; it found its way into his instrumental works, which reveal a wonderful prodigality of ideas, although comparatively little learning is displayed in turning them to account. In his orchestral writings Schubert is celebrated for extraordinary delicacy in his method of instrumentation, especially in his treatment of the wood-wind; and this is the more remarkable from the fact of his never having heard the effect of his very finest passages—for some of his noblest pieces were not performed until long after his death. He rarely altered anything he had written, and could never understand the immense pains taken by Beethoven in perfecting his scores. Schubert wrote as one impelled by imperious necessity to relieve his mind of ideas, which in his case were sometimes forgotten as soon as they were committed to paper—a fact which will be the more readily appreciated when it is remembered that, although his years were fewer than those of any other master of the first rank, he composed more than 500 songs, ten symphonies (including two left unfinished), six masses, a host of sonatas and other works for the pianoforte, a number of string quartetts (those in A minor and D minor being especially fine), as

well as several operas, cantatas, and overtures. Schubert's personal character was extremely modest and retiring; hence perhaps, to some extent, his failure to obtain any permanent appointment by which he might have been delivered from that sadly precarious mode of existence which doubtless hastened his end. His sweetness and amiability of disposition endeared him to every one, while he was generous to a fault. The insignificance of his appearance gave no token of the genius it concealed; his friend Lachner describes him as 'looking like a cabinan.'

See Grove's article, revised by Hadow, in *Grove's Dictionary of Music*; Lives by Hellborn (1866), Frost (1881), Duncan (1905), and Dahms (1912); works on Schubert's songs by Risse (in German, 1872), and de Cuzon (in French, 1900).

Schulze-Delitzsch, HERMANN, founder of the people's banks of Germany, was born on 29th August 1808, at Delitzsch, a small town of Prussian Saxony. He was educated to follow the law, at Leipzig and at Halle, and entered the public service of Prussia; but in 1841 he settled down in his native town as patrimonial judge (a kind of estate manager discharging also judicial and administrative functions), and thenceforward devoted his life to the better economic education of the small farmers and operatives amongst whom he lived. When the National Assembly was called together in Berlin in 1848 Schulze-Delitzsch, who represented his native town, was chosen chairman of a commission to inquire into the distress prevailing amongst the labouring and artisan classes; and two years later, for protesting that it was unjust to tax the people when their representatives were not allowed to deliberate together, he was tried on a charge of treason, but was acquitted. On his return to Delitzsch he started the first people's bank. In these institutions the subscribers, all contributors of small sums, received credit and dividends in proportion of their savings; the joint credit of the association was used for borrowing money; and the banks were managed by a board of the subscribers. By 1859 there were already more than two hundred of these banks in the central districts of Germany; and in that same year, at a congress which met at Halle, these were united under one organisation, with Schulze-Delitzsch as manager. The system was introduced with great success into Austria, Italy, Belgium, and Russia; and when its deviser and founder died, on 29th April 1883, at Potsdam, there were in Germany alone 3500 branches, having twelve million members, with a share capital of £10,000,000 and deposits to more than twice that sum. In 1861 he again took his seat in parliament, joining the Progressist party and labouring for constitutional reform. When Lassalle began to agitate for state loans to productive associations he found Schulze-Delitzsch, a firm believer in self-help, writing and speaking in opposition to him. 'He who preaches to the people self-help, self-responsibility, self-reliance as the condition of their economic independence and political freedom must in the first place practise these principles in his own life,' such was the social creed he lived by. And when the members of his party wished to make him a gift of £7000 in recognition of his disinterested labours in behalf of social reform, they could only prevail upon him to accept £1000 for himself; the rest he set aside for the payment of men who should promote the cause of social reform. An account of his system of people's banks is contained in *Vorschuss- und Kredit-Vereine als Volksbanken* (5th ed. 1876); besides this he wrote *Die Entwicklung des Genossenschaftswesens* (1870) and other books on co-operation.

See the Life of him by Bernstein (1879), the article CO-OPERATION, and books there cited.

Schumann, ROBERT, the great apostle of the Romantic school in music, was born at Zwickau in Saxony, 8th June 1810. His father was a man of a distinctly artistic turn of mind, and until his death in 1826 Robert had every encouragement to indulge any taste he had for music. No very decided manifestation, however, was apparent until Schumann's mother and guardian had to face a most unwelcome desire on the part of the young man, who should have been pursuing his law studies. His mother was sorely troubled, and sought advice from Frederick Wieck, the eminent pianoforte teacher. His answer favoured Schumann's ardent ambition, and at the age of twenty-one, after a desultory course of law and philosophy, a good deal of observant travel in Germany, Switzerland, and Italy, and a thorough course of Jean Paul Richter, Schumann began to qualify himself for his great mission, and settled down in Leipzig as an ardent student of music under Wieck. In his haste to become perfect in his art he defeated his own ends; for, not content with arduous practising, he had recourse to mechanical means for improving the power of his hands—one of them so violent that he permanently disabled the third finger of his right hand. He turned perforce to composition, and his misfortune has proved our gain. In 1832 Clara Wieck, his teacher's daughter, who though only thirteen years of age was already an accomplished pianist, made a deep impression on Schumann, which later developed into a still deeper and a mutual feeling.

In 1833 his first important pianoforte compositions were published (*Toccata*, &c.), and in the following year his overflowing energy conceived the idea of a new musical paper, and inspired three friends with the same enthusiasm for art criticism as he had himself. As editor of this *Neue Zeitschrift für Musik* for more than ten years he contributed many essays, some very fantastic, some of inestimable value, and all showing strong imaginative and poetical powers. His critiques on young composers are particularly interesting for their keen critical acumen, their frank admission and fearless proclamation of any good quality in any artist however young or unknown, and their generous encouragement of all earnest workers. For an account of Schumann's charming idea of an imaginary society, the *Davidbündler*, reference must be made to a more detailed notice of his life.

From the year 1836 his genius for composing asserted itself more and more, and it is very interesting to notice how it seems to have turned deliberately and methodically from one branch of composition to another. His greatest pianoforte works were written between 1836 and 1839 (*Fantasia*, *Novelletten*, *Kinderscenen*, *Kreisleriana*, *Humoreske*, *Faschingsschwank*, &c.). The reception of these works was on the whole very encouraging, and against the neglect of some authorities, and the adverse criticism of others, Schumann had the support of such as Liszt and Moscheles.

In 1835 Mendelssohn came to Leipzig filled with the energy and enthusiasm which in a few years raised Leipzig to the dignity of the most important musical centre in Germany. Schumann with ready and generous appreciation at once fell down and worshipped. 'I look up to Mendelssohn as to a high mountain peak,' he wrote. He accepted a professorship in the new Conservatorium, but he was eminently unfitted for such work, and in a short time he resigned the appointment. In 1836 a visit to Vienna yielded important though indirect results. Interested as he was in Franz Schubert's writings, he made thorough investigations for possible MSS., and was rewarded with the score of the C major symphony, which he forwarded to Mendelssohn in Leipzig, and it was performed there

for the first time eight years after the composer's death. At length in 1840, in spite of Wieck's opposition, he married his daughter Clara Josephine (born 13th September 1819). And as the time of trial had inspired some of his most tender works, notably many songs, so the perfect happiness of the next few years gave his compositions an impulse to a richer, fuller style, characterised by more repose. In the following year he turned his attention to instrumental work, and rapidly produced three symphonies and the romantic concerto in A minor. Chamber music next claimed his attention, and the three beautiful quartets prepared the way for what is probably the most widely popular, as it is one of the most perfect of all Schumann's concert pieces—the *Quintet* for pianoforte and strings. The pianoforte *Quartet* belongs to the same year (1842). In 1843, the last year of his residence in Leipzig, he produced two important choral works, *Paradise and the Peri*, which met with great success, and scenes from *Faust*. But the insidious disease which had been working in his brain since early youth, and which bereft him of reason before his death, broke out now in unmistakable symptoms, and in order to comply with medical advice he left the exciting musical life of Leipzig and settled in Dresden. For more than two years the state of his health gave his friends great anxiety, but in 1847 the clouds lifted—only, alas, to gather for the last dark years. From 1848 to 1850 works of all kinds appeared in rapid succession—*Genoëvea* (his only opera), incidental music to Byron's *Manfred*, songs, and much instrumental solo and concerted music.

In 1850 Schumann was invited to succeed Dr Hiller as musical director in Düsseldorf—a post for which he was as unfitted as he had proved for the professorship in Leipzig. He had none of the qualities necessary in a conductor—concentration of attention, prompt decision, resource; and on one occasion in a fit of absent-mindedness went on beating time after the piece had concluded. Much desultory work, some remarkably fine, some only grand fragments, some never getting beyond ambitious design, belongs to the years in Düsseldorf (1850–54); but it became ever more and more evident that he must retire from his post as a conductor, and this, naturally enough, he could not be induced to consider necessary. Hence arose ill-feeling and unpleasantness. In 1851 his former ailment broke out anew, and his eccentricity gradually grew more marked. He was subject to most curious delusions, and devoted himself largely to the art of table-turning and spiritualism. One famous delusion was that the spirits of Schubert and Mendelssohn visited him; and once he jumped up during the night to note down a theme given him, as he imagined, by Schubert—the unfinished Variations on which were his last work. In February 1854, during an attack of extreme depression, he threw himself into the Rhine, but was rescued by boatmen. Insanity had asserted its sway, and Schumann spent the last two years of his life in a private asylum near Bonn, where he died in his wife's arms, July 29, 1856, aged only forty-six.

The characteristics of Schumann's compositions are great originality and fertility in subjects and themes, freshness, force, and piquancy in rhythm, and a wealth and resource in harmony which places him among composers not far from Bach himself. Those works which are cast in certain forms, as sonatas, symphonies, &c., do not always follow the recognised canon, but the exuberance of what is generally self-contained and restrained fancy maintains such unflagging vivacity and interest that the analytical faculty is often quite disarmed. Among

writers of songs and ballads he is second to none. The extreme originality and unconventionality of his work account for a tardy appreciation, but he has won a secure place now among the great composers. His talented and devoted wife laboured incessantly to obtain a hearing for his pianoforte compositions, and she lived to see her labours crowned with success. After his death she taught at the Frankfort Conservatoire, and played in the chief cities of Europe—her visit to London in 1886 was a splendid success. She died 20th May 1896.

Other biographies and criticisms will be found in Wasielewski's *Robert Schumann* (Dresden, 1858; 3d ed. Bonn, 1880; Eng. trans. 1878), the work of an intimate friend and a long recognised authority; Dr Spitta's admirable article in *Grove's Dictionary of Music*; Reissman's *Life and Works of Robert Schumann* (Eng. trans. 1886); *Life of Schumann told in his Letters* (trans. from the German by May Herbert, 2 vols. 1890); shorter Lives by Fuller-Maitland (1884), Annie W. Paterson (1903) and Herbert Bedford (1925); the study by Camille Maclair; and V. E. Wolff, *Schumann's Lieder*. The authoritative Life of Schumann by Prof. Niecks (ed. Christina Niecks, 1925) unfortunately lacks his final revision. See also Berthold Litzmann, *Clara Schumann* (3 vols. 1903–9) and Florence May, *The Girlhood of Clara Schumann*.

Schürer, EMIL, a learned biblical scholar, was born at Augsburg, 2d May 1844, studied at Erlangen, Berlin, and Heidelberg, became professor at Leipzig, Giessen, Kiel, and, from 1895, at Göttingen. He edited the *Theologische Literaturzeitung* from its commencement in 1876, after 1881 with Harnack. He died 30th April 1910. His chief books are *Schleiermacher's Religionsbegriff* (1868); *De Controversiis paschalibus* (1869); and the *Lehrbuch der neuesten Zeitgeschichte* (1874), re-issued (2 vols. 1886–90) as *Geschichte des jüdischen Volkes zur Zeit Christi*, and in its 3d ed. (3 vols., 1901–2) a standard work, translated into English and other tongues.

Schurz, CARL, born near Cologne, 2d March 1829, entered Bonn University in 1846, joined Kinkel (q.v.) in the revolutionary movement of 1848–49, and next year returned from Switzerland and effected his master's escape. In 1852 he passed to the United States, where he speedily engaged in politics, lectured, practised law, and as major-general of volunteers took part in several battles during the civil war. Journalism next engaged his attention till in 1869 he was elected to the United States senate. In 1877–81 he was Secretary of the Interior, returned to editing, published lives of Henry Clay and Lincoln, and promoted Civil Service reform. He died in May 1906. See his *Reminiscences* (1909).

Schütz, HEINRICH (1585–1672), German composer, was chapel-master at Dresden from 1615, with a few interruptions, till his death. His settings of the *Passions* after the four evangelists, the oratorio *The Resurrection*, and other sacred works are very beautiful, while his opera, *Dafne*, is regarded as the first German opera. Schütz is important as embodying the conflict between the old polyphonic and vocal music, and the new harmonic and instrumental music of the Italian Renaissance.

Schuyler, PHILIP JOHN, a leader of the American Revolution, was born at Albany, 22d November 1733, raised a company and fought at Lake George in 1755, and rendered other services during the French and Indian War. He was a member of the colonial assembly from 1768, and was a delegate to the Continental congress of 1775, which appointed him one of the first four major-generals. Washington gave him the northern department of New York, and he was preparing to invade Canada when ill-health compelled him to hand the command over to General Montgomery. He still

retained a general direction of affairs from Albany, but jealousies and complaints, especially from Gates, rendered his work both hard and disagreeable, and in 1779, after a congressional committee had acquitted him honourably of all charges, he resigned. He would not again accept a command, although he remained one of Washington's closest friends and advisers. Besides acting as commissioner for Indian affairs, and making treaties with the Six Nations, he sat in congress from 1777 to 1781, and was a state senator for thirteen years between 1780 and 1797, a United States senator in 1789-91 and 1797-98, and surveyor-general of the state from 1782. With Hamilton (who married a daughter) and John Jay he shared the leadership of the Federal party in New York; and he aided in preparing the state's code of laws. He died at Albany, 18th November 1804. See the *Life* by B. J. Lossing (enlarged ed. 2 vols. 1872), and G. W. Schuyler's *Philip Schuyler and his Family* (2 vols. New York, 1888).

Schuykill (pron. *Skoolkill*), a river of Pennsylvania, which rises in the coal region, near Pottsville, and, flowing 130 miles south-east, past Reading and Norristown, empties into the river Delaware at the southern limit of Philadelphia. This city is built on both sides of the river, and formerly drew its water-supply from it. Coal-barges ascend the river by dams and locks.

Schwalbach, or LANGENSCHWALBACH, a spa of Germany, 8 miles W. by N. of Wiesbaden, has eight springs impregnated with iron and carbonic acid gas, the water of which is efficacious in female complaints, poor blood, and muscular weakness.

Schwann, THEODOR, naturalist and founder of the cell-theory, was born 7th December 1810 at Neuss in Rheinland, studied at Bonn, Würzburg, and Berlin, and became assistant to Johannes Müller. In 1838 he became professor of Anatomy at Louvain, in 1848 at Liège, where he also lectured on physiology. He died at Cologne, 14th January 1882. He made many discoveries on digestion, muscular structure, contractility of the arteries, and the nervous system; but his chief contributions to science, practically establishing the cell-theory, are found in his classic *Microscopic Investigations on the Accordance in the Structure of Plants and Animals* (1839; Eng. trans. 1847), the main ideas of which are explained at CELL.

Schwanthaler, LUDWIG MICHAEL, a German sculptor, was born on 26th August 1802, at Munich, the descendant of an old family of Tyrolese sculptors, and was trained in the Munich Academy of Art and in his father's workshop. After a visit to Rome he set up a studio at Munich, and, being brought under the notice of King Louis, was charged to execute for the Glyptothek several bas-reliefs and figures. In 1832 he revisited Rome, for the purpose of preparing models for the national monument of Valhalla and the Pinakothek. On his return to Munich (1834) he began his bas-reliefs and sculptures for the Königsbau. In 1835 he was appointed professor at the Munich Academy. The number of his works is singularly great, while their excellence places him in the first rank of German sculptors. Yet, spite of his power of design, he is somewhat conventional in his conception; and his influence on art has not been all for good. The multitude of his commissions is responsible for a good deal of work being left to his assistants, and for the lack of careful finish such work shows. Among his remaining efforts may be mentioned two groups for the gable ends of the Valhalla, the colossal statue of Bavaria, 60 feet high, that stands in front of the Temple of Fame, statues of Goethe, Jean Paul Richter, and Mozart, of Venus, Diana, Apollo, Bacchus, &c., and many

others, both groups and single figures. He died on 28th November 1848, leaving his models to the nation.

Schwarz, BERTHOLD. See GUNPOWDER.

Schwarzburg, an old princely family of Germany, which traces its descent from a Thuringian count, Günther, whom St Boniface converted to Christianity. The first to adopt the title of Schwarzburg was Count Sizzo IV., early in the 12th century. Count Günther XXXIX., who introduced the reformation into his states, was the common ancestor of the two lines of the Schwarzburg family: his son Johann Günther founded the line of Schwarzburg-Sondershausen, and Albert that of Schwarzburg-Rudolstadt.

SCHWARZBURG-RUDOLSTADT and SCHWARZBURG-SONDERSHAUSEN, two former sovereign principalities of Germany, situated partly in the Thüringerwald and partly in Prussian Saxony, and since 1919 forming part of the republican state of Thuringia (*Bundstaat Thüringen*). In the Saxon portion (where is found the Kyffhäuser, the mountain under which, according to the legend, Frederick Barbarossa sleeps) agriculture is the mainstay of the people; in the Thüringerwald, manufacturing industry (porcelain, glass, machinery, mathematical instruments, &c.), mining, forestry, and grazing. Education stands at a high level. The chief towns are Rudolstadt (14,887) and Sondershausen (9122). In 1922 a new division of the territories was made (see THURINGIA).

Schwarzenberg, a princely family of Germany, the head of which was raised (1429) by the Emperor Sigismund to the dignity of Baron of the Empire. Three of this family have acquired a European reputation. ADAM, Count of Schwarzenberg, who was born in 1584, became (1619) prime-minister and adviser of George William, Elector of Brandenburg. He was all-powerful during the Thirty Years' War, and brought down terrible calamities on Brandenburg by his obstinate refusal to join the Protestant union and his firm adherence to a policy of neutrality. He died 14th March 1641, shortly after the death of his master.—KARL PHILIPP, Prince of Schwarzenberg, won distinction as an Austrian field-marshal during the Napoleonic wars. He was born at Vienna, 15th April 1771, and first served against the Turks. In the war against the French republic he fought with especial honour at the battles of Cateau-Cambrésis (1794), Würzburg (1796), and Hohenlinden (1800), and reached the grade of lieutenant field-marshal. He was under the orders of Mack in the campaign of 1805; and, when he saw that Ulm was lost, he cut his way through the French army and retired to Eger. He was ambassador at the Russian court in 1808 by the express wish of the Emperor Alexander, fought at Wagram in 1809, and conducted the negotiations for the marriage between Napoleon and Maria Louisa. In this capacity and as ambassador at Paris he so far gained the esteem of Napoleon that the latter expressly demanded him as general-in-chief of the Austrian contingent which was sent to aid France in the invasion of Russia in 1812. Schwarzenberg passed the Bug and achieved some slight successes, but was driven into the 'duchy of Warsaw,' where, acting on secret instructions from Napoleon he took up a position at Pultusk and remained inactive. In the following year he was appointed to the command of the Austrian army of observation in Bohemia; and when Austria joined the allied powers he became generalissimo of the united armies, was defeated by Napoleon at Dresden, and was late at Leipzig. In 1814 he helped to occupy Paris. He died of apoplexy at Leipzig, 15th October 1820. Although a bold and skilful leader of cavalry, as a general

he was a pedant. See Life by Prokesch-Osten (new ed. 1861). — His nephew, **FELIX LUDWIG JOHANN FRIEDRICH**, born 2d October 1800, was sent on a diplomatic mission to London in 1826, but became involved with Lady Ellenborough in a divorce case, was ambassador at Naples in 1846, distinguished himself in the Italian campaign of 1848, was placed at the head of affairs at Vienna, called in the aid of the Russians against Hungary, and pursued a bold absolutist policy, his object being to make Austria supreme amongst the German states. He died at Vienna, 5th April 1852. See Life by Berger (Leip. 1853).

Schwarzwald. See BLACK FOREST.

Schwatka, **FREDERICK**, Arctic explorer, was born at Galena, Illinois, 29th September 1849, graduated at West Point in 1871, and served as a lieutenant of cavalry on the frontier till 1877, meanwhile being also admitted to the Nebraska bar and taking a medical degree in New York. In 1878-80 he commanded an expedition to King William's Land which discovered and buried the skeletons of several of Sir John Franklin's party, and gathered information which filled up all gaps in the narratives of Rae and McClinton, besides performing a notable sledge-journey of 3251 miles. After exploring the course of the Yukon in Alaska, in 1884 he resigned his commission. In 1886 he commanded the *New York Times* Alaskan expedition, and ascended Mount St Elias to a height of 7200 feet; and in 1891 he led another party to Alaska which opened up some 700 miles of new country in the same quarter. In 1889 he had led an expedition, for the journal *America*, into Chihuahua, in Northern Mexico. He died 3d November 1892. He published *Along Alaska's Great River* (1885), *Nimrod in the North* (1885), *The Children of the Cold* (1886). See also *Schwatka's Search*, by W. H. Gilder (1881).

Schwedt, a town of Prussia, in the province of Brandenburg, on the Oder, 28 miles SSW. of Stettin, with wood-sawing, lime-burning, and tobacco industries. It was the residence of the margraves of Brandenburg-Schwedt from 1689 to 1788, and was entirely rebuilt after a fire in 1684.

Schwegler, **ALBERT**, theologian and philosopher, born at Michelbach in Württemberg, 10th February 1819. He studied theology at Tübingen, and was profoundly influenced by the writings of Hegel, Strauss, and especially Baur. His striking treatise on Montanism (1841) and many contributions to Zeller's *Theologische Jahrbücher* brought him into collision with the church authorities in Württemberg, and caused him to abandon the clerical calling. In 1843 he started the *Jahrbücher der Gegenwart*, and habilitated as *privat-docent* in philosophy and classical philology at Tübingen, where in 1848 he became extra-ordinary professor of Classical Philology, later ordinary professor of History, and died 5th January 1857.

Besides theological works he was author of a translation with commentary of Aristotle's *Metaphysics* (4 vols. 1847-48); the *Geschichte der Philosophie* (1848; Eng. trans. by Dr Hutchison Stirling, 1872), a masterly sketch; and the posthumous *Geschichte der Griech. Philosophie* (ed. by Köstlin, 1859), in which he broke away from his earlier Hegelianism. He left unfinished a *Röm. Geschichte* (3 vols. 1853-58; continued by Clason).

Schweidnitz, a town of Lower Silesia, 36 miles by rail SW. of Breslau. Woollen and linen goods, agricultural implements, gloves, needles, pottery, and numerous other articles are manufactured. The beer has been celebrated since the 16th century. Considerable quantities of flax and beet-root are grown in the neighbourhood. Between 1641 and 1807 Schweidnitz was besieged and taken six times, the last time by the French, after which

the defences were in great part destroyed. Pop. 27,000.

Schweinfurt, an ancient and long an imperial free city in the north-west of Bavaria, on the Main, 28 miles NE. of Würzburg by rail. It contains a beautiful market-place, in which important cattle and wool markets are held. Wine-growing, sugar-refining, and manufactures of chemicals, paper, bells, dyeing materials, as white-lead, ultramarine, Schweinfurt green, &c., and numerous other articles are carried on. Rückert, the poet, was born here; and a monument was erected in 1890. Pop. 32,000.

Schweinfurth, **GEORG AUGUST**, a German traveller in Africa, was born in Riga, 29th December 1836. He studied at Heidelberg, Munich, and Berlin, making botany his specialty. In 1864 he made a journey by the Nile and the Red Sea to Abyssinia. In 1869, by the aid of a grant from the Humboldt Society of Berlin, he again started for Khartum, whence he made his way into the interior in the company of ivory-traders, passed through the regions inhabited by the Bongo, Dinka, Niam-Niam, Madi, and Monbuttu peoples, and discovered the Welle. He returned in 1871, and in 1874 published his travels, an English translation, *The Heart of Africa*, appearing the same year (new edition in 1918 with much new material). Between 1874 and 1883 he explored various districts of Egypt, especially their botany. In 1880 he was appointed director of all the Egyptian museums, &c. in Cairo. In 1891-94 he made botanical expeditions to Erythraea. He died 20th September 1925. He published *Artes Africane* (Leip. and Lond. 1875) and numerous papers in periodicals, &c.

Schweitzer, **ALBERT**, German philosopher, theologian, and musician, born at Colmar, 14th January 1875, studied philosophy and theology at the universities of Strasburg, Paris, and Berlin. He is a well-known organist and authority on the music of Bach. He graduated in medicine in 1913 specially to do medical missionary work (1913-17) in Equatorial Africa in connection with the denominational Paris Evangelical Mission. His literary works include *The Quest of the Historical Jesus* (1906), *Life of J. S. Bach* (1908), *Paul and his Interpreters* (1912), *On the Edge of the Primeval Forest* (1922), *The Philosophy of Civilisation* (1923), and *Memoirs of Childhood and Youth* (1924). Most of his books have been translated into numerous European languages.

Schwenkfeld, **CASPAR VON**, founder of a Protestant sect, was born of noble family in 1490 at Ossig near Liegnitz in Lower Silesia, studied two years at Cologne and elsewhere, and, before retiring into private life in 1521 to a constant study of the Scriptures, served at various courts with Duke Charles of Münsterberg, and as aulic counsellor with Duke Frederick II. of Liegnitz. He became acquainted with the views of John Huss, from his youth up had been a student of Tauler, and was permanently won over to the Reformation by the noble courage of Luther at Worms. About 1525 he openly declared for Luther, and went to Wittenberg to converse with him, but found his views widely divergent on baptism and the eucharist. Still further, he found himself unable to accept any confessions of faith except such as followed closely the letter of Scripture, and in his profound conviction that the new movement should proceed from within outwards, and not from without inwards, he disagreed with the Lutherans in their policy of linking the Reformed Church with the state, instead of waiting passively for the direct guidance of the Holy Spirit, the sole fountain of sanctification. Schwenkfeld did not himself

partake of the Lord's Supper, although he did not forbid it to others, for he held that there could be no right participation without the exclusion of unbelievers, and that the true Lord's Supper is kept through faith inwardly in the soul as often as a man receives *divine sweetness in Christ*. He did not approve of infant baptism, yet without admitting the Baptist view of the importance of the baptism of adults. His views coincide with those of George Fox in the doctrine of the Inward Light, the Immediate Revelation, and the inability of mere outward bodily acts, such as partaking of the Lord's Supper or baptism, to give the inward and spiritual reality and power of the Lord's 'body' and 'blood,' or that of the spiritual 'washing of regeneration.' Schwenkfeld's views in that intolerant time brought him the hatred of Lutherans and Catholics alike. The influence of the Emperor Ferdinand forced the Duke of Liegnitz to banish him in 1529, and he thereafter travelled to Ulm, Augsburg, Nürnberg, and Strasburg, everywhere gaining disciples. Luther fiercely denounced him, and many untrue charges were brought against him by others, but all the violence of his antagonists the much-enduring man received with saintly patience. He died at Ulm, 10th December 1561. Schwenkfeld wrote ninety distinct works, most of which were burned, if not answered, by both Protestants and Catholics. One of the most important was his *Bekandtniss und Rechenschaft von den Hauptpunkten des Christlichen Glaubens* (1547). By means of personal teaching and his books a group of earnest disciples more than 4000 strong was formed all over Germany, but mostly in Swabia and Silesia, who separated themselves under the name of Confessors, or Followers of the Glory of Christ. They were persecuted in Silesia in his lifetime, and many emigrated to Holland, some to England. The Jesuit mission established in Silesia in 1719 persecuted the remnant still further, and some joined the Protestant churches, some fled to Saxony, where they were protected by Count Zinzendorf. In 1734 forty families emigrated to England, and finally thence to Pennsylvania, where, as Schwenkfeldians, they have maintained a distinct existence to this day.

See H. W. Erdkam, *Geschichte der protestantischen Sekten im Zeitalter der Reformation* (Hamburg, 1848); Kadelbach, *Geschichte Schwenkfelds und der Schwenkfeldianer* (Lauban, 1861); and Hoffmann, *Kaspar Schwenkfeld's Leben und Lehren* (1897).

Schwerin, capital of the German republic of Mecklenburg-Schwerin, is agreeably situated on the west shore of the Lake of Schwerin (14 miles in length and 3 broad), with smaller lakes behind it. It is surrounded with suburbs and contains the former grand-duke's castle (1845-58), partly burned in 1913, a Renaissance structure; the cathedral (1365-1430), with interesting monuments and stained glass; an arsenal; a museum and picture-gallery. It manufactures lacquered wares, machinery, cloth, &c. Pop. 45,000.

Schwyz, a canton of Switzerland, touches in the north the Lake of Zurich, and in the west the Lakes of Zug and Lucerne. Area, 351 sq. m.; pop. 60,000, nearly all German-speaking and Roman Catholics. The surface is mountainous, rising to 7494 feet, and in Kinzigkum on the border to 9052 feet. Cattle-breeding and the keeping of swine, goats, and sheep are the principal occupations, though cotton and silk are both spun and woven, and much fruit is grown. Schwyz *Kirschwasser* being in great demand. The celebrated monastery of Einsiedeln (q.v.) attracts large numbers of pilgrims, and the Rigi (q.v.) vast numbers of tourists in the summer. Schwyz, one of the three original cantons of the Swiss Confederation (1291,

the others being Uri and Unterwalden), and also one of the Four Forest Cantons, has supplied the name to the whole country of which it forms a part. The people govern themselves through a grand council, consisting of one representative for every 600 citizens, and an executive of seven members chosen by the council from its own body; all these rulers are elected for four years. Schwyz, the capital, is picturesquely situated 26 miles by rail east of Lucerne, and has a Rathaus decorated with frescoes. Pop. 8000.

Sciaccia (anc. *Thermæ Selinuntinæ*), a seaport on the south coast of Sicily, stands on a bold cliff 30 miles NW. of Girgenti, has an 11th-century cathedral, the ruined castles of the Lunas and the Perollos (between whom there existed a terrible feud), an old palace of the Saracen governors (now a convent), and hot sulphurous and saline springs half-way up the adjacent Monte San Calogero, with caves that have been used as steam baths since Phœnician times. Off the coast very productive coral banks were discovered in 1875-80. Tommaso Fazello (1498-1570) the father of Sicilian history, was born here. Pop. (1921) 25,630.

Sciatica is the term given to neuritis of the great sciatic nerve, the largest in the body, which passes down the back of the thigh. It is characterised by irregular pains about the hip, especially between the great trochanter of the thigh-bone and the bony process on which the body rests when sitting, spreading into neighbouring parts, and running down the back of the thigh to the leg and foot; or the pains may occupy only isolated parts, as the knee-joint, the calf of the leg, or the sole of the foot. It generally differs from the most typical forms of Neuralgia (q.v.) in that the pain, though subject to severe exacerbations, is constantly present. The nerve usually becomes very tender to touch, either at isolated points or throughout; and, in severe and prolonged cases, diminution of sensation in the area of distribution of the nerve, and wasting of the muscles of the limb, are apt to occur. It is sometimes dependent on a gouty condition of the system; but more frequently can be traced to some definite exposure to cold or wet, or to chronic constipation. It is often a very obstinate disease: the treatment must be conducted on the same lines as that of other forms of neuritis. Here Acupuncture (q.v.) and injection of saline solution, novocain, &c., into the nerve are specially valuable. In intractable cases *nerve-stretching*—i.e. cutting down upon the trunk of the nerve, and forcibly pulling upon it—has often been successful where all other measures have failed to cure. The same result may sometimes be obtained by forcibly bending the thigh up towards the abdomen.

Siceli, a town in the south-east corner of Sicily, 50 miles SW. of Syracuse by rail, with some cloth-weaving and cheese-making. Pop. (1921) 23,953.

Science. From early life everyone is interacting with his environment, and this both natural and human; and thus is becoming acquainted with it in the concrete, and with some understanding as well. Wonder early awakens, curiosity develops, and observation may thus become habitual; even reflection also; while from child's play to most developed occupations, both experience and reasoned activity increase. We all thus acquire some knowledge of surrounding nature and civilisation, with material for thought accordingly; and in the measure in which this discloses some uniformity amid the variety of nature, something of order in the multifarious details of life and work, we have made our beginnings of the respective sciences. Ideas spread, and are passed on by tradition; though often uncritically, and so

tending to loss or confusion, as well as gain. In short, science begins with observation; its 'common sense' advances to reflective thought, seeking to understand and interpret the given phenomena. Yet our explanations need verification, by observation anew, and by experimental tests so far as may be, since otherwise the possibilities of error are manifold.

Primitive folk, as gatherers and fishers, were thus necessarily much of naturalists, and even something of herbalists and physicians. They prepared for physical sciences with their increasing mastery of flint and fire; and further, through their quests of metals, from gold to copper and tin for bronze, and thence made progress through the iron age towards the active science of later times. And since the prime use of language and its main development have obviously been in speaking of our human affairs, past, present, or possible, what we now call the social sciences—history and biography, economics, &c.—must similarly be remotely prehistoric in their earliest origins. The daily and nightly marvel of the heavenly bodies, yet their cyclic regularities of appearance and succession, not only initiated astronomy, but first raised it to scientific rank; the more with its observations of movements in time and space reinforced by human and terrestrial measurements and numberings, the beginnings of mathematics. Primitive reckonings by lunar months were thus surpassed by the great discovery of the solar year; and its services in anticipating the seasons, invaluable for agriculture especially, raised astronomers to priestly guidance of early societies, as testified by the stone circles of the neolithic past, as well as by the temple-observatories of Egypt and Babylon. No doubt all this with priestly conservatism as well, and with astrologic developments more than astronomic: yet these evoked observations and reflection, indeed until comparatively recent times. It is the great service of Greek astronomers to have developed their science towards cosmic clearness, and for its intellectual interest, in substantial freedom from dubious human applications; and thus not only up to the Ptolemaic system, but even to forecasts of the Copernican. The Greeks also developed for us the fundamentals of mathematics, as not only for arithmetic and geometry, but even to conic sections, though these had to wait many centuries for their astronomic applications. Again the torments of diseases, the quests of remedies, the mysteries of birth and of death, with the various practices of burial also, have aroused reflection; and with contributions, through the medical and surgical arts, towards the beginnings of physiology, pathology, and anatomy, and of botany and zoology as well. Yet truly scientific observation and thought in medicine substantially date for us from the Greek physician Hippocrates; and zoology, botany, embryology, &c. from Aristotle. Indeed, each of these founders in his own way anticipated much of that general study of life we now call biology. The advancing archaeology and history of ancient civilisations—those of Egypt and Babylonia especially, but also of China and India—are yielding frequent evidence of scientific and medical knowledge; and the Greeks acquired much from their neighbours and their past: yet none the less we have to recognise them as substantially initiating the orderly study and presentment of each and all our modern sciences, as their very names indeed testify—logic and mathematics, astronomy, mechanics and physics, zoology and botany, and even history, economics, and ethics. All these were included, albeit at first too simply, within the comprehensive purview of philosophy; and this especially within the encyclopedic mind of Aristotle. The history

of science, so fundamental to adequate appreciation of each and all its fields, is thus essentially of the development, or renewal, of Greek initiatives. Main results of these were further systematised in Hellenistic times, as at Alexandria especially. They too much subsided in Roman days, and more throughout the barbaric invasions, and with but very imperfect recovery in the middle ages. Amid the freer inquiries of the Renaissance, the renaissance sciences had struggles and difficulties, indeed still scarcely ended; yet the four past centuries have increasingly produced initiatives and endeavours worthy of the best days of Greece, and still accelerating in the current century. To trace such varied histories is beyond these limits: but see articles on GREECE, ROME, MIDDLE AGES, RENAISSANCE, &c.; also ASTRONOMY, MATHEMATICS, MECHANICS, PHYSICS, CHEMISTRY, PHYSICAL CHEMISTRY, GEOLOGY, ZOOLOGY, BOTANY, BIOLOGY; likewise GEOGRAPHY, HISTORY, BIOGRAPHY, ARCHAEOLOGY, ANTHROPOLOGY, ETHNOLOGY, POLITICAL ECONOMY, and SOCIOLOGY; also LOGIC, ÆSTHETICS, PSYCHOLOGY, ETHICS.

Leaving the outlines, generalisations, and methods of each science to the above articles and their sub-references, the question next arises of their correlation and classification towards a unified view of science as a whole, and throughout the range of nature and discourse. This inquiry again comes down from Greek philosophy and science; and it is traceable through mediæval endeavours—as so notably by Aquinas as philosopher and Roger Bacon as scientist—to the Renaissance, with Descartes and Francis Bacon as its illustrious types. Stirred by the encyclopedic movement of the 18th century, and the varied industrial, political, and social changes which followed it, there came the completion of the series of main sciences by the founding of Sociology by Comte. This was essentially based upon his 'law of three states' (see SOCIOLOGY) and his serial classification of the sciences (and claim for education accordingly), as from mathematics, through astronomy, physics, and chemistry, to biology (including psychology), and all as leading up to the social science in its various fields. He also showed the necessity of the essentials of all these, in harmony with ethics, for the adequate conduct of life—industrial, social, political, and even moral and religious.

Despite Herbert Spencer's criticisms, his best work substantially followed on these lines; and subsequent writers have scarcely modified them. Each science, however, has now so multifarious a subdivision of labour into specialised fields, each with a copious and increasing literature of its own, that many of their productive workers practically despair of the co-ordination of knowledge, as beyond our human powers. This indeed is an old story; for even the 13th-century alchemist, Basil Valentine, quaintly says, 'the shortness of life maketh it impossible for one man thoroughly to learn antimony, in which every day something of new is discovered:' and if for 'antimony' we now read 'radium,' this saying may again seem more convincing than ever. Yet to this, Leibniz, the most comprehensive mind of Newton's century, provided the needed reciprocal assurance: 'I perceive that the more a science advances, the more it concentrates into little books.' Continued evidences of this generalising progress of the sciences are not far to seek. Thus in the last century witness the unification of the mechanical and physical sciences through the doctrine of energy; the illumination of chemical thought by Mendeleeff's law, by the introduction of spectroscopy, &c.; and again for biological science, with the cell-theory, the germ-theory, &c.; and above all, for it, and for other sciences also, with the

doctrine of Evolution. So, too, in the first generation of this century we have had the rise and advance of radiology, with its revolution in our physical and chemical conceptions; and next, Einstein's at first so perplexing doctrine of relativity, with its even further-reaching range and significance. After these, indeed, it has seemed as if each and every science were again in the melting-pot; yet is not that a symbol of purification for each, and of fresh combination for all? Such unifications are thus ever coming into view, and for concrete knowledge and abstract thought together. The task of science, concretely viewed, is to prepare a general cosmography; within which the heavenly bodies, the whole earth—with its rocks and minerals, its plant and animal life, and its human types and communities as well—have all to be observed, analysed, and classified as far as may be. Yet all this in no mere static enumeration nor museum presentment, but in their movement and life, their interrelations of actions and reactions accordingly. We are thus ever searching more deeply into the rationale of phenomena. Astronomy advances, not simply with deeper telescopic penetration, into its ever-extending universe; it is also rendering this more intelligible mathematically, and even physically and chemically as well. As geological surveys and maps spread over the globe, the play of physical forces is increasingly explaining them; witness the many clarifying theories, as of recurrent glacial ages, of volcanic and earthquake action, of earth-upheavals, thrusts and subsidences, and even of the drift of continents. And the more our fossil collections increase, the more they set before us life's histories in their courses of evolution. Biology is in unifying flux—its sub-sciences are coming together, and into a new harmony with psychology, since mind and body are becoming viewed as in evolution together. Archaeology and anthropology are elucidating man's sub-human origins and his early past; and even illuminating the evolution of civilisations from simplest surviving peoples to long lost or too imperfectly known cultures, and again to our own contemporary ways of life and even types of mind. The biological, psychological, and social sciences, despite all those complexities and intricacies which prevent them from attaining the demonstrative lucidity of mathematics and physics, are thus bringing their long separate and detailed advances towards harmony, and into a vision of life in its creative evolution. This utilises all that the preliminary sciences have been yielding since Descartes's times, yet is also becoming liberated from their too simply mechanistic interpretations; and, with its own more vital and psychologic conceptions, it even shows beginnings towards harmonising these physical advances in imagery less traditionally material, and more energetic and dynamic.

Thus, what subjects have longer seemed less on speaking terms than geography and philosophy?—geography with its naively concrete and mundane explorations, descriptions, and mappings; and philosophy with its lofty abstractions, as from the good, beautiful, and true of Plato to the manifold thought-systems which have succeeded his, and which still range from frankest materialisms—stopped short at the Unknowable, to idealisms and transcendentalisms—pressing forward towards the Absolute. Yet since evolution becomes more and more discernible throughout this everyday world, our cosmography—physical, organic, and human alike—is now becoming a rational cosmogony, in which all the sciences have their part. Such a comprehensive conception of evolution extending throughout the universe of nature and humanity is thus at once philosophic and scientific, since unifying our studies of nature and life with our best thought. If so, we can no

longer think of cosmography and philosophy as at contrasted poles of thought, but as combined throughout its single sphere, in fact as cosmosophy; so that even terms like 'geosophy' and 'biosophy' are also needed to express this dual parentage, scientific and philosophic, in harmonious union. Again, nature and life are alike rich in beauty; the sciences are ever advancing in the discovery and enjoyment of truth; and the broadening and deepening anew of life we thus attain, despite all struggles, arrests, and deteriorations, exhibits above all the increasing dominance of species-regarding and life-regarding processes over simply individual and utilitarian functionings; at briefest, then, the triumph of love over hunger, of altruism over egoism; and thus a predominant evolution of the good. In short, evolutionary science is Platonist as well as Aristotelian. Hence philosophy at its best, with its increasing quest of widest and deepest truth—and even religion at best also, with its endeavours to advance and express goodness and love in their ideal union with truth and beauty at their highest—have alike nothing to fear from science. Its at times seeming destructive criticisms are indeed increasingly acknowledged as often of service to religion towards liberation from burdens of tradition and misunderstandings delaying its vital fulfilment.

Yet this view of science as it tends to be is too optimistic for science as it yet is. Admission must candidly be made that the advances of the physical sciences—say rather of their applications, as in the unparalleled progress of our industrial age, and also towards its destructive activities of war—have had tragic consequences, and these still far from ended. The explanation of these is not far to seek; it lies fundamentally in the ascending order of knowledge, with its increasing complexities, so that the mathematical and physical sciences, as relatively simplest, are as yet by far the most developed and applied. With these sciences we can and do have their ever-increasing applications in material developments, manufactures, transports, and communications, and for peace and war alike; also in business, exchanges, and pecuniary interests concerned with all these. Thus arise tensions, rivalries, and struggles, which oscillate between internal social strifes and external wars; while for these latter especially, the applications of the physical sciences are more and more destructively potent. Hence the frequent dread of science, sometimes even to despair. Yet it is this incompleteness of science which is dangerous. Given mathematics, with its conceptions of movement, time, space, and number, and the physical sciences, thus intellectually reinforced for their increasing mastery of the matters and energies of the inorganic world, these cannot yield more than a mechanistic view of life and society. Hence, if such range of science and its philosophy be final, there is no escape from more rigorous acceptance and more unsparing application of them than ever; and with fullest pessimism accordingly. But if the sciences of life and mind, of society and morals, be emancipating themselves, as above noted, from this mechanistic domination, and entering on a fresh period of synthetic progress, the whole perspective of science and its philosophy must also change, to an evolutionary view, demonstrably melioristic. For as man must ever strive to put his knowledge to practice and service, and thus has been applying his mechanistic knowledge to the full, so also he cannot but consider and attempt the application of the higher and complexer humanistic sciences, the more since now in their turn also advancing towards clearness. The social and moral sciences, as they progress, are thus assured of

They sheltered Prince Charles in 1645 before he fled to Jersey (Clarendon here began his History), and Cromwell's Tower on Tresco was set up by the parliamentary forces. In 1834 they were leased to Augustus John Smith, a radical reformer, although somewhat of an autocrat, the best friend the islanders have ever had. He made Tresco his home for thirty-eight years, and his tropical gardens there are unique in northern Europe. He built churches and schools, suppressed smuggling, encouraged agriculture, and forbade overcrowded holdings. In 1921 the current lease was surrendered by the family.

The climate is mild, but necessarily damp, and the weather is changeable and frequently stormy; but the temperature is extremely equable, averaging 57° F. in summer and 47° F. in winter. The leading natural features of the scenery are the fantastically weathered rocks and rock-basins and the bold coast-lines. There are remains of stone circles; and a perfect kistvaen (containing human bones showing traces of fire action) was opened upon Samson in 1862. Tresco Abbey and its gardens are considered the leading objects of interest for the tourist. No part of the islands is more than 160 feet above sea-level. The highest points are the 'Telegraph' on St Mary's, and St Martin's Head, which has had a daymark since 1833. There has been a lighthouse on Bishop Rock since 1858, and on Round Island since 1887, and on St Agnes from 1630 to 1911, when it was superseded by one at Peninnis Head on St Mary's. Hugh Town on St Mary's, from which a panoramic view of the whole group can be obtained, is the only town on the islands. There is good anchorage in the roadstead. Many of the islands, especially Annet, abound with sea-fowl.

Wrecks used to be very numerous and were a fruitful source of wealth. One of the most famous was that of three ships of Sir Cloudesley Shovel's fleet in 1707, when 2000 men, including the admiral, were drowned. Farming is practised, and early potatoes and broccoli are exported; but the principal industry now is the cultivation of narcissus and lilies between the months of December and May. Nearly all the available acreage is occupied with bulbs. Large cargoes of mackerel are sent to the mainland, but the fishing-boats belong to Penzance and the east coast.

Scimitar, an oriental sabre. See SWORD.

Scinde. See SIND, SINDHIA.

Scink. See SKINK.

Scintillation, or twinkling of the stars, is a familiar phenomenon to all who have directed their attention to the firmament above us. Under ordinary atmospheric conditions this flickering is possessed only by the so-called fixed stars (see STARS). A planet shines steadily and by this mark can readily be picked out. When near the horizon, however, planets have been observed to scintillate slightly; while stars at low altitudes invariably twinkle more vigorously than stars overhead. This at once points to the atmosphere as an important factor, since the phenomenon is more pronounced when the light has to traverse a greater depth of air. Again, when viewed through sufficiently large telescopes stars cease twinkling altogether. The action of the telescope is to concentrate upon the eye a much larger pencil of rays than could naturally enter it. Instead of one slender ray the eye receives the integral effect of a great number of rays, whose individual features are lost in the general average. In the case of a planet, again, the rays which fall upon the retina converge from all parts of a disc of sensible size; and in the integral effect of this pencil the individual features of the component rays are lost. But

a star is so far distant as to be virtually a point of light. In this case we have an excessively slender ray infinitely narrow compared even to the small pencil of light that comes to us from a planet. The vicissitudes of refraction which a star-ray experiences in passing through the infinitely irregular variations of density, temperature, and humidity in our atmosphere characterise its integral effect on our retina, and the result is twinkling. The exquisite chromatic effects that accompany the twinkling of a bright star like Sirius are fully accounted for in terms of this general explanation. It is possible indeed by separating the images of a star produced in the two eyes to observe two different scintillations at one and the same time. Scintillation may thus be said to depend on three factors: (1) The vast distance even of the nearest stars reducing the largest of them to mere points of light; (2) the ever-changing variability in condition of the atmosphere through which the light must come to us; (3) the smallness of aperture of our eye, which receives an almost ideal single ray of light.

Scio. See CHIOS.

Scioppius (Latinised form of *Schoppe*), KASPAR, a classical scholar and controversialist, was born at Neumarkt in the Palatinate, 27th May 1576, and studied at Heidelberg, Altdorf, and Ingolstadt. Whilst on a visit to Prague in 1598 he abjured Protestantism and became a Roman Catholic. Henceforth his career is a series of fierce onslaughts on his former co-religionists, on the old Latin writers, and on all who enjoyed a reputation in the world. He was honoured with the title of a count of Spain, and was made a pensioner of the Vatican. Amongst the first to feel his venom was Scaliger (q.v.), against whom in 1606 he launched *Scaliger Hypobolimeus*. Sent in 1608 by the court of Rome to the diet of Ratisbon for the purpose of observing the religious condition of Germany, he published numerous pamphlets against the Protestants, recommending the Catholic powers to use every means for their extermination. Shortly afterwards he fired off several venomous libels against James I. of England. For this the servants of Lord Digby, ambassador in Madrid, gave him a sound cudgelling in that city in 1614. Scioppius fled from Spain to Ingolstadt, where he issued his *Legatus Latro* (1615) against the ambassador. In 1618 he went to Milan, where he resided for the next twelve years, devoting himself partly to philological studies and partly to theological warfare. He died at Padua, 19th November 1649, the reviler of all respectable parties, loved by none, but also feared by none. Scioppius was a prodigious scholar, and might have rivalled Scaliger himself in reputation, as he did in learning, had it not been for the infirmities of his temper and judgment. His most important work is *Grammatica Philosophica* (1628); next in value come *Verisimilium Libri Quatuor* (1596), *Suspecta Lectiones* (1597), *De Arte Critica* (1597), *Observationes Linguae Latinae* (1609), *Paradoxa Literaria* (1623), and *De Scholarum et Studiorum Ratione* (1636).

Scioto, a beautiful river of Ohio, rises in the north-west portion of the state, and flows east and then south, past Columbus and Chillicothe, to its junction at Portsmouth with the river Ohio. It is nearly 300 miles long, and from its mouth to Columbus feeds the Ohio and Erie Canal.

Scipio, PUBLIUS CORNELIUS, surnamed AFRICANUS MAJOR, one of the most famous soldiers of ancient Rome, was born in 237 B.C. He took part in the disastrous battle of the Ticinus (218), where he saved his father's life, and later at the Trebia

and the fatal field of Cannæ. In 212 he was elected ædile, though not yet of legal age, and in 210 was specially selected by acclamation of the people as a general extraordinary for Spain. His noble beauty and personal charm proved irresistible, but in this gracious and self-reliant youth of twenty-seven the people had found a hero and the state a saviour. His arrival gave a new turn to the war. By a bold and sudden march he captured *Nova Carthago*, the stronghold of the Carthaginians, and his courtesy soon won over many of the native chiefs. He checked Hasdrubal, but failed to prevent him from crossing the Pyrenees to the assistance of Hannibal. In 207 he won a decisive victory over the other Hasdrubal (son of Gisgo) and Mago, which gave him the whole of Spain. Soon after he returned to Rome, where he was elected consul (205) though he had not yet filled the office of prætor. His favourite plan to transfer the war to Africa was opposed by a party in the senate; but the popular enthusiasm for the name of Scipio proved too strong, and in 204 he sailed from Lilybæum, in Sicily, with 30,000 men, and landed on the coast near Utica. His successes against Syphax and their own armies compelled the Carthaginians to recall Hannibal from Italy—the very object Scipio had laboured to achieve. After some abortive efforts at reconciliation the great struggle between Rome and Carthage, between Scipio and Hannibal, was terminated by the battle fought near Zama, 19th October 202, in which the Carthaginian troops were routed with immense slaughter. Hannibal advised his countrymen to abandon what had now become a hopeless and ruinous contest, and his advice was taken. The noble magnanimity of Scipio's character made submission the more easy; and peace was concluded in the following year, when the conqueror returned to Rome to enjoy a triumph. The surname of Africanus was conferred on him, and so extravagant was the popular gratitude that it was proposed to make him consul and dictator for life, honours which would have been the destruction of the constitution, but which Scipio was either wise enough or magnanimous enough to refuse. In 190, in order to give him his aid, he served as legate under his brother Lucius in the war with Antiochus, and crushed his power in the great victory of Magnesia. But after their triumphant return a prosecution was raised against Lucius for allowing himself to be bribed by Antiochus, the colour being the too lenient terms he had been granted. Lucius was declared guilty by the senate; his property was confiscated, and he himself would have been thrown into prison had not Africanus forcibly rescued him from the hands of the officers of justice. In 185 Scipio was himself accused by the tribune M. Nævius; but, instead of refuting the charges brought against him, he delivered, on the first day of his trial, a eulogy on his own achievements, and opened the second day by reminding the citizens that it was the anniversary of the battle of Zama, and therefore a time to return thanks to the immortal gods, and to pray for other citizens like himself. The people followed him to the Capitol in a fever of excitement, and the prosecution was at an end. But Scipio felt that popular enthusiasm was uncertain, that the power of the oligarchy was irresistible, that its hatred of him was unappeasable, and that his day was over. He retired to his country-seat at Liternum, in Campania, where he spent the remainder of his life, and where he died about 183. His wife was daughter to the Æmilius Paulus who fell at Cannæ; his daughter was Cornelia, mother of the Gracchi. Scipio Africanus is commonly regarded as the greatest Roman general before Julius Cæsar; and certainly in the brilliancy of his gifts and

accomplishments he was unsurpassed; but if his career be strictly examined it will be found that he owed as much to fortune as to genius. No doubt he won splendid successes, and made the most of his great advantages. Yet his fondness for sounding titles and lavish display, his nepotism, his corruption of the public spirit by largesses, and his assumption of personal superiority to the common law were influences distinctly harmful to the state. His beauty, bravery, and courtesy, his proud yet pious belief that the gods favoured him with their inspiration, won him the love and reverence of soldiers and of women; and his magnanimity towards his fallen foe, who flitted about the eastern courts in dreary exile, is a bright feature in his character, and nobly distinguishes him from the cruel-hearted oligarchs of the senate.

See Life by B. H. L. Hart, *A Greater than Napoleon* (1926).

Scipio Æmilianus, PUBLIUS CORNELIUS, surnamed AFRICANUS MINOR, born 185 B.C., was a younger son of that Lucius Æmilius Paulus who conquered Macedon, but was adopted by his kinsman, Publius Scipio, son of the great Scipio Africanus. He accompanied his father on his expedition against Macedon, and fought by his side at Pydna (168). In Greece he made the acquaintance of Polybius the historian, who afterwards became one of his most valued friends. In 151 he went to Spain as military tribune under the consul Lucius Lucullus, and two years later began the third and last Punic war, which mainly consisted in the siege of Carthage. Scipio still held the subordinate position of military tribune; but the incapacity of the consuls, M. Manilius and L. Calpurnius Piso, (149–148), and the brilliant manner in which he rectified their blunders, drew all eyes to him. The favourite both of the Roman army and the Roman people, Scipio was at length in 147, when only a candidate for the ædileship, elected consul by an extraordinary decree of the Comitia, and invested with supreme command. Even the aged Cato, who was not liberal with his praise, marked his opinion of the relative worth of the young Scipio and his comrades by quoting the Homeric line, 'He only is a living man; the rest are gliding shades.' The story of the siege of Carthage, the despairing heroism of its inhabitants, the determined resolution, the sleepless vigilance, the incessant labours of Scipio belong to history. The city was finally taken by storm in the spring of 146; and by the orders of the senate it was levelled to the ground, and the ploughshare driven over its site. Scipio, a man of noble and refined soul, steeped from his youth up in the culture of Greece, obeyed the savage command with sorrow, even with horror. As he gazed on the ruin he had wrought, the thought flashed across his mind that some day Rome too might perish, and the words of the *Iliad* rose to his lips: 'The day shall come when sacred Troy shall perish, and Priam and his people shall be slain.'

Scipio, though probably the most accomplished Roman gentleman of his age, was rigorous in his observance of the antique Roman virtues; and when holding the office of censor in 142 he made fruitless efforts to follow in the footsteps of Cato. In 139 he was accused on the charge of *majestas* by the tribune Tiberius Claudius Asellus, but was acquitted, and soon after was sent to Egypt and Asia on a special embassy. Meanwhile affairs had gone badly in Spain. Viriathus, the Lusitanian patriot, had again and again inflicted the most disgraceful defeats on the Roman armies, and his example had roused the hopes of the Celtiberian tribes, who also rushed to war against the common foe. The contest continued with varying

success; but the interest centres in the city of Numantia, whose inhabitants displayed amazing courage in the struggle with Rome. For long it seemed as if the Numantines were invincible—one consul after another finding their subjugation too hard a task; but at length in 134 Scipio, re-elected consul, went to Spain, and after a siege of eight months forced the gaunt and famished citizens to surrender, and utterly destroyed their homes. He then returned to Rome, where he took a prominent part in political affairs as one of the leaders of the aristocratic party, and, though one of the more moderate, his popularity with the populace greatly declined. Although a brother-in-law of Tiberius Gracchus, whose sister Sempronia he had married, he disclaimed any sympathy with his political aims; and when he heard of the murder of his kinsman quoted his favourite Homer: 'So perish all who do the like again.' The Latins, whose lands were being seized by the commissioners in their unwise haste to carry out to the full the Sempronian law, appealed to Scipio for protection, and he succeeded (129) in getting the jurisdiction suspended until the consuls should determine what were domain lands and what private property. But his action caused the most furious indignation among the party of reform, and shortly after Scipio was found dead in his bed, doubtless murdered by some unscrupulous member of the Gracchan party. Scipio was neither a rigid aristocrat nor a flatterer of the people. Inferior in splendour of genius to his adoptive grandfather, he surpassed him in purity of character, in simplicity of patriotism, and in liberality of culture. 'The history of Rome,' says Mommsen, 'presents various men of greater genius than Scipio Æmilianus, but none equalling him in moral purity, in the utter absence of political selfishness, in generous love of his country, and none, perhaps, to whom destiny has assigned a more tragic part. . . . It was his lot to fight for his country on many a battlefield and to return home uninjured, that he might perish there by the hand of an assassin; but in his quiet chamber he no less died for Rome than if he had fallen beneath the walls of Carthage.'

Scire Facias, a writ for enforcing judgments, decisions about patents, &c., or for annulling them: often contracted, like *fi. fa.*, into *sci. fa.* See WRIT.

Scirocco. See SIROCCO.

Scirpus, a genus of plants of the family Cyperaceæ (q.v.). The plants of this genus are called Club-rushes, and *S. lacustris* of our ponds and sluggish streams is a familiar example (see BULRUSH). The species are universally diffused, although found chiefly in temperate climates. They date from the Lower Miocene period.

Scirrhus (Gr., 'hard'), a term applied to a kind of Cancer (q.v.).

Scissors. See CUTLERY.

Scitamineæ. See ZINGIBERACEÆ.

Sclerostomum, a genus of nematode worms (see THREADWORMS). One of the species *S. armatum* occurs in the mesenteric arteries and intestine of the horse, causing aneurysms and colic.

Sclerotic. See EYE.

Sclerotium is a hard, multicellular tuber-like body formed towards the end of the vegetative season by the close union of the ordinary mycelial filaments of Fungi (q.v.). It represents the dormant or resting stage of the fungus, but is not common to all fungi. At the beginning of the period of growth it sends out filaments or groups of filaments which carry on the active life-history of the individual, and soon the store of nourishment is absorbed from the sclerotium by these filaments. Ergot of Rye (q.v.) is a sclerotium.

Scolopendra. See CENTIPEDE.

Scolopendrium. See HART'S-TONGUE.

Scomberidæ. See MACKEREL.

Scone (pronounced *Scoon*), in Perthshire, on the Tay's left bank, 2 miles N. of Perth, was the capital of Pictavia as early as 710, and the coronation place of the Scottish kings from 1153 till 1488, as afterwards in 1651 of Charles II. (see SCOTLAND). Fordun vividly describes the semi-Celtic coronation of Alexander III. (1249), who was the last to be seated on the 'Stone of Destiny,' carried off in 1296 by Edward I. An Augustinian abbey, founded by Alexander I. in 1115, was totally demolished by a rabble in 1559; and the subsequent Palace of the Viscounts Stormont, in which the Old Pretender lived for three weeks in 1716, and which was also visited by Prince Charles Edward, has given place to a modern castellated mansion, the seat of their descendant, the Earl of Mansfield.

Scopas, an ancient Greek sculptor, founder, along with Praxiteles (q.v.), of the later Attic school, was a native of the island of Paros, and flourished during the first half of the 4th century B.C. One of his earliest works we read about was the temple of Athena Alea at Tegea in Arcadia, on the site of a previous one burned down in 395 B.C.; he superintended both the building of it and the adorning of it with sculpture. Some fifteen years or so later he settled in Athens, where for more than a quarter of a century he laboured at his profession. Towards the end of his life he was associated with Leochares and others in preparing sculpture for the great Mausoleum (q.v.) of Halicarnassus in Asia Minor. A large composition representing Achilles being conveyed to Leuce by Poseidon, Thetis, and the Nereids, preserved for some time in the temple of Neptune at Rome, was accounted one of his greatest masterpieces. Another composite work attributed to him, though doubtfully, was the 'Slaughter of the Children of Niobe.' He excelled also in statues of single gods and goddesses, as the 'Apollo with the Lyre.' See E. A. Gardner, *Six Greek Sculptors* (1910).

Score, music for several voices or instruments, or for an orchestra, so written that each part has a separate staff for itself, these staves being placed over each other, bar corresponding to bar. Occasionally, where there is a deficiency of staves for all the parts, or where any of the parts have so little to do that it is not worth while to assign them a separate staff, parts related to or connected with each other, as two flutes, two clarionets, or three trombones, may be written on the same staff together. The orchestra is split up into groups, the woodwind being placed at the top of the score, then the brass, then the percussion, then (in the case of a concerto) the solo instrument, and lastly the strings at the foot of the score. In each group the highest part should be placed uppermost, then the next lower and gradually descending. All the parts of a chorus should be kept together, and placed either between the percussion and strings or in the middle of the strings, between the violin and the viola staves.

Scoresby, WILLIAM, Arctic explorer and savant, was born at Cropton near Whitby, 5th October 1789. He commenced a seafaring life at the age of eleven, by accompanying his father, a whaling captain, to the Greenland seas; and next succeeding his father, he made several voyages to the Spitsbergen and Greenland whaling-grounds. He attended classes at Edinburgh University, carried on investigations in natural history, botany, meteorology, magnetism, &c., and published the results in *An Account of the Arctic Regions* (2 vols. 1820). In 1822 he surveyed 400 miles

of the east coast of Greenland. After one more voyage he retired from seafaring life in order to enter the church; and having studied at Cambridge, and been ordained (1825), laboured faithfully at Liverpool, Exeter, and Bradford. At length failing health compelled him to retire (1849) to Torquay; but he still continued his physical researches. The results of these, as of some earlier inquiries, were published in the transactions of the learned societies, and in *Magnetical Investigations* (2 vols. 1839-52). For the better prosecution of these researches Scoresby made a voyage to the United States in 1847, and to Australia in 1856. He died at Torquay on 21st March 1857. See *Life* by his nephew (1861).

Scorie are the cinders and slags of volcanoes, more or less porous from the expansion of the gases contained in the melted materials. See **VOLCANO**, **IGNEOUS ROCKS**.

Scorpion, a name applicable to any member of the family Scorpionidæ, included along with spiders, mites, &c. in the heterogeneous class Arachnida. Among the common genera are *Scorpio*, *Androctonus*, and *Buthus*. Altogether there are about 200 species, natives of warm countries in both hemispheres. About thirteen species live in southern Europe. Shy of the light, they lurk during the day under stones and in crevices, but run about actively in the darkness seeking their prey—usually insects or spiders—which they sting and afterwards suck. The form of the body is distinctive: the head and the thorax are united, covered by a cephalo-thoracic shield, and bear a pair of chelicere, a pair of large pedipalps, and four pairs of walking legs. On the



Common Scorpion (*Scorpio europæus*).

anterior part of the shield there are several pairs of simple eyes, a pair centrally and several pairs near the margin. The abdomen consists of twelve segments, of which five form the narrow 'tail,' which is curled over the back when the animal runs. On the under surface of the abdomen we see most anteriorly a small double plate covering the genital aperture, then a pair of remarkable comb-like appendages or 'pectines,' probably with tactile functions, and behind these on four successive segments the slit-like apertures of four pairs of respiratory lung-books (so called because they consist of lamellæ like the leaves of a book). The tail ends in a sting, containing a paired gland from which poison flows through the perforated sharp point. When the scorpion strikes it suddenly straightens the tail, bringing the point (which is usually up-turned) rapidly downwards. It can also bend the sting forward to poison an insect held in the pedipalps. It does not seem possible for the scorpion to sting itself, as is often alleged; there has been much controversy on the subject, the old allegation being that a scorpion surrounded by a ring of fire would, recognising its fate, deliberately commit

suicide by stinging itself on the head. But scorpions evidently suffer much from great heat, and their excited movements may readily have given rise to apparently suicidal designs such as the creature is of course utterly incapable of forming. Scorpions cannot poison either themselves or other scorpions.

In seizing the prey the scorpion's large pedipalps are of use, and the small chelicere may serve to hold the dead body close to the mouth; the pharynx is suctorial, and the food-canal is very narrow, the food being for the most part merely the juices of the victim. The brain is well developed, and there is a ventral nerve-cord with seven ganglia. The lung-books are like those of spiders. In regard to their reproduction the most interesting fact is the parental care of the mother scorpion, who brings forth her young alive, shelters them under her body, or carries them about with her. When alarmed or irritated scorpions show some fierceness, moving their tail threateningly; they are highly sensitive to sound, musical or other. They are universally disliked, and not a little dreaded, being apt to get into houses, and into beds, hiding themselves under pillows, in shoes, boots, &c., so that accidents are very frequent in countries where they abound. The wound which they give is seldom fatal, but even that of the common European scorpions is very painful, and that of some of the largest species—which are six inches long—is much more severe, attended with nausea and constitutional derangement, nor do the effects soon cease. It is of use to press a large key or other tube on the wound, so as to force out part of the poison. The best remedy is ammonia, internally administered, and also applied externally; see **VENOMOUS BITES**.

Scorpion-grass, an old name for Forget-me-not (q.v.), supposed on the Doctrine of Signatures (q.v.) to be good for scorpion bites.

Scory, **JOHN**, Bishop of Hereford, was born at Acle in Norfolk, and about 1530 was a friar in a Dominican house at Cambridge. After its dissolution in 1538 he got preferment from his patron, Archbishop Cranmer, to whom he was chaplain until in 1551 he became Bishop of Rochester. He was translated next year to Chichester as successor to the deprived Dr Day, but on Mary's accession he was himself deprived, and, appearing before Bonner, renounced his wife, did penance, and had formal absolution (1554). Still he cannot have felt safe, for he fled abroad, first to Emden, and then to Geneva; and from the Continent addressed an 'Epistle to the faythfull in pryson in England,' exhorting them to continue in patience and hope. Mary dead, he came back to England (1559), and the same year was made Bishop of Hereford, and helped to consecrate Archbishop Parker. We find him in 1579 petitioning Burghley for removal from Hereford ('my present purgatorie') to Norwich, but death only removed him, on 26th June 1585, at his palace of Whitbourne. See vol. i. of Cooper's *Athenæ Cantabrigienses* (1858).

Scorzoneræ (probably Ital. *scorzane*, 'viper'), a genus of Compositæ (Cichoriæ), having yellow or rarely rose-coloured flowers. The species are numerous, mostly natives of the south of Europe and the East. No species is found in Britain. The Common Scorzoneræ of kitchen-gardens, *S. hispanica*, a native of the south of Europe, has long been cultivated for its esculent roots. The root is black externally, white within, about the thickness of a man's finger, long, and tapering very gradually. It contains a white milky juice, and has a mild, sweetish mucilaginous taste; it is very pleasant when boiled, the outer rind being first scraped off, and the root steeped in water,

to abstract part of its bitterness.—Other species of *Scorzonera* are used in the same way, and the roots of Sicilian *S. deliciosa* are preserved with sugar.

Scot (or **SCOTT**), **SIR JOHN**, of Scotstarvet in Fife (1585–1670), was a lawyer and statesman, Director of Chancery and a Lord of Session, who studied at St Andrews, signed the Covenant, lost his offices under Cromwell, and did not recover them at the Restoration. His *Staggering State of Scots Statesmen* (not published till 1754) is an uncomplimentary criticism of the mean arts needful in his time to secure and hold office. He cherished a correspondence with native and foreign scholars, promoted learning, and was a brother-in-law of Drummond of Hawthornden. He secured the publication of Arthur Johnston's *Delitiae Poetarum Scotorum*, and continued Timothy Pont's Survey of Scotland.

Scot, **MICHAEL**. See **SCOTT**.

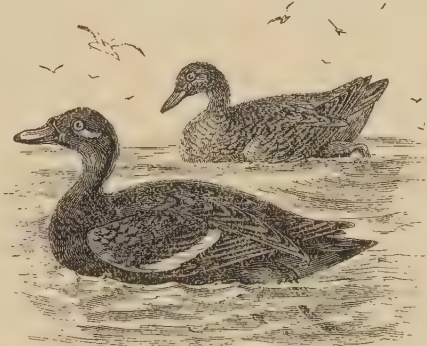
Scot (or **SCOTT**), **REGINALD**, an early disbeliever in witchcraft, was a younger son of Sir John Scot of Scotshall near Smeeth in Kent, was born about 1538, studied at Hart Hall, Oxford, and died 9th October 1599. He published *The Hoppe-Garden* in 1574, and is credited with the introduction of hop-growing into England. His famous work, *The Discoverie of Witchcraft*, appeared in 1584, its deliberate aim to check the persecution of witches. The work is marked by humanity and strong sense, great boldness and power of logic, and is an admirable exposure of the childish absurdities which formed the basis of the witchcraft cases, and of the absurd manner in which the evidence was collected by the inquisitors and witch-finders. The healthy rationalism and openness of mind of the writer were more than two centuries before their time in England, and naturally excited the antipathy of a self-conceited fool like King James, who wrote his *Dæmonology* (1597) 'chiefly against the damnable opinions of Wierus and Scot, the latter of whom is not ashamed in public print to deny there can be such a thing as witchcraft.' The king's answer was pitiful, but he had the advantage of being able to burn Scot's book by the hands of the common hangman. Scot's work should have been complete as an antidote to 'Sprenger's fables and Bodin's bables, which reach not so far to the extolling of witches' omnipotence as to the derogating of God's glorie;' but, besides the feeble effort of the royal Solomon, answers and refutations continued to be written by Gifford, Perkins, Méric Casaubon, Cotta, and many eminent divines, and, with such few exceptions as the writers Webster, Wagstaffe, Ady, and others, witchcraft kept its hold upon the minds even of great men down to and beyond Glanvill, Sir Thomas Browne, Richard Baxter, and even John Wesley. One great merit of Scot's book to the modern student is its richness as a collection of forms of incantations and the processes of sorcery, for its rational and liberal-minded author had the fairness to quote his antagonists honestly before pulverising them with his logic. The full title of the book best explains its scope and aim: 'The discoverie of witchcraft, wherein the lewde dealing of witches and witchmongers is notable detected, the knaverie of conjurers, the impietie of incantors, the follie of soothsayers, the impudent falsehood of cousenors, the infidelitie of atheists, the pestilent practices of Pythonists, the curiositie of figure-casters, the vanitie of dreamers, the beggarlie art of Alcumystrie, the abomination of idolatrie, the horrible art of poisoning, the vertue and power of naturall magike, and all the conveiances of Legierdemaine and juggling are deciphered: and many other things opened, which have long lien hidden,

howbeit verie necessarie to be knowne'—'for the undeceiving of Judges, Justices, and Juries, and for the preservation of poor, aged, deformed, ignorant people; frequently taken, arraigned, condemned, and executed for Witches, when according to a right understanding, and a good conscience, Physick, Food, and necessities should be administered to them' was added in the 1651 title-page, besides other changes. This second edition was in quarto; the third, in 1665, was in folio, and contained, from an unknown and less rational pen, nine fresh chapters, commencing the fifteenth book, and a second book of the 'Discourse on Devils and Spirits' appended to the first and second issues. The next edition in time was the limited reprint of 1886, admirably edited, with an Introduction, by Brinsley Nicholson, M.D. See also **CONJURING**.

Scot and Lot. The old legal phrase *Scot* (O.E. *scat*, 'pay') and *Lot* embraced all parochial assessments for the poor, the church, lighting, cleansing, and watching. Previously to the Reform Act the right of voting for members of parliament and for municipal officers was, in various English boroughs, exclusively vested in payers of Scot and Lot.

Scotch Fir, properly Scots Pine. See **PINE**.

Scoter (*Edemia*), a genus of oceanic ducks, represented on British coasts by the Common Scoter (*E. nigra*), the larger Velvet Scoter (*E. fusca*), and occasionally by the North American Surf Scoter (*E. perspicillata*). In



Velvet Scoter (*Edemia fusca*).

North America *E. americana* is widely distributed. The Common Black Scoter is about the size of the common duck. The whole plumage of the male is deep black; that of the female is dark brown. They are abundant in winter on many parts of the British coast, but most migrate in spring to northern Scandinavia, Russia, and Siberia. They usually nest by inland fresh-water lakes. They feed on molluscs. The flesh is oily, and has a fishy taste, but, being therefore permitted to Roman Catholics during Lent, is in great request in some countries.

Scotists. See **DUNS SCOTUS**, **SCHOLASTICISM**.

Scotland, the northern part of Great Britain, is washed on the W. and N. by the Atlantic, on the E. by the North Sea, and on the S. is parted from England by the Solway Firth and the (largely artificial) line described in the article **BORDERS**. Its length, from Cape Wrath to the Mull of Galloway, is 274 miles; its breadth varies between 24 and 146 miles; and its total area is 19,070,466 acres or 29,796 sq. m. excluding 609 sq. m. of inland water. The geology, physical geography, meteorology, &c.

have already been sketched at GREAT BRITAIN; still, here we may recapitulate the outstanding features of Scotland for purposes of comparison and of reference to innumerable articles scattered throughout this work. Of 787 islands, belonging mostly to the Hebrides, Orkneys, or Shetland, sixty-two exceed 3 sq. m. in area, and of these the largest are Long Island (Lewis and Harris, 859 sq. m.), Skye (643), the Mainland of Shetland (378), Mull (347), Islay (246), Mainland of Orkney (207), Arran (168), Jura (143), and North Uist (136). Of twenty-six rivers flowing direct to the sea the chief are the Tweed (97 miles long), Forth (75), Tay (93), Dee (87), Don (82), Deveron (62), Spey (96), Clyde (106), and Nith (71); and of these the Forth, Tay, and Clyde expand into important estuaries. There is also the Moray Firth; and indeed the whole coast is so intersected by arms of the sea that few places are more than 40 miles inland. Fresh-water lakes are numerous—Lochs Lomond (27 sq. m.), Ness (19), Ave (16), Shin, Maree, Tay, Earn, Leven, Katrine, &c. The division of Scotland into Highlands and Lowlands, which puzzles strangers, who cannot understand how Wick comes to be Lowland and Inveraray Highland, has been explained at HIGHLANDS. In the Lowlands the highest points are Merrick (2764 feet) in Kirkcudbrightshire, and Broad Law (2723 feet) in Peeblesshire; in the Highlands there are no fewer than 184 summits that exceed 3000 feet above sea-level—among them Ben Nevis (4406), Ben Macdhuil (4296), Ben Lawers (4004), Ben Cruachan (3689), Ben Wyvis (3429), and Ben Lomond (3192). See CHEVIOTS, OCHILS, GRAMPIANS, &c. Of the total area about 50 per cent. is occupied with mountain and heath affording rough grazing, about 17 per cent. with arable, about 8 with pasture, and about 5 with woods and plantations; the rest may be said to have no special economic value. The highest proportion of cultivated area is found in Fife, and the lowest in Sutherland.

The gradual growth of the total population has been as follows: (1801) 1,608,420; (1821) 2,091,521; (1841) 2,620,184; (1861) 3,062,294; (1881) 3,735,573; (1901) 4,472,103; (1921) 4,882,497. The principal burghs in order of population are Glasgow (1,034,069), Edinburgh (420,281), Dundee (168,217), Aberdeen (158,969), Paisley (84,837), Greenock (81,120), Motherwell and Wishaw (68,869), Clydebank (46,515), Coatbridge (43,909), Dunfermline (39,886), Kirkcaldy (39,591), Hamilton (39,420), Kilmarnock (35,756), Ayr (35,741), Falkirk (33,312), and Perth (33,208).

At the head of the administration is the Secretary for Scotland (in 1926 made one of the principal secretaries for state), who is responsible for the management of Scottish business in parliament. The Secretary of the Scottish Privy Council was under the later Stewarts, the most powerful person in the kingdom, and there was a Scottish secretary till 1725, and again in 1731–45. Thenceforward till 1885 the British Home Secretary, advised by the Lord Advocate, was responsible for Scottish business, and the Lord Advocate was the principal Scottish minister. In 1885 the office of Secretary for Scotland was created, and the new secretary has then or since taken over most of the powers of the Home Office, the Privy Council, the Treasury, and the Board of Trade; the secretary being also vice-president of the Scottish Education Department (in London) and president of the Scottish Board of Health. He has accordingly large responsibilities in regard to education, sanitation, pollution of rivers, prisons, manufactures, fisheries, county councils, and local taxation. In the House of Lords there are 16 representative Scottish peers elected by the Scottish peerage for the duration of the parliament.

County.	Area in statute acres (ordnance survey 1923) excluding water.	Population. Census 1801.	Population. Census 1921.
Aberdeen.....	1,261,521	121,065	301,016
Argyll.....	1,990,472	81,277	76,862
Ayr.....	724,251	84,297	299,273
Banff.....	403,053	37,216	57,298
Berwick.....	292,535	30,206	28,246
Bute.....	139,658	11,791	33,711
Caithness.....	438,833	22,609	28,285
Clackmannan.....	34,927	10,858	32,542
Dumbarton.....	156,927	20,710	150,861
Dumfries.....	686,802	54,597	75,370
Eastlothian (Haddington).....	170,971	29,986	47,487
Fife.....	323,012	93,743	292,925
Forfar.....	559,087	99,053	271,052
Inverness.....	2,695,094	73,672	82,455
Kincardine.....	244,482	26,349	41,779
Kinross.....	52,392	6,735	7,963
Kirkcudbright.....	575,832	29,211	37,155
Lanark.....	564,667	147,692	1,539,442
Midlothian (Edinburgh).....	234,825	122,597	506,377
Moray (Elgin).....	804,931	27,760	41,558
Nairn.....	104,252	8,322	8,790
Orkney.....	240,847	24,445	24,111
Peebles.....	222,240	8,735	15,332
Perth.....	1,595,802	125,583	125,503
Renfrew.....	151,431	78,501	295,904
Ross and Cromarty.....	1,977,248	56,819	70,818
Roxburgh.....	426,028	33,721	44,989
Selkirk.....	170,793	5,388	22,607
Shetland.....	352,819	22,379	25,520
Stirling.....	288,835	50,825	161,721
Sutherland.....	1,297,914	28,117	17,802
Westlothian (Linlithgow).....	76,868	17,844	85,960
Wigtown.....	811,984	22,918	30,783

See P. Hume Brown's *Early Travellers in Scotland, 1295–1689* (1891); F. Grose's *Antiquities of Scotland* (2 vols. 1789–91); Sir John Sinclair's *Statistical Account of Scotland* (21 vols. 1791–99); Dorothy Wordsworth's *Tour in Scotland*; G. Chalmers's *Caledonia* (3 vols. 1807–24; new ed. Paisley, 7 vols. 1888 et seq.); R. Chambers's *Picture of Scotland* (2 vols. 1827); the *New Statistical Account* (15 vols. 1845); Sir Thomas Dick Lauder's *Scottish Rivers*; Billings's *Baronial and Ecclesiastical Antiquities of Scotland* (4 vols. 1848–52); Cosmo Innes's *Origines Parochiales Scotiae* (3 vols. 1850–55); Hugh Miller's *Cruise of the Betsy* (1858); Sir A. Geikie's *Scenery of Scotland viewed in connection with its Physical Geology* (1865; 3d ed. 1901); Dean Ramsay's *Reminiscences of Scottish Life and Character* (many editions); J. Anderson, *Scotland in Early Christian and Pagan Times* (4 vols. 1881–86); F. H. Groome's *Ordnance Gazetteer of Scotland* (1882–85; 2d ed. 1893–95); C. Rogers's *Social Life in Scotland* (3 vols. 1884–86); MacGibbon and Ross's *Castellated and Domestic Architecture of Scotland* (4 vols. 1886–92) and *Ecclesiastical Architecture*; Kermack's *Historical Geography of Scotland* (1913); Munro's *Prehistoric Scotland* (1899); Warrack's *Domestic Life, 1488–1688* (1920); Graham's *Social Life in the 18th Century* (1899); Heddle's *Mineralogy of Scotland* (1901); Harvie Brown's *Fauna of Scotland* (1907); Murray and Pullar's *Survey of Freshwater Lochs* (1910); Mitchell and Cash's *Bibliography of Scottish Topography* (1917); the Cambridge County Geographies; Reports on Historical Monuments for the various Counties. A general reference may suffice to our articles on the counties, towns, rivers, lakes, &c. of Scotland; and special information will be found under a multitude of headings—e.g.:

Advocate, Lord.	Earth-houses.	Paraffin.
Advocates, Faculty of.	Education.	Parliament.
Ballad.	Fisheries.	Picts.
Borders.	Gaelic.	Poor-laws.
Brochs.	Golf.	Printing.
Catrail.	Great Britain.	Round Towers.
Celts.	Grouse.	Salmon.
Court of Session.	Hebrides.	Sculptured Stones.
Covenant.	Highlands.	Shupbuilding.
Crannogs.	Hill-forts.	Signet.
Criminal Law.	Library.	Stone-circles.
Crofters.	Maeshowe.	University.
Deer-forests.	Ogam.	Whisky.

CIVIL HISTORY.—An account has been given under the article PICTS of the early inhabitants of the country which has long been known by the name of Scotland, but which by the Romans was called Caledonia (q.v.). The original Scotia or Scotland was Ireland, and the Scoti or Scots, at their first appearance in authentic history, were the

people of Ireland (q.v.). The Scots were a Celtic race, and their original seat in Northern Britain was in Argyll, which they acquired by colonisation or conquest before the end of the 5th century; and thence they spread themselves along the western coast from the Firth of Clyde to the modern Ross. The name of Scotland seems first to have been given to the united kingdom of the Picts and Scots in the 10th century. It was then sometimes styled, by way of distinction, *Scotia Nova* (New Scotland), and it was a considerable time afterwards before the name of Scotland was applied to it, to the exclusion of Ireland. This interchange of names was a fruitful source of dispute between Irish and Scottish writers in the 16th and 17th centuries.

The first prince of the British Scots mentioned in our authentic annals was Fergus, son of Ere, who crossed over to Britain about 495 or 498. His nation had been converted to Christianity by St Patrick, and Fergus himself is said to have received the blessing of the saint in his early years. His great-grandson, Conal, was king of the British Scots when Columba (q.v.) began the conversion of the Northern Picts; and by that prince, according to the best authorities, Iona was given for the use of the mission. Conal was succeeded by his nephew, Aidan, who was inaugurated as sovereign by St Columba in the island of Iona—a ceremony which Scottish writers, misled by the great French antiquary Martène, long believed to be the first example of the benediction of kings. Aidan was a powerful prince, and more than once successfully invaded the English border, but in 603, towards the end of his reign, he received a severe defeat from the Northumbrian sovereign Ethelfrid at Dægsastane (probably Dawstone in Liddesdale).

The history of Aidan's successors is obscure and uninteresting, except to the professed students of our early history. Their kingdom was overshadowed by the more powerful monarchy of the Picts, with which, as well as with its neighbours in the south—the Britons of Cumbria—it was engaged in almost unceasing conflict. The Scots were for a time under some sort of subjection to the English of Northumbria, but recovered their independence on the defeat and death of King Ecgfrid in battle with the Picts at Nechtansmere (Dunnichen, Forfarshire) in 685. In the middle of the 9th century, by a revolution, the exact nature of which has never been ascertained, the Scots acquired a predominance in Northern Britain. Kenneth Macalpin, the lineal descendant of Fergus and Aidan, succeeded his father as king of the Scots in 836. The Pictish kingdom was weakened by civil dissension and a disputed claim to the crown. Kenneth laid claim to it as the true heir in the female line, and was acknowledged king of Alban in 843.

King Kenneth transferred his residence to For-teviot in Stratherne, which had been the Pictish capital, fixing soon afterwards the ecclesiastical metropolis of the united kingdom at Dunkeld, whence in 908 it was translated to Abernethy. The Picts and Scots, each speaking a dialect of the Celtic tongue, gradually coalesced into one people, whose territory extended from the Firths of Forth and Clyde to the northern extremity of Britain. The crown descended to a line of princes of the family of Kenneth, whose rule gave a unity and comparative tranquillity to the Scots of Britain which those of Ireland, at no time really united under one prince, never possessed. The first interruption to the descent of the crown in the line of Kenneth was the reign of a usurper named Grig, round whose name, amplified to Gregory by the writers of a later age, a cloud of legendary fiction gathered. The old family was restored on his expulsion in 893.

The reign of Constantine, son of Aodh, who succeeded in 904, was a remarkable one. In his time it is probable that the seat of the ecclesiastical primacy was transferred from Abernethy to St Andrews, and that the regal residence was fixed at Scone. At the latter place, in the sixth year of his reign, the chronicles mention that Constantine the king, Kellach the bishop, and the Scots swore to observe the laws and discipline of the faith and the rights of the churches and the gospels. This seems to indicate the meeting of some sort of council, civil or ecclesiastical, or more probably a combination of both, according to the form prevalent at this period both among the Celtic and the Teutonic nations. Even before the establishment of the kingdom of the Picts and Scots in the person of Kenneth, Northern Britain had experienced the attacks of a new enemy, the Scandinavian invaders, generally spoken of under the name of Danes. Constantine resisted them bravely, but towards the end of his reign he entered into an alliance with them in opposition to the English. In 937 a powerful army, composed of Scots and Picts, Britons and Danes, disembarked on the Humber, and was encountered at Brunanburh (q.v.) by Athelstan, king of England. A battle was fought there, the first of a series of unfortunate combats by Scottish princes on English ground. The confederate army was defeated, and, though Constantine escaped, his son was amongst the slain. Weary of strife, the king soon afterwards retired to the Culdee monastery at St Andrews, of which he became abbot, and there died in 953.

During the reign of Malcolm, the first of that name, and the successor of Constantine, a portion of the Cumbrian kingdom, including the modern Cumberland and part of Westmorland, which had been wrested from the Britons by Edmund, king of England, was bestowed by that prince on the Scottish sovereign. This grant was the foundation of that claim of homage made by the English kings on the Scottish sovereigns, which afterwards became the cause or the pretext for the great struggle between the two nations. The northern kingdom was still further increased in the reign of Kenneth, son of Malcolm, by the acquisition of Lothian, and of Northern Cumbria, or Strathclyde. The former province, previously a part of the Northumbrian kingdom, and entirely English in its population, was bestowed on Kenneth by Edgar, king of England. The Cumbrian kingdom, which had at one time extended along the west coast from the Firth of Clyde to the border of Wales, had been weakened by the loss of its southern territories; it was inhabited by a Celtic people speaking Cymric or Welsh, and now fell under the dominion of the Scottish king, though its inhabitants long retained their own speech and a peculiar system of laws (see BRETT'S AND SCOTS). The last addition to Scotland in the south took place under Malcolm II., son of Kenneth, who acquired the Merse and Teviotdale from the Earl of Northumbria, and thus advanced his kingdom on the eastern border to the Tweed. The reign of Malcolm II. extended from 1003 to 1033. The kings who immediately followed are better known to the general readers than any of their predecessors, Shakespeare having made their names familiar to every one. Malcolm's successor was his grandson, Duncan, whose brief reign was followed by that of Macbeth (q.v.). The latter was a vigorous and prudent ruler, munificent to the church, and famous as the only Scottish king who made a pilgrimage to Rome. But, although by marriage he was connected with the royal line, he was unable to secure the affection of his subjects. Malcolm, the eldest son of Duncan, assisted by his kinsman, Siward, Earl of Northumbria, invaded Scotland. The usurper was defeated and

slain at Lumphanan, in Mar, in 1057, and Malcolm was acknowledged as king.

The long reign of Malcolm Canmore was the commencement of a great social and political revolution in Scotland. His residence in England, and still more his marriage with the English Princess Margaret, the sister of Edgar Atheling, led to the introduction of English customs, the English language, and an English population into the northern and western districts of the kingdom. The influx of English colonists was increased by the tyranny of William the Conqueror and his Norman followers. All received a ready welcome from the Scottish king, whose object it was to assimilate the condition of the Scots in every respect to that of their fellow-subjects in Lothian; and what his stern, though generous, character might have failed to accomplish was brought about by the winning gentleness and Christian graces of his English queen.

Malcolm fell in battle before Alnwick Castle in the year 1093, and Margaret survived only a few days. It seemed as if the work of their reign was about to be utterly overthrown. The Celtic people of Scotland, attached to their old customs, and disregarding the claims of Malcolm's children, raised his brother, Donald Bane, to the throne. The success, however, of this attempt to restore a barbarism which the better part of the nation had outgrown was of brief duration; Donald was dethroned, and Edgar, the eldest surviving son of Malcolm and Margaret, was acknowledged as king. The very name of the new sovereign marked the ascendancy of English influence. That influence, and all the beneficial effects with which it was attended, continued to increase during the reigns of Edgar and his brother and successor, Alexander I. The change went steadily on under the wise and beneficent rule of David (q.v.), the youngest son of Malcolm. His reign, which extended from 1124 to 1153, was devoted to the task of ameliorating the condition of his subjects, and never was such a work more nobly accomplished. David was in every respect the model of a Christian king. Pious, generous, and humane, he was at the same time active and just, conforming himself to the principles of religion and the rules of the church with all the devotion of his mother, but never forgetting that to him, not to the clergy, God had committed the government of his kingdom. He was all that Alfred was to England, and more than St Louis was to France. Had he reigned over a more powerful nation his name would have been one of the best known among those of the princes of Christendom. At the time of David's accession Scotland was still but partially civilised, and it depended in a great measure on the character of its ruler whether it was to advance or recede. It received a permanent stamp from the government of David. The Celtic people were improved morally, socially, and ecclesiastically, and all along the eastern coast were planted Norman, English, and Flemish colonies, which gradually penetrated into the inland districts, and established the language and manners of that Teutonic race which forms the population of the greater part of Scotland. David encouraged and secured the new institutions by introducing a system of written law, which gradually superseded the old Celtic traditional usages, the first genuine collections of Scottish legislation belonging to his reign. David was as great a reformer in the church as in the state. The ecclesiastical system prevalent in Scotland almost up to his time differed in some points from that established in England and on the Continent, bearing a great resemblance to that of Ireland, from which it was indeed derived. David established dioceses, encouraged

the erection and endowment of parishes, provided for the maintenance of the clergy by means of tithes, and, displacing the old Celtic monastic bodies, introduced the Benedictine and Augustinian orders.

David, though devoting his energies to the improvement of his subjects in the manner which has been mentioned, did not forget duties of a less agreeable kind. He knew that a Scottish king really held his crown by the tenure of the sword, and none of his fierce ancestors was a more intrepid warrior than the accomplished and saintly David. His skill and courage were shown, though without success, at the Battle of the Standard. As the representative through his mother of the ancient kings of England, he had many friends in that country; and had the Scottish army been successful the history of the two kingdoms might in some respects have been different. As it was, he contented himself with maintaining the cause of his sister's child, the Empress Matilda, against King Stephen.

David's grandson and successor, Malcolm IV. (1153-65), and his brother, William the Lion (1165-1214) pursued the policy of their grandfather with equal resolution, though sometimes with less success. They were embarrassed by their connection with the English King Henry II., who took advantage of his superior power and ability to impose unwise and unjust restraints on the independence of the Scottish sovereigns and their kingdom—a policy which laid the foundation of the unhappy national strife of after years. This was averted for a time by the concessions of Richard I. in 1189. 'For more than a century,' says Lord Hailes, 'there was no national quarrel, no national war between the two kingdoms—a blessed period.' That period was well employed by the next two kings, Alexander II. and Alexander III., the son and grandson of William the Lion, to consolidate the institutions of their kingdom, and extend and confirm what had been begun by David. Alexander III. was one of the ablest and best of the Scottish kings. By a treaty with the king of Norway he added to his kingdom Man and the other islands of the Western Sea, held by the Norwegians. His sudden death in 1286 was one of the greatest calamities with which Scotland could have been afflicted. It closed a period of prosperity—a course of improvement—which the kingdom did not again enjoy for fully 400 years.

On the death of the infant granddaughter and heiress of Alexander III. in 1290 the succession to the crown was disputed. The question between the two chief claimants, Baliol and Bruce (q.v.), was not free from doubt according to the customs of the time; and Edward I. (q.v.) of England, to whom the decision was referred, appears at first to have acted with good faith. But this great king, who had already subdued Wales, was now bent on uniting the British Islands under one sceptre; and in the pursuit of that object he sacrificed humanity, honour, and justice. The results were most deplorable. The national spirit of the Scots was finally roused, and after a long struggle under Wallace and Bruce, in 1314 they secured their independence on the field of Bannockburn (q.v.). The battle of freedom was won; but it was at the expense of tranquillity and civilisation. The border counties were continually wasted by the English; the central provinces were the scene of frequent warfare among the chief nobles; and the highland districts became more and more the seat of barbarism, the Celtic tribes re-acquiring something of their old ascendancy, just as they did in Ireland in the troubled times which followed the invasion of Edward Bruce. The strong arm of King Robert might have repressed these disorders had his life been longer spared after

the treaty of Northampton; but his death in 1329 and the accession of an infant son again plunged the country into all the miseries of foreign and civil war. When that son, David II., grew up to manhood he proved in every respect unworthy of his great father. The reigns of this prince and his successors Robert II. and Robert III., the two first princes of the House of Stewart, may be regarded as the most wretched period of Scottish history. In the year 1411 the kingdom would have become absolutely barbarous if the invasion of the Lord of the Isles had not been repulsed at Harlaw (q.v.) by the skill of the Earl of Mar and the bravery of the lowland knights and burghesses.

A happier time began to dawn with the release of James I. in 1424 from his English captivity. The events of the following period are better known, and a brief notice of the most important will be sufficient. Reference may be made for details to the accounts of the particular kings. The vigorous rule of James I. had restored a tranquillity to which his kingdom had long been unaccustomed; but strife and discord were again brought back on his assassination. One of the most calamitous features of the time was a long series of minorities. James himself had succeeded to the crown when a child and a captive; James II., James III., James IV., James V., Mary, and James VI. all succeeded while under age, and all except James IV. when little more than infants. The courage and ability shown by almost all the Stewart princes were insufficient to repair the mischiefs done by others in the beginning of their reigns, and to abate the great curse of the country—the unlimited power and constant feuds of the nobles. The last addition to the Scottish kingdom was made in the reign of James III., when the islands of Orkney and Shetland were made over to him as the dowry of his queen, Margaret of Denmark. The marriage in 1503 of James IV. with Margaret of England was far more important in its ultimate results, and brought about in the reign of his great-grandson that peaceful union with England which the death of the Maid of Norway had prevented in the 13th century. Many good laws were enacted during the reigns of the Jameses; but the wisdom of the Scottish legislature was more shown in framing them than the vigour of the government in enforcing them. Among the most important improvements of the period was the establishment of universities—the first of which, that of St Andrews, was founded during the minority of James I.—and the institution of the College of Justice in the reign of James V.

During the reign of the fifth James religious discord added another element to the evils with which Scotland was afflicted. The practical corruptions of the church were greater than they were almost in any other country in Europe, and one of the consequences was that the principles of the Reformation were pushed further than elsewhere. The first great ecclesiastical struggle had hardly ceased, by the overthrow of the Roman Catholic system, when the strife began anew in the Reformed Communion in the shape of a contest between Episcopacy and Presbyterianism, the former being supported by the sovereign, the latter by the common people, the nobles throwing their weight into either scale as it suited their policy at the time. James VI. struggled hard to establish an absolute supremacy, both in church and state, in opposition to a powerful party, which admitted no royal authority whatever in the former and very little in the latter. After his accession to the English crown he was apparently successful in carrying out his designs, but during the reign of his son, Charles I., the contest again broke out with increased bitterness. The nobility, whose rapacity

had been checked by the sovereign, joined the popular party. The opponents of the crown bound themselves together, first by the National Covenant, and afterwards, in alliance with the English Puritans, by the Solemn League and Covenant. Their efforts were completely successful, but their success led to the utter overthrow of the monarchy by Cromwell. See MONTROSE.

The restoration of Charles II. was welcomed by all classes, wearied as they were of a foreign and military rule, but especially by the nobles and gentry, who had learned by bitter experience that the humiliation of the sovereign was necessarily followed by the degradation of their order. Had the government of Charles II. and James VII. been reasonably just and moderate it could hardly have failed in securing general support; but it was more oppressive and corrupt than any which Scotland had experienced since the regencies in the minority of James VI. The natural result was the revolution which seated William and Mary on the throne: the Jacobite victory of Killiecrankie was more than neutralised by the fall of Dundee.

The parliament of Scotland, which met for the last time in 1706, was originally composed, like the English parliament, of three classes—the ecclesiastics (consisting of bishops, abbots, and priors), the barons, and the burghesses. The spiritual lords during the establishment of Episcopacy after the Reformation were composed of bishops only. When Presbyterianism was established at the time of the Covenant, and when it was formally ratified by law at the Revolution, the ecclesiastical estate ceased to have any place in parliament. The barons, or immediate vassals of the crown, at first sat in their own right, whether holding peerages or not; but afterwards the peers alone sat, the others sending their representatives. The burghesses were the representatives of the burghs. All the three estates sat to the very last in one house, the sovereign presiding in person, or through a commissioner named by him.

Hardly had the majority of the nation been successful in the Revolution settlement when many of them began to repent of what they had done, and Jacobitism became more popular than royalist principles had ever been when the House of Stewart was on the throne. The discontent was greatly increased by the fears entertained of English influence. Ancient jealousies had been revived and intensified by the collapse of the Darien Scheme (q.v.). The state of matters grew so threatening after the accession of Queen Anne that the ruling English statesmen became satisfied that nothing short of an incorporating union between the two kingdoms could avert the danger of a disputed succession to the throne and of a civil war. Supported by some of the ablest and most influential persons in Scotland, they were successful in carrying through their design, though it was opposed by a majority of the Scottish people, under such leaders as Fletcher (q.v.). The Act of Union was formally ratified by the parliament of Scotland on the 16th of January 1707. It subsequently received the royal assent, and came into operation on the 1st of May of the same year. The union continued to be unpopular in Scotland for many years, an unpopularity increased by the corrupt means freely used to carry it through. Suspicions were cherished that the national life would pass away with the national separateness, and that the independence of the Scottish church and the distinctness of the national system of jurisprudence would inevitably suffer. There were agitations and petitions for the repeal of the union and the restoration of the national parliament. But the discontent gradually died down; not that the malcontents were silenced by argument but by the logic of facts. The

association with the larger and wealthier kingdom of the south opened a vastly wider field to the enterprise for which in all departments of life the 'præferendum ingenium Scotorum' had already been noted; and the rapid growth of prosperity by the extension of old and the establishment of new industries helped to bring about a sense of well-being and content. The peaceful acquiescence of the great majority of the nation in the union was brought out at the time of the Jacobite rebellions of 1715 and 1745 (see JACOBITES); the Porteous Mob (q.v.) was a temporary ebullition of a discontent only partly political. It became patent to all that the consequences of the union were beneficial to both countries; yet Scotland and England are in many respects two countries still, and a Scot abroad, asked if he is an Englishman, will seldom give an affirmative answer.

Scotland and Scotsmen have taken a prominent part in the public affairs and intellectual life of the United Kingdom, in its warfare and colonial expansion; the literature of Scotland blossomed luxuriantly (see below) after the union; Reid and Dugald Stewart founded a school of philosophy (see SCOTTISH PHILOSOPHY), as Jeffrey and Cockburn did a school of criticism; and in the 18th century the 'Modern Athens' was more conspicuously a centre of literary and intellectual culture than at any former period. A long series of scientific worthies begins with Napier of Merchiston, including in mathematics, physics, and chemistry, the Gregories, Simson, Black, Brewster, J. D. Forbes, Clerk-Maxwell, Macquorn Rankine, Dewar, Tait, and Graham Bell; in engineering and steam navigation, Watt, Rennie, Telford, Symington, Henry Bell, Fairbairn, and the Stevensons; in geology, almost all the greatest British names—Hutton, Playfair, Hall, Murchison, Lyell, and the Geikies; in zoology, Edward Forbes and Wyville Thomson; Brown the great botanist; and in medicine and surgery, the dynasties of Gregories, Cullens, Munros, Hunters, and Bells, Simpson, Liston, and Syme. Paterson and Law, founders of the bank of England and the Bank of France, were Scotsmen. Among British Prime Ministers Gladstone, Rosebery, Balfour, Campbell-Bannerman, Bonar Law, Ramsay MacDonald, have been Scottish by birth or descent. Erskine, Campbell, and Haldane sat on the Woolsack of England, Sir Alexander Cockburn was Lord Chief Justice. Of painters, Jameson, Allan, Nasmyth, Thomson, Raeburn, Wilkie, Dyce, David Scott, Phillip, McTaggart, MacCulloch, and Orchardson, may be named, with the brothers Adam, architects. Amongst soldiers have been Marshal Keith, Marshal Stair, Abercromby, Moore, Heathfield, Lynedoch, Lord Clyde, and Earl Haig; amongst sailors, Camperdown and Dundonald; and amongst travellers and explorers, Bruce the 'Abyssinian,' Livingstone, Joseph Thomson, and W. S. Bruce.

The 'Scot abroad' was always a familiar phenomenon equally in French universities and in French, Austrian, Swedish, and Russian armies; and Scotsmen have not since then become a race of stay-at-homes. Sweden has its Hamiltons, Germany its Douglasses, and France its Macdonalds; the Russian poet Lermontoff, the Norwegian composer Grieg, the German general Mackensen bear Scottish names more or less modified. The Scots Guards (q.v.) in France became famous, while Sir Charles Dilke said (in *Greater Britain*), 'In British settlements from Canada to Ceylon, from Dunedin to Bombay, for every Englishman you meet who has worked himself up to wealth from small beginnings without external aid, you find ten Scotsmen.' But this is a pardonable exaggeration.

See the 'Historians of Scotland' series (10 vols. 1871-80), comprising the chronicles of Fordun and Wyntoun,

the lives of SS. Ninian, Kentigern, and Columba, the *Critical Essay on the Ancient Inhabitants of Scotland*, by Father Innes (q.v.), &c.; the *History of Bede*, the Irish Annals, and especially Skene's *Celtic Scotland* (3 vols. 1876-80; new ed. 1886). For the period down to the Reformation may be added the *Chronicles of Melrose and Lanercost*, Leslie's and Buchanan's *Histories*, E. W. Robertson's *Scotland under her Early Kings* (2 vols. 1862), and the Acts of the Scottish Parliament. For the period from the Reformation to the Union—Knox's, Calderwood's, Spottiswoode's, and Robertson's *Histories*, Baillie's *Letters*, Wodrow's and Burnet's *Histories*, the Acts of Parliament, and the State Papers. The Scottish Records publications include *The Exchequer Rolls of Scotland*, *Accounts of Lord High Treasurer*, *Register of Privy-council*, *Documents illustrating Scottish History*. See also Pinkerton's *Inquiry*; Hailes's *Annals*; the histories by Tytler, Laing, Hill Burton, Hume Brown (3 vols. 1898-1909, Andrew Lang (4 vols.) and Sanford Terry (1920, 1921); various works by Rait, including *Parliaments of Scotland* (1924); Chambers's *Domestic Annals*; the works of Cosmo Innes; Craik's *A Century of Scottish History* (1901); Hill Burton's *Scot Abroad*; Fischer's books on Scots in Germany, Sweden, &c.; Grant's *Scottish Soldiers of Fortune* (1889); Mackintosh's *History of Civilisation in Scotland* (1878-84), his *Scotland from the Earliest Times to the Present Century* (1890); a succession of works by W. L. Mathieson (1902-16); Mackinnon's *Social and Industrial History of Scotland to the Union* (1920), and *Constitutional History of Scotland to the Reformation* (1924); besides works on special periods. Additional references may be found by consulting articles in this work, such as GOWRIE CONSPIRACY, JACOBITES, &c., and the lives of the kings and other great personages of Scottish history. For the royal arms of Scotland, see HERALDRY.

ECCLESIASTICAL HISTORY.—Christianity in Scotland dates from the 4th century, but its beginnings are obscure. What we know centres mainly round the lives of the great Celtic missionaries, Ninian, Kentigern, and Columba, and may be traced in the articles on them, as also in those on Adamnan, on Cuthbert, on the Culdees, and on the Picts. The connection of St Palladius, 'chief apostle of the Scottish nation,' with Scotland seems mythical; he is said to have been sent 'in Scotiam' in 430 by Pope Celestine; but the 'Scotia' here meant was certainly Ireland, and Skene doubts if Palladius was ever in Scotland till after his death, when St Ternan brought his relics to Fordoun in Kincardineshire. The doctrines of the ancient Scottish Church were the same as those of the rest of Western Christendom. In ritual there were some points of difference, but so slight that the most important related to the time of observing the Easter festival. In these points also the Scots gradually conformed to the usage of the Roman and English Churches. In one point, however, there continued for several centuries to be a marked distinction between the Scots and Irish on the one hand and the churches of England and the Continent on the other. This was in reference to ecclesiastical government. The Scots recognised the same orders of the ministry, bishops, priests, and deacons, as other Christians did; and like them they held that ordination could be given only by bishops. But they acknowledged no such supremacy of jurisdiction in the episcopal order as was held by other churches. In Scotland there were neither dioceses nor parishes; but there were numerous monasteries in which the abbots, whether bishops or priests, bore the chief rule, all being in subordination to the successor of St Columba, the presbyter-abbot of Iona, who in virtue of that office was primate of the Scots.

When Iona was desolated by the Northmen the primacy seems to have been transferred in the middle of the 9th century to the Abbots of Dunkeld, then to the Bishops of Abernethy, and finally to the Bishops of St Andrews, who became known as *Episcopi Scotorum*, the bishops of the Scots. Slowly at

first, but gradually, an assimilation to the English and continental usages began, a change rendered more easy by the Scottish dominion being extended over Lothian, in which the ecclesiastical system was the same as that of England. A great impulse was given in the same direction by the marriage of Malcolm III., king of the Scots, with Margaret the sister of Edgar Atheling. The king and queen used their utmost efforts to introduce the English usages in ecclesiastical as in other matters; and Margaret herself held repeated conferences for that purpose with the chief Scottish ecclesiastics, at which her husband acted as interpreter. The principal points in which she attempted to bring about a reform were the commencement of the Lent fast, the superstitious infrequency of receiving the communion, and the lax observance of Sunday and of the scriptural and canonical restrictions on marriage between relations.

The reform begun by Malcolm and Margaret was fully carried out by their youngest son, David I. These improvements were completed by his successors, and before the end of the 12th century the ecclesiastical system of Scotland differed in no important point from that of the rest of Europe. Some Scottish writers have lamented the change, as being one from purity of belief and practice to superstition and immorality. This is undoubtedly a mistake. The Celtic Church had become very corrupt, and the clergy were inferior both in learning and morals to their brethren in the south. King David was a reformer in the best sense of the word, and it does not detract from the character of his reformation that as time went on the Scottish Church became involved in those superstitions with which the rest of Christendom was overspread.

The ritual of the Scottish mediæval church was almost the same as that of England, the Salisbury Missal and Breviary being the models of the Liturgies and Office Books used in Scotland. The external system of the church—cathedral, parochial, and monastic—was also in almost every point identical. The chief monastic orders were the Benedictine and its most important branches the Cluniac and Cistercian, the canons regular of St Augustine, and the Reformed Premonstratensian canons. The Cluniacs and Cistercians were in strict subordination to the mother-houses of their orders at Clugny and Cîteaux. In the 13th century the Dominican, Franciscan, and Carmelite friars were introduced into Scotland. The chapters of all the Scottish cathedrals, except those of St Andrews and Whithorn, were composed of secular canons—the chief dignitaries being a dean, archdeacon, chancellor, precentor, and treasurer. The prior and canons regular of the Augustinian monastery at St Andrews formed the chapter of that see, and the prior and Premonstratensian canons of Whithorn formed the chapter of the cathedral of Galloway. There were twelve dioceses in the Scottish Church, to which Orkney was added on the transference of those islands to the Scottish sovereign in the 15th century. The twelve dioceses were Caithness, Ross, Moray, Aberdeen, Brechin, Dunkeld, Dunblane, St Andrews, Argyll, the Isles, Glasgow, and Galloway. The larger of these dioceses were divided, like the English dioceses, into rural deaneries. The single point in which the mediæval church down to the 15th century differed from that of England and other churches of the west was in its having no metropolitan. St Andrews, and next to it Glasgow, had a certain precedence; the bishops of the former see, and failing these the bishops of the latter, having the privilege of crowning and anointing the sovereign. But they had no jurisdiction over the other sees, nor did their bishops bear the style of archbishop. This led to claims on

the part of the Archbishops of York to metropolitan authority in Scotland, which had no foundation except in regard to the southern portion of the diocese of St Andrews and the see of Galloway, the bishops of which were for several centuries suffragans of York. The court of Rome found it convenient, for the sake of its own privileges, to encourage this anomalous system; but to provide for the meetings of the Scottish bishops in provincial council a bull of Pope Honorius III. in 1225 authorised them to meet in synod. In virtue of this bull the bishops, abbots, priors, and other chief ecclesiastics, with representatives of the capitular, collegiate, and conventual bodies, assembled annually in provincial synod, sitting in one house under the presidency of a conservator chosen by and from the bishops. The chief government of the church under the pope thus devolved on these synods and their elective presidents. This continued until the erection of St Andrews into an archiepiscopal and metropolitan see, in virtue of a bull of Pope Sixtus IV. in 1472. By this bull all the Scottish sees were made suffragans to that of St Andrews, whose bishops were now to be styled archbishops.

In 1492 Glasgow was raised to the dignity of a metropolitan see by a bull of Pope Innocent VIII., and the bishops of Dunkeld, Dunblane, Galloway, and Argyll were made suffragans to its archbishop, an arrangement which was soon afterwards altered to some extent—Dunkeld and Dunblane being reannexed to St Andrews, and Glasgow having for its suffragan sees those of Galloway, Argyll, and the Isles. This last arrangement continued till the Reformation, and afterwards during the establishment of Episcopacy—the two Scottish archbishops occupying towards each other precisely the same position as the Archbishops of Canterbury and York, and being sometimes involved in the same unseemly broils, in regard to jurisdiction and precedence, which long existed between the English metropolitans.

The ignorance and immorality of the clergy were far worse than they were in England, or perhaps anywhere in Europe, except in the Scandinavian churches. The desire for reformation which led to the proceedings of Huss and Wyclif produced similar effects in the Scottish kingdom. As early as the year 1406 or 1407 James Resby, an English priest and a disciple of Wyclif, was burned at Perth; and in 1433 Paul Crawler, a Bohemian Hussite, was burned at St Andrews. The opinions of Wyclif continued to be privately taught, particularly in the south-western counties, where his followers were known by the name of the Lollards (q.v.) of Kyle. In the following century the intercourse with the Continent was frequent and close, and the effects of Luther's preaching and writings were soon felt in Scotland. In the year 1525 the importation of Lutheran books and the propagation of the Reformer's tenets were forbidden by an act of the Scottish parliament; and in February 1528 Patrick Hamilton, abbot of Ferne, was burned at St Andrews for teaching and publishing Lutheran doctrines. The piety of Hamilton and the patience with which he bore his sufferings induced others to follow his teaching and example. Several persons, both ecclesiastics and laymen, were subsequently burned, and many more fled to England or the Continent.

The persecution, though encouraged or permitted by the bishops, was disapproved of by some ecclesiastics of learning and influence, who were desirous of effecting a reform in the church without breaking off from communion with the hierarchy. The efforts of this school were unsuccessful, and the Scottish nation was gradually divided into two parties—one

of which, headed by the bishops and supported by the state, was determined to resist all change; and the other, composed of a considerable number of the clergy both regular and secular, of the gentry, and of the burghesses of the large towns, was disposed to carry its reforming principles far beyond what had been done by Luther and Melancthon. These two parties came into deadly conflict in 1546. On the 28th of February in that year George Wishart, the most eloquent of the Reforming preachers, was condemned to death by an ecclesiastical court—at which Cardinal Beaton, Archbishop of St Andrews, presided—and was burned. On the 28th of May following the cardinal was murdered by Norman Leslie and other adherents of the Reforming party. The struggle continued during the regency of the Earl of Arran and that of Mary of Lorraine, the mother of Mary, the young queen of Scots.

In the year 1559 the Reformers became strong enough to set the regent at defiance. Various circumstances encouraged them to demand freedom for their opinions, particularly the death of Mary of England and the accession of Elizabeth. They were further animated at this time by the return from Geneva of their chief preacher, John Knox. The conflict was to be decided by other than spiritual weapons. The regent and the Reformed party, now known by the name of the Congregation, met in open warfare. The contest was carried on for a twelvemonth, and ended in the triumph of the Congregation. A parliament met at Edinburgh on the 1st of August 1560. The Reforming party had the complete ascendancy, and succeeded in passing several acts by which the jurisdiction of the pope was abolished, the mass was proscribed, and a Confession of Faith drawn up by Knox and his associates was ratified, the spiritual lords making a faint resistance.

The new Confession of Faith adhered in all essential articles of belief to the ancient creeds of the church. In regard to the sacraments it differed entirely from the recent teaching of the Western Church; but its language, on the whole, was moderate and conciliatory. In reference to ceremonies and the details of church polity it declared that such things were temporary in their nature, and not appointed for all times and places, and that they ought to be altered when they fostered superstition and ceased to be conducive to edification.

A Book of Discipline was soon afterwards drawn up by the compilers of the Confession, which was generally approved of, but did not receive the sanction of parliament. It followed out in detail the principles laid down in the Confession. In regard to the office-bearers of the church various orders were mentioned, but three were specially of importance—ministers, elders, and deacons. Ministers were to be chosen by each several congregation, but were to be examined and admitted in public by the ministers and elders of the church. No other ceremony, such as imposition of hands, was to be used. The elders and deacons were to be chosen yearly in each congregation, and were not to receive any stipend, because their office was only to be from year to year and because they were not to be debarred from attending to their own private occupations. In order to the better provision for the wants of the time certain persons called superintendents were appointed in particular districts, with power to plant and erect churches and to appoint ministers within the bounds of their jurisdiction.

The chief governing as well as legislative and judicial power in the Reformed Church was entrusted to a General Assembly, which met half-yearly or yearly, and was composed of the super-

intendents, ministers, and lay commissioners, and which gradually, by the introduction of the system of representation, assumed the form and more than the power of a parliament.

The worship of the Reformed Church was modelled on that established by Calvin at Geneva. It was embodied in a formulary called the Book of Common Order, which for nearly a century continued to be generally used. It contained forms for the ordinary worship both on Sundays and weekdays, and for the administration of the sacraments, and for certain other occasions. The minister was not absolutely restricted to these forms. Except in the singing of Psalms, the people took no direct part in ordinary worship, and there was no distinction of ecclesiastical seasons, all holidays whatever except Sunday being abolished.

The form of church government established at the Reformation did not remain long undisturbed. Some of the most zealous Protestants thought the danger to which the church was exposed from state tyranny and aristocratical oppression could best be met by restoring the bishops to their ancient position both in the church and in the parliament; while others of equal zeal and sincerity saw in this only the commencement of a plan for bringing back all the errors of popery. A scheme of this kind was actually established for some time, and the sees were filled with Protestant bishops set apart for the office by their brethren of the ministry. It was almost immediately attacked by some of the ministers, who soon found a leader in Andrew Melville, a scholar of considerable eminence, who returned to Scotland in 1574, after a residence in Geneva, during which he had ardently embraced the new opinions as to ecclesiastical government maintained by Beza.

The struggle continued for some years, the bishops being encouraged by the sovereign and his advisers, whose support was frequently of little real advantage to them, and Melville receiving the zealous assistance of many of the ministers, and of the great body of the common people, who sympathised with him in his democratic theories of civil and ecclesiastical government. Melville was at last entirely successful. His opinions were embodied in what was called the Second Book of Discipline, which received the formal sanction of the General Assembly in 1581. This formulary differed very much from the First Book. It laid down authoritatively those principles in regard to ecclesiastical authority which the English Puritans were vainly striving to establish in the southern kingdom, and was in reality an attempt to make the civil power subordinate to the ecclesiastical, even in matters secular. It recognised four orders of office-bearers in the church, the Pastor, Minister, or Bishop, the Doctor, the Presbyter or Elder, and the Deacon. These were to be set apart by ordination and the imposition of the hands of the eldership, but no one was to be intruded into any office contrary to the will of the congregation or without the voice of the eldership. Four sorts of church courts, each rising above the other, were sanctioned; first, of particular congregations one or more; second, of a province or what was afterwards called the Provincial Synod; third, of a whole nation; and fourth, of the universal church. What is generally regarded as the most essential feature of the Presbyterian system—the Presbytery—was not yet introduced in its proper form, the lowest court being a combination of what were afterwards known as the Presbytery and the Kirk-session. It was, however, introduced before the year 1592, when the privileges of general and provincial assemblies, presbyteries, and parochial sessions were ratified by parliament, though the Book of Discipline itself did not receive any formal sanction.

Clerical 'superintendents' had been appointed over districts, but without episcopal rank or powers.

King James had assented to the establishment of Presbyterianism, but disliked its discipline and soon endeavoured to overthrow it—more effectually after his accession to the crown of England. He gradually obtained from the General Assembly a recognition of the civil rights of the bishops, and this led to the restoration of their ecclesiastical privileges. His changes were sanctioned by a General Assembly which met at Glasgow in 1610, and in the course of the same year Episcopacy was restored in reality, as well as in name, by the consecration of three Scottish prelates by four of the English bishops at London.

The king wished to assimilate the Scottish Church as far as possible to that of England, and his next important movement was the establishment of what are called the Five Articles of Perth (see PERTH).

These various changes excited great dissatisfaction in Scotland, particularly in the southern counties, but it gradually abated to a considerable extent, and might have altogether ceased had not further innovations been attempted. It was the wish of James to introduce a prayer-book like that of the English Church in place of the Book of Common Order, but he saw the danger with which the proposal was attended, and gave it up or postponed it. His son Charles was as inferior to his father in prudence as he excelled him in conscientiousness and religious zeal. During his first visit to Scotland he added another bishopric—that of Edinburgh—to the dioceses of the Scottish Church. Most unwisely and most improperly he endeavoured by his royal authority to introduce into that church a Book of Canons and a Liturgy framed on the model of those of England. The king had many loyal supporters in all parts of Scotland, and in the north Episcopacy was preferred by the people to Presbyterianism. But the storm of popular indignation which was now roused swept everything before it. The king's opponents banded themselves together by the National Covenant, and at a General Assembly held at Glasgow abolished the Perth Articles and Episcopacy and re-established Presbyterianism. Charles attempted to maintain his claim by the sword, but was unsuccessful, and obliged to ratify in parliament all that had been done by his opponents.

Had the Covenanters been satisfied with the victory which they had won Presbyterianism might have remained the established religion of the Scottish kingdom. But they could not resist the entreaties for aid from the English Puritans, or rather they yielded to the delusion of extending their own discipline over the churches of England and Ireland. They just attempted, in an opposite direction, what James and Charles had failed to accomplish. For a time their policy seemed to triumph. The Solemn League and Covenant of the three kingdoms, after having been approved by the General Assembly in Scotland, was signed by the Assembly of Divines which the parliament had summoned to meet at Westminster and by the parliament itself. The ecclesiastical documents which were afterwards drawn up originated with the Assembly of Divines, but were sanctioned by the Assembly in Scotland. The principal of these were a Directory for Public Worship, a Confession of Faith, and a Larger and Shorter Catechism. The first of these documents was intended to supersede the Book of Common Prayer in England, and indirectly the Book of Common Order in Scotland. It laid down certain general rules in regard to public worship and the administration of the sacraments, but left very much to the discretion of the particular ministers and congregations.

The union between the Scottish and English Puritans was dissolved by the ascendancy of the Independents. Scotland, distracted by civil and ecclesiastical dissension, was unable to defend itself against Cromwell. It was conquered and kept thoroughly under subjection by the English army, which forbade the meetings of the General Assembly, but left the other courts and the rest of the church system as they were before. At the Restoration the higher classes generally, who had suffered under the ecclesiastical tyranny of the ministers, were zealous for the re-establishment of Episcopacy. The greater part of the nation, except in the south-western provinces, was indifferent, and the king experienced no difficulty in restoring the bishops to their former rights both in church and state. But Episcopacy alone was restored; there was no attempt to introduce a liturgy, or even to enforce the observance of the Perth Articles. The new primate, Archbishop Sharp, was an able man of good moral character, but ambitious and overbearing, and the Covenanters never forgave his change from Presbyterianism, though he had always belonged to the more moderate of the two parties into which the church was divided. He was almost the only one of the bishops who enjoyed political influence; and, unfortunately for himself and the hierarchy, that influence was generally used to encourage, not to restrain, the severe measures of the government. When the primate was assassinated that severity became a cruel tyranny, and many who had no predilection for any particular ecclesiastical opinions were ready to welcome the change which took place at the Revolution.

When the Scottish Estates met in 1689 to consider what course was to be adopted in the northern kingdom the bishops declined to abandon King James. Whatever might have been the consequences had they taken an opposite course, this resolution was fatal to the Episcopal establishment. William and Mary were called to the throne, and Prelacy was declared to be an insupportable grievance and was abolished. In the following year Presbyterianism was re-established, and the Westminster Confession of Faith was ratified as the national standard of belief, and the right of patrons to nominate to ecclesiastical benefices was taken away. In the end of the same year a General Assembly was held, the first which had been allowed to meet since its dissolution by the order of Cromwell. It was composed as before of ministers and elders from the various presbyteries and of elders from the burghs and universities, and was presided over by a lay commissioner named by the crown and a minister elected by the members as moderator. With the exception of some years in the reign of William, the Assembly has continued to meet annually since the Revolution and to transact business during the periods when it was not in session by a commission named by itself for the purpose. The other chief ecclesiastical events of William's reign were a series of vain attempts on the part of the sovereign to bring about a comprehension of the Episcopal clergy with those of the Establishment and the passing by the Assembly in 1697 of what was called the 'Barrier Act,' which guarded against sudden legislation by providing that no permanent act should be passed until it had received the approbation of the majority of the presbyteries.

During the reign of Queen Anne and in the year 1707 England and Scotland were united into one kingdom. A special statute was passed for the security of the Protestant religion and Presbyterian church government in the latter country; providing that these should continue without any alteration in time to come, and confirming the act

of William and Mary which ratified the Confession of Faith and settled the Presbyterian form of church government.

In the year 1712 an act was passed by the British parliament which restored to patrons in Scotland their right of presentation to benefices. This statute excited great discontent among the members of the Established Church, and for many years attempts were made to obtain a repeal of it. These attempts were unsuccessful, but its provisions were long practically disregarded. When at length the General Assembly began to act upon it the dissatisfaction increased among those who held the divine right of the people to choose their own ministers. The leader of the discontented party was a minister named Ebenezer Erskine, and he with his adherents in the year 1733 finally separated from the Establishment and formed a communion which took the title of the Associate Presbytery, though its members were popularly known as the Seceders. The Seceders themselves were soon divided by a dispute as to whether it was consistent with principle to take the Burgher's oath of allegiance into two bodies, called the Burgher and Anti-burgher Synods, and later, a second split occurred in each of these on the question of civil magistracy. The two newer and smaller bodies were known as 'Old Lights' and the two older and larger as 'New Lights.' In the year 1761 another secession from the Establishment took place in connection with the law of patronage; and the separated body assumed the name of the Presbytery of Relief.

There were no further secessions for nearly a century; but the church was divided into two parties, known as the Moderates and Evangelicals, the former of whom were favourable, the latter hostile, to the law of patronage. For many years the Moderates, headed by Dr Robertson the historian and others of his school, and supported by the influence of the government, maintained an ascendancy in the General Assembly and throughout the country. In the later years of George III. and during the reign of George IV. this ascendancy began to decrease. The political excitement which prevailed in the beginning of the reign of William IV. strongly affected the Scottish Establishment, which from its very constitution is peculiarly liable to be moved by the impulses of popular feeling. The two parties in the General Assembly engaged in a struggle more fierce than any in which they had yet met; and the subject of dispute as before was immediately connected with the law of patronage. Dr Chalmers, the most distinguished minister in Scotland, added the whole weight of his influence to the popular party, and in 1834 an interim act of Assembly was passed, known as the Veto Act, which declared it to be a fundamental law of the church that no pastor should be intruded on any congregation contrary to the will of the people, and laid down certain rules for carrying out this principle. The legality of this act was doubted; and in connection with a presentation to the parish of Auchterarder the presentee, on being rejected by the presbytery in terms of the Veto Act, appealed, with concurrence of the patron, to the Court of Session—the supreme civil court in Scotland. That court decided that the conduct of the presbytery in rejecting the presentee was illegal, and their judgment was affirmed by the House of Lords. Other cases of a similar nature followed, and something like a conflict took place between the civil and ecclesiastical courts, the former enforcing their sentences by civil penalties, the latter suspending and deposing the ministers who obeyed the injunctions of the Court of Session. In the General Assembly of 1843 the dispute came to a crisis. A large number of ministers and elders of

the popular party left the Assembly and met apart in a similar body, of which Dr Chalmers was chosen moderator. They formed themselves into a separate communion under the title of 'The Free Church of Scotland,' and gave up their benefices in the Established Church and all connection whatever with that body. The Free Church carried off about one-half of the members of the Establishment and became a rival communion in most of the parishes. By an act of parliament in 1874 patronage was abolished in the Established Church and the right of choosing the minister transferred to the congregation.

In 1820 the New Light sections of the Burgher and Anti-burgher Seceders were united under the name of the Associate Synod of the Secession Church, and were joined in 1842 by the Old Lights; and in 1847 this Associate Synod and the Relief Synod were united under the name of 'The United Presbyterian Church.' Negotiations for a union of the United Presbyterian Church and the Free Church (q.v.), ineffective in 1873, were crowned by the formation in 1900 of the United Free Church, though a minority remained outside and retained the name of 'Free Church.' Negotiations began in 1907 for the union of the Church of Scotland and the United Free Church, and in 1925 parliament passed the Church of Scotland (Property and Endowments) Act, in order to smooth the way.

Episcopal Church in Scotland.—It is a common but erroneous opinion that almost all the Episcopal clergy were Jacobites from the time of the accession of William and Mary. The bishops were so (see NONJURORS); but a large number, probably a considerable majority of the clergy, had at first no objection to take the oath of allegiance to the new government. During the reign of Queen Anne the Episcopal clergy were well disposed to the government, knowing the queen's good wishes to their communion. They were frequently harassed by the courts of the Establishment; but all who were willing to take the oaths obtained an ample protection for their worship on the passing of the Toleration Act of 1712. On the death of the queen almost all the clergy and most of the laity were involved directly or indirectly in the attempts to overthrow the Hanoverian dynasty, and it was this which finally made the names of Episcopalian and Jacobite for many years to be convertible terms.

In the meantime the succession of bishops had been kept up by new consecrations, and after some years the dioceses, though diminished in number, were regularly filled. An important change took place in the forms of worship. No longer trammelled by their connection with the state, they adopted liturgical forms similar to those in the English Prayer-book, and in almost all cases identical, except that many of the congregations used an Office for the communion modelled on that of the Scottish Liturgy of King Charles I. The Episcopalians took no such open part in the insurrection of 1745 as they did in that of 1715, but their sympathies were known to be with the House of Stewart; and the government carried through parliament some intolerant acts, which were put in execution with great harshness, and which for many years suppressed all public worship in the Episcopal communion. It was only after the accession of George III. that these statutes ceased to be actively enforced; and it was not till 1792 that the Episcopalians, who from the death of Prince Charles had acknowledged the reigning dynasty, were relieved from the penal laws. The act which gave this relief imposed restrictions on their clergy officiating in England and prohibited their holding benefices in the English Church. In

1804 the bishops and clergy agreed to adopt the Thirty-nine Articles of the Church of England, and in 1863 the Prayer-book was adopted as the authorised service-book of the Episcopal Church, permission being given in certain cases to use the Scottish Communion Office. The restrictions imposed on the Scottish clergy by the Act of 1792 were modified by an act passed in 1840; and in 1864 they were entirely removed, the right being reserved to bishops in England and Ireland to refuse institution to a Scottish clergyman without assigning any reason, on his first presentation to a benefice in England or Ireland, but not after he should have once held such benefice.

The dioceses of the Scottish Episcopal Church are seven in number—viz. Moray, Aberdeen, Brechin, Argyll, St Andrews, Edinburgh, and Glasgow. The bishops are chosen by the clergy of the diocese and by representatives of the lay communicants, a majority of both orders being necessary to a valid election. One of the bishops, under the name of Primus, chosen by the other bishops, presides at all meetings of the bishops, and has certain other privileges, but possesses no metropolitan authority. The highest judicial body is the Episcopal College, composed of all the bishops. The highest legislative body is a General Synod, composed of two houses, the one of the bishops, the other of the deans and the representatives of the clergy. There is also a Church Council, composed of the bishops, clergy, and representatives of the laity, which meets yearly, and is recognised as the organ of the church in matters of finance.

Roman Catholic Church.—The ecclesiastical revolution of 1560 by no means extinguished the Roman Catholic Church. An act of parliament was indeed passed making the saying or hearing of mass a crime punishable by confiscation of goods and imprisonment for the first offence, banishment for the second, and death for the third. Under its provisions Archbishop Hamilton and some few other priests were thrown into prison in 1563. The bishops for the most part were cowed and helpless, and a number of priests fled the country. Nevertheless, many noblemen and a large part of the population, especially in the north, remained faithful at heart to the old religion, and were till the end of the century a formidable political power upon which the partisans of Queen Mary in England, the Guises, and the king of Spain could rely in their projects against the throne of Elizabeth. Missionaries, chiefly Jesuits, came into the country to keep alive as best they could the decaying faith. The sufferings of both priests and people were extreme, yet notwithstanding the bitter hostility displayed by the kirk with whom the coercive power lay, it is notable that only one priest, John Ogilvy the Jesuit, suffered the penalty of death (1615), and this not on the ground of his priestly office, but for language which was, not unnaturally, judged to be treasonable.

The Scottish Roman Catholics suffered also for a long time from the want of any regular ecclesiastical organisation. In 1598 the secular clergy were placed under the jurisdiction of the newly-appointed archpriest of England, George Blackwell, and in like manner continued to be subject to Dr William Bishop, the first vicar-apostolic of England and Scotland, in 1623. It was not until nearly a century after the Reformation (1653) that they were granted a 'prefect' of the mission in the person of William Ballantyne. Meanwhile measures were taken to keep up the supply of missionary priests by the foundation of seminaries abroad. Clement VIII. founded the Scots college at Rome in 1600. In 1612 a seminary originally set up at Tournai, after many wanderings, was finally established at Douai. A college was

opened at Madrid in 1633, and subsequently transferred to Valladolid. Another seminary was established at a later period in connection with the Scottish monastery at Ratisbon. During the whole of the 17th and 18th centuries, or until the episcopate of the illustrious convert from Protestantism, Dr William Hay (1769–1811), the fortunes of the Scottish Catholics were at a very low ebb. Bishop Hay founded in 1799 a seminary at Aquhorthies near Inverurie, and provided Catholics with a new literature.

A report made to Rome in 1679 estimated the total number of Catholic *communicants* at 14,000. Of these 12,000 belonged to the Highlands, where, however, there were only 3 or 4 priests. In 1705 there were said to be 160 Catholics in Edinburgh, 5 in Leith, and 12 in Glasgow. Certain districts of the Highlands and Islands named as exclusively Catholic are South Uist and Barra, Canna, Rum and Muck, Knoydart and Morar, Arisaig, Moydart and Glengarry, in which places there were about 4500 Catholics. The district of Braemar contained 500. There were at this time 36 priests on the mission in all Scotland. The number of Catholics in the country about the year 1779 has been estimated at from 20,000 to 30,000, while it is said that not more than twenty of these possessed land worth a hundred a year. A very great increase, chiefly owing to the influx of Irishmen, took place at the beginning of the 19th century. In 1800 Edinburgh and Leith contained 1000 Catholics; in 1829, 14,000. In the latter year there were 25,000 in Glasgow, 1500 in Perth, 1400 at Preshome, 1500 in Glengarry, 1000 in Dumfries, and 3000 in Aberdeen—the whole Catholic population being reckoned about this time at 70,000, including the bishops and 50 priests. In 1923 there were over 600 priests, over 450 churches, and about 600,000 adherents.

The first bishop appointed as vicar-apostolic for Scotland was Thomas Nicolson (1695). The vicariate was divided into a Lowland District and Highland District in 1731, and into three districts in 1828. The Hierarchy, consisting of two archbishops, St Andrews and Edinburgh, and Glasgow, and four bishops suffragans of the former, was established by Leo XIII., 4th March 1878. St Mary's College at Blairs, 6 miles south-west of Aberdeen, is a seminary removed from Aquhorthies in 1829.

The chief original authorities for the ecclesiastical history of Scotland down to the Revolution are the same as those mentioned in the article on the Civil History, to which may be added Theiner's *Vetera Monumenta Hibernorum et Scotorum* and Joseph Robertson's *Concilia Scotiæ* (2 vols., Bannatyne Club, 1866). The chief modern authorities are Cook's *History of the Reformation and History of the Church of Scotland*; Principal Lee's *Lectures* (1860); Principal Cunningham's *Church History of Scotland* (2d ed. 1883); Scott's *Fasti Ecclesiæ Scoticanæ* (new ed. 1915 et seq.); *The Church of Scotland, Past and Present*, edited by Professor Story (5 vols. 1891); Dowden's *The Mediæval Church in Scotland* (1910); MacEwen's *History of the Church in Scotland to 1560* (1913–18); and MacGregor's *The Scottish Presbyterian Polity* (1926). See also Dean Stanley's *Lectures on the History of the Church of Scotland* (2d ed. 1879), with Principal Rainy's Reply (1872); Bishop Wordsworth's *Discourse* (1881); for the Free Church point of view, M'Crie's *Sketches* (1841); Hetherington's *History* (1841), and Buchanan's *Ten Years' Conflict* (1849); for the Episcopal side, Russell's *Church of Scotland* (1838) and Miss Kinloch's *History* (1888). See W. Forbes-Leith, S.J., *Narratives of Scottish Catholics under Mary Stuart and James VI.* (1885); *The Catholic Church in Scotland*, edited by the Rev. J. F. S. Gordon (Glasgow, 1869); and Dr Bellesheim, *History of the Catholic Church in Scotland*, trans. by F. Hunter-Blair, vols. iii. and iv. (1889–90); and see in this work the articles on CONFESSIONS OF FAITH, COVENANT, PRESBYTERIANISM,

ASSEMBLY, ELDER, FREE CHURCH, UNITED PRESBYTERIANS, CAMERONIANS, and those on the great church leaders, Knox, Melville, Henderson, Chalmers, Macleod, Tulloch, &c.

SCOTTISH LANGUAGE.—This name is now applied to the Teutonic speech of Lowland Scotland, especially in its literary form, as the official language of the kingdom in the 15th and 16th centuries, and the vehicle of ballad and lyric poetry down to the present day. As originally used, it meant the Celtic language of the Scoti or Scots of Ireland, and to a comparatively late date it continued to be applied to the same language as spoken by the Celtic people of the Highlands and Western Isles, the 'Saxon' tongue of the Lowlander being then usually distinguished as 'Inglis' or English. All the earlier Scottish writers, Barbour, Wyntoun, Harry the Minstrel, Dunbar, and even Sir David Lindsay recognised their language as 'Inglis'; Fordun, about 1400, still applied the name *Scottish* to the Celtic, saying of his countrymen: 'For they use two languages, the Scottish and the Teutonic (*Scotica et Teutonica*); the people speaking the latter occupies the seacoast and lowland districts, the people of Scottish language (*lingua gens Scotica*) inhabit the highlands and isles beyond.' But as the nationality of Scotland, as distinct from England, became more definitely recognised, there were obvious inconveniences in applying the name *Scottish* to the speech of what had become the least important section of the nation, and the Celtic tongue began to be usually spoken of by Lowlanders as *Yrische* or *Erse*; it was natural also that in the struggle with 'oure alde enemeis of Ingland,' the name *Inglis* should become distasteful to patriotic Scots; and, accordingly, in the 16th century, the name 'Scottis,' after having been disused for more than a century, was recalled, and applied to the Lowland tongue as being the official language of Scotland and of the vast majority of Scotsmen. Thus Gavin Douglas in the preface to his translation of *Virgil*, and the author of the *Complaynt of Scotland*, claimed to write in the 'Scottis toung;' and from 1550 onwards this has always meant the Teutonic or Saxon speech of Lowland Scotland, the original *lingua Scotica* of the Highlanders being distinguished as *Erse* or Scottish Gaelic. The latter is a form, or group of forms, of the common Celtic tongue which is spoken, with many dialectal gradations, from Cape Wrath in Scotland to Cape Clear in Ireland, the Gaelic of Argyll and Islay not differing from the Irish Gaelic of Ulster on the one hand, more than it does from the Scottish Gaelic of Inverness and Skye on the other. The *Erse* has been a literary language in Ireland from a remote period; its literary career in Scotland is much shorter, beginning with Carswell's Gaelic version of John Knox's Liturgy, printed in 1567, and of little moment before the 19th century. The Gaelic is still extensively spoken in Scotland west and north of a line which runs up the Firth of Clyde and Loch Long, and crosses by Glen Douglas, Rowardennan, Aberfoyle, Callander, Comrie, Dunkeld, Glen Shee, Mount Blair, till it reaches the Dee 6 miles above Balmoral; leaving the Dee 3 miles above Ballater, it continues by the southern watershed of Glen Livet to the Spey and Knock of Moray, Coulmony on the Findhorn, and reaches the Moray Firth about 3 miles west of Nairn. East of this line, as also in the north-east half of Caithness and in the Orkney and Shetland Isles, Gaelic is no longer native; but even to the west of the line a large proportion of the population is bilingual. There has never been any newspaper or journal published wholly in Gaelic, so that the literary standing of the language is very different from that of Welsh.

Lowland Scots is a form of the Teutonic or

Germanic speech introduced into Britain by the Angles and Saxons in the 5th century. These tribes spoke different dialects, which may be broadly distinguished as *Saxon*, including West Saxon and Kentish, and *Anglian*, including Mercian and Northumbrian. In the Middle English period these developed into the Southern, Midland, and Northern English dialects respectively. Lowland Scots forms part of the Northumbrian or Northern English division; modern standard English is a blending of Midland and Southern. Before the Norman Conquest, and for some centuries later, old Northumbrian was spoken probably with little or no variation from the Humber to the Firth of Forth. But after the division of the Northumbrian territory between England and Scotland, and especially after the final establishment of the independence of Scotland in the beginning of the 14th century, this common speech began to be exposed to diverse influences north and south of the Border. South of the Tweed and Cheviots Northumbrian sank from the rank of a literary language used by poets, preachers, and chroniclers, to that of a local dialect, or group of patois, overshadowed by the king's English of London, and more and more depressed under its influence. After 1400, or at least after the 15th century, it disappears from the view of the student. But north of the Tweed and Solway, though strongly influenced by Chaucer and other Englishmen, Northumbrian remained the language of a court and a nation; it spread westward and northward over districts formerly occupied by British and Gaelic (or it may be Pictish) populations, from which it sustained modifications phonetic and structural; it received literary culture, and especially contracted alliances with French and Latin on its own account; so as to acquire by the close of the 15th century distinctive and strongly-marked features of its own not found in the cognate dialects in the north of England. From the close of the 14th to the beginning of the 17th century it was the vehicle of an extensive and in many respects brilliant literature, it was the medium of legislation and justice, and fulfilled every function of a national language. But a serious shock to its independent development was given by the Reformation, in consequence of the close relations between the leaders of that movement and the English Protestants, and the use of English books, especially of the English version of the Geneva Bible, printed at Edinburgh in 1576-79. Then followed the accession of James VI. to the crown of England, the transference of the seat of government to London, and the consequent disuse of the 'Scottis toung' by the court and by the nobility, who found it desirable to speak the king's English, and gradually grew ashamed of their Scots. After this, few works were written in the native tongue, except such as were intended for merely local use. It became obsolete in public legal use at the time of the Commonwealth, and though retained a little longer in the local records of remote burghs and kirk-sessions, it disappeared from these also by 1707. But though it thus became obsolete in official and literary use, so that Scotsmen thenceforth wrote in English tinged more or less with Scotticisms, or words, phrases, and idioms derived from their native speech, it still continued, in several dialectal varieties, to be the vernacular of the people, and after a period of neglect it bloomed forth anew as the vehicle of ballad and lyric poetry, in Lady Wardlaw, Allan Ramsay, Burns, and their numerous fellow-singers. Sir Walter Scott also led the way in its use in prose fiction as the characteristic speech of local characters, a purpose for which it has continued to be effectively used down to the

present day by many popular writers. These uses are, however, only *dialectal*; they must be classed with the similar use of Lancashire, Cumberland, Dorset, or Devonshire dialect, by English poets and novelists as the appropriate language of the local muse, and of local *dramatis personæ*; with this difference that Scottish, having been a literary language, has preserved a certain literary status which is wanting to these English dialects. But even this difference tends to disappear; recent writers of Scottish tales have sought to heighten the local truthfulness of their delineations by giving as close a transcript as possible of the local speech, regardless of the traditional conventionalisms of the 'literary' Scots.

The Teutonic tongue was probably introduced into the country south of the Forth as early as into any part of England. But few actual specimens of the language in these early times have come down to us; the chief is the Runic inscription still extant on the Ruthwell (q.v.) Cross in Dumfriesshire in Northumbrian of (possibly) about 660; then there are the local names, which, in so far as they are those of the dwellings of men, or of the less conspicuous natural features, are in eastern Lothian, Teviotdale, and lower Tweeddale, as truly Teutonic as in Kent or Essex. Isolated vernacular words and phrases in early Latin charters, and in the Latin texts of the early laws, some of which go back to the reign of David I., testify to the currency of the language in the 11th and 12th centuries. But connected specimens are all of later date, and the earliest of these are, moreover, known only in transcripts much later than their own date. Thus the eight lines of verse beginning:

Quhen Alysander our kynn wes dede
That Scotland led in luv and le,

though referring to events which followed the year 1289, are preserved for us only by Wyntoun who wrote after 1400. Rude snatches of song relating to the siege of Berwick in 1296 are preserved by Fabyan who wrote about 1500. Even Barbour's *Brus*, written about 1375, is, with the exception of the passages incorporated by Wyntoun, preserved only in MSS. more than a century younger. A charter of 1385 in the 'Red Book of Glen Tully,' and fragments of Scottish acts of 1389 and 1398 are among the earliest contemporary documents. But after 1400 the remains become plentiful.

The Scottish language as thus known to us has been divided into three periods: *Early Scottish*, during which the language did not differ appreciably from the Northern Middle English, extending from the earliest remains down to about 1475; *Middle Scottish*, the national period of the language, from that date to about 1650; *Modern Scots*, the dialectal period, from 1650 onwards. The distinctive characters of these periods are fully set forth in the Historical Introduction to Murray's *Dialect of the Southern Counties of Scotland* (1873). It will be observed that the first is coterminous with the Middle English period of the English language, and that the second is co-extensive with the Early Modern, or Tudor and Early Stuart Period of modern English. Barbour and Wyntoun represent the Early Period; Dunbar, Gavin Douglas, Lyndesay, Montgomery, and the fine prose of Bellenden, the *Complaynt of Scotland*, Archbishop Hamilton's Catechism, and the writings of Ninian Winzet, Father Dalrymple, and the other Roman Catholics belong to the Middle Period; the poets and novelists of the 18th, 19th, and 20th centuries to the Modern Period.

The living tongue now exists in numerous dialects and sub-dialects, easily distinguished from each other by differences of pronunciation and vocabulary. The researches of Sir J. Murray, followed by those of Dr Alexander J. Ellis, estab-

lished three main dialects, classed as Southern or Border Scots (Teviotdale, Dumfriesshire, and Selkirkshire; Central Scots (Lothian and Fife, Ayrshire and Clydesdale, Galloway, south-east Perthshire); North-eastern Scots (Angus, Aberdeen and Moray, Caithness). In the Orkney and Shetland Isles dialects of Norse survived till a century ago, many traces of which still characterise this fourth or *Insular Scots* group.

It was long a favourite notion that the Scottish speech contains a much larger Norse element than English; some writers even went to the length of claiming that it was of Scandinavian rather than of Anglo-Saxon origin. This is an entire mistake. There is no record of any Norwegian or Danish conquests and settlements in the east of Scotland, as in the east of England. In England the northern limit of Danish influence is about Durham; the county of Northumberland and the whole Scottish Lowlands, except a small district near the Solway, are entirely void of Danish characteristics. The differences relied upon as evidences of Scandinavian influence in Scotland, are really the differences between a pure Anglian dialect such as that of Scotland, and the largely Saxon dialect which lies at the basis of literary English. Scandinavian words and forms prevail extensively in certain English dialects, as in Yorkshire and Lincolnshire, but fewer of them have passed into Scots than into literary English.

The greatest work dealing with the Scottish language is Dr Jamieson's *Dictionary* (published 1804; with supplement, 1825; new ed. 1879-87). The author aimed to include both the literary words of the earlier periods and the modern words from all the dialects. For the former he was necessarily hampered by the deficiency of available printed material. For the latter he was dependent on the co-operation of friends in different districts. It is to be wondered that in these circumstances he produced so estimable a work. Its most serious defect was due to his utter ignorance of the subject historically, and his erroneous fancy that Scots was more intimately related to the tongues of Scandinavia, even to Suio-Gothic, as he called old Swedish, than to northern English. This coloured his whole work, even his definitions. The *New English Dictionary* (vols. i.-ix, 1888-1919) includes all literary Scottish words, either in separate articles or as variants under other heads. A systematic collection of all living Scottish words, of all the dialects, has been undertaken. Meanwhile the *English Dialect Dictionary* (6 vols. 1895-1905), edited by Prof. Jos. Wright, partly covers the ground. See also Gregor's *Glossary of Banffshire* (1866) and Edmonston's *Shetland Glossary* (1866), both published by the Philological Society; Warrack's *Scots Dialect Dictionary* (1911); Watson's *Roxburghshire Word-book* (1923); books by Sir James Wilson on the dialects of Strathearn, central Ayrshire, and central Scotland (1915-26); Grant and Dixon's *Manual of Modern Scots* (1921); and Gregory Smith's *Specimens of Middle Scots*.

SCOTTISH LITERATURE.—A special difficulty presents itself in connection with the literary history of Scotland. Are we to regard as Scottish literature only what is written in the Scottish vernacular in its various developments from Barbour to Burns? Thus regarded, Scottish literature would manifestly be the inadequate expression of the Scottish character and genius. On the other hand, the literature produced by Scotsmen in standard English is for many reasons best treated under the general head of English literature. Nevertheless, a national literature being the expression of the national consciousness only when considered as an organic whole, the survey here attempted will take account of the total contribution made by Scotsmen to the literature of the world.

If we pass over the enigmatical 'Huchoun of the Awle Ryale,' the literature of Scotland begins with John Barbour (died 1395). A few scraps of verse of questionable authenticity and doubtful author-

ship hardly justify us in saying that he had any predecessor. Barbour's *Brus* marks an epoch at once in the literature and the political history of the country. As has been said of him, he is the first poet and, at the same time, the first historian of Scotland. In his sober and yet imaginative presentment of his theme—the deeds of the national hero and the establishment of the national independence—Barbour struck that note in Scottish literature so conspicuously manifest in the intense national feeling of Burns and Scott. As the exponent of the same tradition with all the exaggerations of popular feeling, Blind Harry, though he came a century later, may be naturally grouped with Barbour. Of little value as poetry, and grotesque in its perversion of the story he professed to tell, Blind Harry's *Wallace* has its distinct place in the national life of Scotland. 'Next to the Bible,' it has been said, 'it was probably the book most frequently found in Scottish households.'

Chaucer may with even greater truth be called the father of Scottish than of English poetry. In England he had predecessors who cannot be altogether disregarded: in Scotland, with the exception of Barbour, who was not great enough to be a source of inspiration, he had none. Moreover, the Scottish poets who looked to him as their master made a far more distinguished succession than his imitators in England. Inspired by the form and the themes of Chaucer, his followers in Scotland in individual effects often surpassed their model, and even suggest the question whether they would not have done better to trust more to their own natural impulse. To the close of the 16th century, however, it was on Chaucer that the poets of Scotland had ever their eyes fixed, and it was by their approximation to his models that they measured their success in their art.

The Scottish line of Chaucerians begins with James I. (died 1437). By his own natural affinities, and by the accident of his personal history, James is the most deeply imbued of them all with the spirit of the English poet. While he was thus so distinctly the vehicle of another's inspiration, every reader of the *King's Quair* feels that in its delicacy of feeling, its sense for the music and subtler shades of language, it is the expression of a mind essentially poetic in its deepest construction of nature and human life. It is in itself a fact of curious interest that the Scotland of James II. and James III. should have produced a poet of the type and of the importance of Robert Henryson. That Henryson achieved the work he did is, in truth, conclusive proof that there was a higher consciousness in the nation than the external history of the time would lead us to infer. The work of Henryson is marked by qualities which have not been conspicuous in poets of his country even greater than himself—pervading artistic feeling and justness of thought and sentiment. In his *Fables*, the *Abbey Walk*, *Robene and Makyne* ('the first English pastoral'), and the *Garmond of Fair Ladies* he exhibits such a range of poetic gifts, and of such an order, as must always ensure to him his own niche among the imaginative writers of British literature. Of a very different type and of far greater natural force is Henryson's younger contemporary William Dunbar. A Chaucerian also, Dunbar is generally acknowledged to have surpassed his master in imaginative intensity and in the blended effects of ghastly humour and daring conception. 'In brilliancy of fancy,' says Scott, 'in force of description, in the power of conveying moral precepts with terseness, and marking lessons of life with conciseness and energy, in quickness of satire, and in poignancy of humour, the Northern Maker may boldly aspire to rival the Bard of Woodstock.'

Where Dunbar falls short of the highest order of poets is in that largeness of humanity, in that just and genial survey of life which gives its breadth and serenity to the work of Chaucer, and has assured his supreme place in English literature. From the number of Dunbar's poems it is sufficient to specify *The Thrissil and the Rois*, *The Golden Targe*, *The Dance of the Sevin Deidly Synnis* (one of the memorable efforts of poetic genius), *The Justis betwix the Tailzeour and the Sowtar* as those which best exhibit his power. Of Dunbar it has to be added that he is the first Scottish writer in whom are unmistakably present the distinctive traits of the national genius as it has expressed itself in literature. As the translator of the *Æneid*, Gavin Douglas (1475–1522) must always remain an interesting figure; and it is on his translation that his claims as a poet mainly rest. In the opinion of the very latest critics Douglas has rendered his author with a sympathetic insight and frequent felicity of interpretation which have not been surpassed by any subsequent translator. Without natural inspiration, however, he fails when left to his own resources. His *Palice of Honour* and *King Hart* are purely conventional productions, without individual stamp, in the tedious allegorical fashion of the time. Like his three predecessors, Sir David Lyndsay (1490–1555) regarded Chaucer as his great exemplar in poetry, and in his early poem *The Dreme* he is directly inspired by his model. Yet no two minds could be more essentially unlike than Chaucer and Lyndsay. Chaucer's view of life was essentially that of a poet: for Lyndsay the world around him was a sight which he regarded not through the medium of the poetic imagination, but with the direct feeling of one moved to the heart by the strivings and sufferings of his fellow-men. The period in which he lived, also, was more proper to men of his type than to men of the purely poetic temper. By the time he reached manhood the great religious revolution of the 16th century had broken upon western Europe, and was begetting universal discontent with existing conditions, and specially with the clergy of the ancient church, who were mainly responsible for the state to which society had come. With the majority of the men of letters of his time, therefore, Lyndsay found scope for his talent as the critic and censor of the social order around him. By the vigour and effect with which he accomplished this task in such poems as *The Testament of the Papyngo*, *The Satyre of the Thrie Estaitis*, and *The Dialog concerning the Monarchie* he did for Scotland what Erasmus did for Europe, preparing the way for Knox as Erasmus did for Luther. As poet and champion of the people Lyndsay came to hold a place in the hearts of his countrymen from which Burns alone was able to dislodge him.

The very success which the four poets just named achieved in their art is proof of a cultivated opinion which made their development possible. It is but what we should expect, therefore, that these four poets are only the brilliant survivors of a numerous race who were their rivals for poetic distinction. The list of such given by Dunbar in his *Lament for the Makars* leaves us with a lively impression of the intellectual activity of an age which many things might persuade us was one in which the finer play of the human spirit was hardly to be looked for. In this connection reference should also be made to that ballad poetry of which Scotland has produced such splendid specimens in their kind. Though their date and authorship cannot be definitely fixed, it seems unquestionable that many of the best of the ballads belong to the 15th and 16th centuries.

It was in vernacular poetry that the Scottish

genius found its highest expression during the period of which we are speaking; but along other lines of expansion there was no lack of well-directed effort. There is conclusive evidence that the intellect of Scotland had already taken that bent which it has kept ever since—that bent for the dialectic treatment of abstract questions which eventually produced Scottish theology and Scottish philosophy. At the close of the 15th century Erasmus notes as a generally recognised fact the affinity of the Scots for abstract thinking, and about the middle of the 16th the younger Scaliger made a similar remark in somewhat different terms. According to Renan, Michael Scott was the first (1230) to introduce the Aristotelian Commentaries of Averrhoes into the western schools—an event of the first importance in the intellectual history of Europe. To Duns Scotus (who according to the best authority, John Major, was undoubtedly a Scotsman) belongs the credit of leading the way by his remorseless logic to the emancipation of men's minds from the scholastic philosophy after it had done its work of discipline on the mind of Europe. The foundation of the three universities of St Andrews (1411), Glasgow (1451), and Aberdeen (1494) is another proof of what has been already said, that in spite of chronic strife and confusion there was a section of the community who had steadily at heart the highest interests of the country.

Like other countries of Europe, Scotland had also during this period its succession of chroniclers of varying degrees of merit. The first of these was John of Fordun, who between 1384 and 1387 wrote his Latin chronicle of the Scottish nation (*Scotichronicon*), afterwards unscrupulously interpolated and continued by Walter Bower (died 1449). With these, though he wrote in vernacular verse, may be mentioned Andrew of Wyntoun, who towards the end of the 14th century composed his *Orygynale Cronycle*, or story of the world from its creation. Of much higher merit as being the product of a time when the Revival of Learning had extended knowledge and raised the level of thought are the Latin histories of Hector Boece (died 1536) and John Major (died 1550). The translation of Boece's history into Scots by John Bellenden is the work of a writer who consciously uses language both with knowledge and skill. An interesting anonymous tract in the Scottish dialect, *The Complaynt of Scotland* (1548), is a curious example of that superfine writing which among the humanists of the time was known as Ciceronianism.

During the latter half of the 16th century the mind and heart of Scotland were engrossed in the task of adjusting its social and political system to the religious settlement accepted by the country in 1560. The time was therefore in the highest degree unfavourable to the growth of imaginative literature. Such productions as the *Gude and Godly Ballades*, interesting as the deepest utterance of the time, show the dominant note even of poetic feeling. When every explanation has been suggested, however, it is a strange fact that Scotland, which during the 15th century had so distinctly the advantage of England in the quality of its poetic literature, for this period can only show against the Elizabethan galaxy such names as Sir Richard Maitland, Alexander Montgomery, Alexander Hume, and King James VI. In vernacular prose the most notable production of the period is John Knox's *History of the Reformation in Scotland*, a work of national importance to his own country, and by the imprint it bears of a commanding personality holding a unique place in its literature. The *History of Scotland* by Bishop Lesley (afterwards translated into Latin), the *Memoirs* of Sir James Melville,

and the *Tractates* of Ninian Winzet, though of no special literary excellence, are all the works of men alive to the great questions that moved the world of their time. Of all the Scotsmen of this period, however, the greatest literary genius was George Buchanan, who by the grace of his Latin poetry and his equal skill in prose gained a reputation second to no writer in Europe. In Buchanan's vernacular writings also, the *Admonition* and *The Chamæleon*, we have the most skilfully wrought Scottish prose that has come down to us. As a scholar of singular attainments, though of no distinctive literary genius, Andrew Melville may also be mentioned as one among many examples of Scotsmen who profited to the utmost by the new studies of the Revival of Learning.

For the 17th century Scotland has but one distinguished poet to show—William Drummond of Hawthornden (1585–1649). In other departments of literature there were many able workers, but none of whom it can be said that their work is of very high order in its kind. During this century also Scotland was absorbed in questions that lay at the roots of the national life, and till these questions should be finally settled a collective intellectual movement, such as is necessary to a great literature, was a moral impossibility. The union of the crowns and the removal of the court in 1603 had likewise for the time an injurious effect in weakening the national spirit, which in the 15th century had been so potent an inspiration. Thenceforward the Scottish language gradually gave way before the standard English, and it is a significant fact that Scotland produced nothing of literary importance in its own dialect till the appearance of Allan Ramsay's *Gentle Shepherd* in the following century. As regards its achievement in literature during the 17th century, therefore, Scotland may be very briefly disposed of.

With Drummond of Hawthornden may be named as poets Sir William Alexander (Earl of Stirling) and Sir Robert Ayton, though neither produced work that deserves a place in a British anthology. In Drummond, however, we have a poet the distinction of whose character and genius has made him one of the interesting figures in literary history. Poor as was the beginning of the century in poetry, the latter half is poorer still, since it boasts not one name that deserves even a passing mention. As continuing the tradition in Latin poetry so brilliantly initiated by Buchanan may be noted the *Delitiae Poetarum Scotorum*, a collection of Latin poetry written by Scotsmen. Among its contributors Arthur Johnston merits special mention as the Scotsman of the period who after Drummond gave proof of the finest literary gift. In history the best work was done by David Calderwood and Archbishop Spottiswoode during the first half of the century, and by Sir James Dalrymple and Bishop Burnet in the second half. Against the brilliant list of English divines for this period Scotland can only show as its two best known Samuel Rutherford and Archbishop Leighton—the latter, however, a writer of such fine suggestions that Coleridge could speak of him as a Christianised Plato. As miscellaneous writers holding a place apart Sir Thomas Urquhart, the translator of the first three books of Rabelais, and Robert Barclay (1648–90), author of the *Apology for the Quakers*, close the list of the most distinguished names in Scottish literature during the 17th century.

Far different is the literary record of Scotland for the 18th century. Due proportion guarded, it may be safely said that during this period she was surpassed by no country in Europe in brilliant initiative and in solid contribution in every field of intellectual activity. The mere enumeration of

the more important names in each department shows that this statement is no exaggeration.

Of the crowd of poets who wrote in the vernacular two stand out pre-eminently as the representatives of their fellows. In the first half of the century Allan Ramsay in his *Gentle Shepherd* produced a work which, in virtue of its intrinsic quality, and as the only example in its kind, is in its own degree a British classic. Robert Burns, born the year after Ramsay's death, is the greatest natural force in the imaginative literature of the 18th century, and it is the supreme tribute to his genius that his poems have made classic the dialect in which he wrote. Two poets who wrote in English also call for special notice in virtue of the fresh impulse of thought and feeling which they communicated to the poetry not only of Britain but of Europe. In his *Seasons* James Thomson (1700-48) gave expression to certain aspects of man's relation to nature which freshened the sources of English poetry and on the Continent influenced notably, among others, Jean-Jacques Rousseau. As perhaps the first to strike the dominant note of Romanticism James Macpherson (1738-96), the 'translator' of the pseudo-Ossianic poems, is rightly regarded as one of the literary forces of his century. In history David Hume (1711-76) and William Robertson (1721-93), both writing before Gibbon, gave a new character and aim to the treatment of the past, and by their insight, philosophic breadth, and literary skill made an era in the science of human affairs. As has been already said, it is the ruling instinct of the Scottish mind to busy itself with the mysteries that lie at the heart of things, and in the 18th century we have signal illustration of the fact. In the line of philosophic thinkers it is sufficient to name Hume, Reid, and Adam Smith to indicate the far-reaching importance of Scottish thought and speculation during the period we are considering. From Hume's disintegrating scepticism dates an epoch in metaphysical science, the extraordinary development of modern German thought resulting by natural recoil from his main position. As the founder of what is distinctively known as the Scottish philosophy Thomas Reid had in France an even more direct and potent influence than Hume in Germany. Of Adam Smith's *Wealth of Nations* it is enough to say that by the consenting opinion of Europe it is one of the epoch-making books in man's history. As masters in their own department, Smollett and James Boswell likewise deserve to be named even in the most cursory account of British letters.

The time has not yet come when the literary forces of the 19th century can be reckoned with the same precision as in the case of the centuries that preceded it. Of Scotland, however, it may be safely said that the literary succession of the 19th century is not unworthy of its brilliant predecessor; and it may also be added that all the work of the highest order contributed by Scotsmen to the imperial literature bears the unmistakable stamp of its national origin. In the two greatest literary Scotsmen of the century, Scott and Carlyle, the distinctive genius of their country cannot be missed. While the work of Scott has its elements of universal interest, in its initial inspiration, in its recurrent moods it is one in nature with the Scottish soil and the Scottish race. In Carlyle we have in ungovernable force that emotion in the presence of the mystery of things against which, as he has himself told us, Scott likewise had all his life to do battle, and which, as we have seen, may be regarded as the deepest and most constant note of the Scottish character and genius.

In the foregoing sketch only writers of the first

importance have necessarily been mentioned; but such names as the following can hardly be left unnoticed in the briefest account of the literature of Scotland. For the 18th century Miss Jean Elliot, Mrs Cockburn, Lady Anne Barnard, John Skinner, and Robert Fergusson as writers of Scottish verse; and John Home, Henry Mackenzie, Lord Hailes, and Dr Adam Ferguson as writers in standard English prose may be specially named. In the 19th century there was no lack of poets in the vernacular—among the best known being Robert Tannahill, Baroness Nairne, James Hogg, Allan Cunningham, William Tennant, William Laidlaw, Lady John Scott, and William Motherwell. In standard English, Thomas Campbell, Joanna Baillie, Professor Wilson, and Professor Aytoun, as poets; George Chalmers, Malcolm Laing, John Pinkerton, Dr M'Crie, Patrick Fraser Tytler, Sir Archibald Alison, John Gibson Lockhart, Hill Burton, and Hume Brown, as biographers and historians; Dugald Stewart, Brown, Mackintosh, Hamilton, and Ferrier, as philosophers; Dr John Brown, Alexander Smith, and Skelton, as essayists; and Galt, Wilson, Lockhart, Miss Ferrier, Michael Scott, William Black, Mrs Oliphant, George MacDonald, and R. L. Stevenson, as novelists, are representative 19th-century names; while Andrew Lang and Barrie connect the 19th with the 20th century.

See the introductions to the works issued by the Scottish Text Society; Irving, *Scottish Writers and History of Scottish Poetry*; Ross, *Scottish History and Literature* (1884); T. F. Henderson, *Scottish Vernacular Literature* (1898); H. G. Graham, *Scottish Men of Letters in the Eighteenth Century* (1902); J. H. Millar, *A Literary History of Scotland* (1903), and *Scottish Prose of the 17th and 18th Centuries* (1912); Gregory Smith, *Scottish Literature: Character and Influence* (1919); the relevant sections of the larger histories of English literature; *Chambers's Cyclopaedia of English Literature*; and in this work the articles on the principal Scottish writers.

Scotland Yard, on the Thames Embankment, since 1890 the headquarters of the Metropolitan Police, is known as New Scotland Yard, to distinguish it from the old building in Whitehall used as headquarters 1829-90. The latter is believed to have received its name from a palace there, in which kings of Scotland and their ambassadors occasionally lodged. See **POLICE**.

Scots Greys. See **DRAGOON**.

Scots Guards is the name of a well-known regiment of Guards (q.v.) in the British army. But the name has most national interest as that of the Scottish force which served the kings of France. The alliance of the Scots and the French, never, perhaps, very cordial and spontaneous on either side, lasted, nevertheless, for a very long period, and was maintained by common interest and reciprocal benefits, and is still distinctly traceable in the Scottish language, laws, and institutions. This alliance originated and developed in the persistent efforts of the Edwards and their successors to subdue both France and Scotland to the English crown. In no outward fact, however, does this alliance appear more conspicuously and interestingly than in the history of the Scots Guards or Scottish Archers in France, extending over 400 years, from 1418 till 1830. All Scotland and all Europe is familiar with the vivid picture of that theme presented by Walter Scott in *Quentin Durward*, in Le Balafre, in the veteran Lindsay, and in the other living figures of that romance, which is mainly based on fact.

In the distracted, almost hopeless, state to which Henry V. of England reduced France in the time of Charles VI. the Scots archers, who then began to flock thither in large numbers by way of La Rochelle, the only port at that time not yet in

possession of the English, distinguished themselves as the staunchest element in the French forces, as the rallying centre of a new army. From 7000 to 10,000 landed in 1419 under the command of the Earl of Buchan. The great victory of Charles VII. at Bauge on 22d March 1421, celebrated in the French court by a whole month's rejoicings, was the achievement of Scottish valour. In that engagement the Duke of Clarence was unhorsed by Sir John Swinton, and had his death-blow dealt him by the Earl of Buchan, who was rewarded with the highest military office in France—that of Constable. At Verneuil in 1424 the Scots fought to the last with stubborn determination, but the English gained a bloody victory. Soon after this the Scottish gentlemen were constituted the king's special bodyguard, and Archibald, Earl of Douglas, who had come over from Scotland at the invitation of the king, was created Duke of Touraine. Of the fifteen companies of men-at-arms, the beginning of a standing army, formed by Charles VII. two were composed exclusively of Scotsmen—'Les Gendarmes Ecosais' and 'La compagnie Ecosaise de la Garde du Corps du Roi.' Subsequently Louis XII. solemnly recognised 'that the institution of the Scots Men-at-arms and the Scots Life-guards was an acknowledgment of their services and their great loyalty and virtue.' To the league against his father the Dauphin (afterwards Louis XI.) tried in vain to gain over the Scots Guards, and after his own accession to the throne Louis XI. rewarded their constancy by increased pay and privileges. And assuredly he had no cause to regret his favour towards them, for on two occasions he had them to thank for his personal safety; the first time, after the drawn battle of Montlhéry, when 'the Scots Guards, considering the danger the king was in, took his majesty, who had been in arms all day without eating or drinking, and carried him safe to the castle of Montlhéry,' the second time, when Louis XI. would have fallen in the furious night sortie of the Liégeois against the besieging forces of France and Burgundy but for the valiant defence of the Scots Guards. In the field of Seminara, when the French cavalry were *culbuté* and the Italian rear-guard had fled, the Scots still stood their ground, refusing to fly or surrender, and preferring to be hewn down, as they were to the number of 400. In the wars of Charles VIII., Louis XII., and Francis I. the Scots took a leading part.

After Scotland became Protestant the alliance with France naturally declined. Yet in the war of Richelieu with the Spanish monarchy we find, besides the Scots men-at-arms under Lord Gordon, the regiment of the *Gardes Ecosaises*, Sir John Hepburn's famous regiment, Forbes's corps of infantry and cavalry, and Colonel Douglas' regiment—all purely Scottish; and under Louis XIV. the Scots continued to take precedence of the rest of the army, heading the French in all the great battles of that reign, Minden, fought on 1st August 1759, being the last in which they figured. After this time the regiments, though they retained the Scottish name, were recruited mainly by French youths; and at the Revolution Scots guards and men-at-arms were, of course, disbanded. Reinstated again in their old privileges, they finally disappeared with the old monarchy in 1830.

See Father William Forbes-Leith, S.J., *The Scots Men-at-Arms and Life-guards in France* (2 vols. 1882).

Scots Money. See POUND, WEIGHTS AND MEASURES.

Scott, a great Border house whose pedigree has been traced back, somewhat dubiously, to one Uchtred Filius Scotti, or Fitz-Scott, a witness to David I.'s charter to Holyrood Abbey (1128), and

thereafter to Richard Scot of Murthockston in Lanarkshire (1294), the cradle, however, of the race having been Scotstoun and Kirkurd in Peeblesshire. Anyhow, we find them possessors of Buccleuch in the lonely glen of the Rankle Burn, Selkirkshire, in 1415, and of Braxholm, near Hawick, from 1420–46 onwards. The then Sir Walter Scott fought for James II. at Arkinholm against the Douglasses (1455), and was rewarded with a large share of the forfeited Douglas estates; and at subsequent periods his descendants acquired Liddesdale, Eskdale, Dalkeith, &c., with the titles Lord Scott of Buccleuch (1606) and Earl of Buccleuch (1619). Among them were two Sir Walters, one of whom fought at Melrose (1526), Ancrum (1544), and Pinkie (1547), and in 1552 was slain in a street fray at Edinburgh by Kerr of Cessford, whilst the other was the rescuer of Kinnmont Willie from Carlisle Castle (1596). Francis, the second earl (1626–51), left only two daughters—Mary (1647–61), married at eleven to the young future Earl of Tarras, and Anna (1651–1732), married at twelve to James, Duke of Monmouth (q.v.), who took the surname Scott, and was created Duke of Buccleuch. After his execution in 1685 his duchess, who had borne him four sons and two daughters, retained her title and estates as in her own right. She afterwards married Lord Cornwallis. Her grandson Francis succeeded her as second duke, and through his marriage in 1720 with a daughter of the Duke of Queensberry that title and large estates in Dumfriesshire devolved in 1810 on Henry, third Duke of Buccleuch (1746–1812), the pupil of Adam Smith, and a great agricultural improver. Walter Francis, fifth Duke (1806–84), was the founder of Granton, and owned in Scotland 676 sq. m. The Harden branch of the Scotts (represented now by Lord Polwarth) separated from the main stem in 1346; and from the Harden branch sprang the Scotts of Raeburn, ancestors of the greatest of all that great line, Sir Walter.

See Sir William Fraser, *The Scotts of Buccleuch* (2 vols. 1879); and Mrs Oliver, *Upper Teviotdale and the Scotts of Buccleuch* (1887).

Scott, CYRIL, composer and author, was born at Oxtou, Cheshire, in 1879, and studied music at the Hoch Conservatorium in Frankfurt. He has composed numerous songs, piano, chamber, and orchestral works, mostly in rather a fugitive and impressionistic idiom, and has also published volumes of poems, as well as essays on occultism and on the relation of tones and colours.

Scott, DAVID, R.S.A., a painter of distinct originality and great imaginative power, was born in Edinburgh on the 10th or 12th of October 1806. He was a grave, silent boy, fond of drawing; probably a copy of Blake's 'Illustrations to the *Grave*' was not without effect in influencing the especial direction of his art. He studied in the Trustees' Academy, under Andrew Wilson, and was apprenticed to his father as a line-engraver. The impetus towards original work, however, was too strong to be resisted, and he determined to devote himself to painting. In 1828 he exhibited his first picture, 'The Hopes of Early Genius dispelled by Death,' in the Royal Institution, Edinburgh; and in the following year he was admitted a member of the recently formed Scottish Academy. The poetical subject of 'Adam and Eve singing their Morning Hymn' dates from 1829; and in 1831 he produced his vigorous personification of 'Nimrod the Mighty Hunter,' and his rendering of 'The Dead Sarpedon borne by Sleep and Death.' In the same year he published six etched plates, 'The Monograms of Man,' a series of profound symbolical inventions, and designed his twenty-five 'Illustrations to the *Ancient Mariner*,' etched and pub-

lished in 1837, which seize with a wonderful force and intensity the weird conceptions of Coleridge's great poem. In 1832 he visited Italy, and remained in Rome for fifteen months, studying the old masters, and painting 'The Vintager,' now in the National Gallery, and other works. His impressions of the art of Italy were embodied in a series of papers published in *Blackwood's Magazine* in 1839-41. In his twenty-eighth year he returned to Edinburgh, and, amid much discouragement from the almost complete want of popular sympathy or interest in his work, he produced his 'Alchemistical Adept (Paracelsus) Lecturing' (1838), now in the National Gallery of Scotland; 'Queen Elizabeth at the Globe Theatre' (1840); and 'The Traitor's Gate' (1841), one of the quietest, most impressive, and entirely satisfactory of his paintings. The following year saw the completion of 'Vasco da Gama encountering the Spirit of the Cape,' a colossal gallery work, over 16 feet in length, now in the Trinity House, Leith. Meanwhile the artist's health had been failing, and the want of appreciation had been chilling him to the heart. Year by year his life became more withdrawn and saddened, and he died before he had reached the age of forty-three, on the 5th of March 1849. His forty designs to the *Pilgrim's Progress*, executed in 1841, were published in 1850, and eleven of his remarkable and daringly imaginative Astronomical Designs, drawn in 1848, were engraved in an edition of Professor J. P. Nichol's *Architecture of the Heavens* (1850). In spite of their frequently hurried execution and consequent faults of detail, Scott's works, on their technical side, have much of the large and powerful draughtsmanship and of the rich and dignified colouring that characterise the productions of the old masters. Their highest value, however, lies in their imaginative quality, in their power and originality as inventions. In his own words, Scott 'always judged painting by its sentiment, by its mental bearing, and thought most of new spheres of meaning.'

See the Memoir by his brother W. B. Scott (Edin. 1850); Selections from his Works, edited by his brother (Glasgow, 1866-67); and the monograph by the present writer (Edin. 1884).

His brother, WILLIAM BELL SCOTT, painter and poet, was born at St Leonards, Edinburgh, September 12, 1811, and was educated at Edinburgh High School. He studied art both at Edinburgh and London, settled in London in 1836, but exhibited only twenty pictures from 1840 down till 1869. The subjects of these were mostly historical or poetical. From 1843 till about 1858 he lived at Newcastle, in charge of the government school of art there, and down till 1865 he acted as one of the South Kensington examiners. His most important work in painting was the series of eight large pictures illustrative of Northumbrian history at Wallington Hall, completed later by eighteen pictures devoted to Chevy Chase in the spandrels. He produced a similar series, illustrating *The King's Quair*, on the walls of a newel staircase at Penkill Castle, near Girvan. Here he died, November 22, 1890. He began early to write poetry, and published *Hades, an Ode* (1838); *The Year of the World* (1846); and the more important *Poems of a Painter* (1854). Later volumes were the carefully selected and revised *Poems* (1875), and the genial and delightful little volume of a hundred short pieces, *A Poet's Harvest Home* (1882). To the literature of art he contributed a *Memoir of David Scott* (1850), *Half-hour Lectures on Art* (1861), *Albert Dürer* (1869), and *The Little Masters* (1879) in the 'Great Artists' series. See the Autobiography edited by Professor Minto (1892).

Scott, SIR GEORGE GILBERT, architect, was born on 13th July 1811, at Gawcott, Buckinghamshire, of which his father, son of Thomas Scott (q.v.), the commentator, was perpetual curate. His education was neglected, but he had a good drawing-master; and his love of old churches suggested his being articled to a London architect (1827-30). His first start in life was as a designer of work-houses (1835); in 1838 he married a second cousin, Caroline Oldrid (1811-72), who bore him five sons, two of whom became architects; and soon after he built the first of several cheap and nasty churches. His 'awakening,' by the Cambridge Camden Society and an article of Pugin's, was in 1840-41; and thereafter, as a leading spirit of the Gothic revival, he built or restored 26 cathedrals, 9 abbey and 2 priory churches, 1 minster, 474 churches, 26 schools, 5 almshouses, 23 parsonages, 57 monumental works, 10 college chapels and 16 colleges, 27 public buildings, 42 mansions, &c. The Martyrs' Memorial at Oxford, St Nicholas' at Hamburg, St George's at Doncaster, the new Government Offices, Albert Memorial, and Midland Terminus in London, Preston town-hall, Glasgow University, the chapels of Exeter College, Oxford, and St John's College, Oxford, and the Episcopal cathedral at Edinburgh may be specified; but countless other notices of his work are scattered throughout this work under the different towns. He was elected an A.R.A. in 1855, an R.A. in 1861; held the professorship of Architecture at the Academy; and was knighted in 1872. He died 27th March 1878, and was buried in Westminster Abbey.

See his *Personal and Professional Recollections* (1879).

Scott, SIR GILES GILBERT, architect, grandson of Sir George Gilbert Scott (q.v.), was born in 1880, elected R.A. in 1922, and knighted in 1924. He achieved sudden fame as the architect of the new cathedral at Liverpool (q.v.), the foundation-stone of which was laid in 1903, but he has also built various smaller churches.

Scott, J. R. HOPE. See HOPE-SCOTT.

Scott, MICHAEL, a mediæval sage, who is said to have been astrologer to Kaiser Frederick II. (1194-1250), and to have translated for him, through the Arabic, some of the works of Aristotle, with Averroes' commentaries. His translation was apparently used by Albertus Magnus, and seems to have been one of the two familiar to Dante (see Jourdain, *Traductions Latines d'Aristote*; and the *Academy*, January 1892, p. 14). Dante, who died in 1321, alludes to him in the *Inferno* (canto xx., 115-117) in a way which proves that his fame as a magician must already have spread over Europe; and he is also referred to by Albertus Magnus and Vincent of Beauvais, and this really is all that we know of him. Dempster (1627) may be right in maintaining that 'Scotus' was the name of his nation, not of his family, in which case he would be probably an Irishman; but by Boece (1527) he was boldly identified with a Sir Michael Scott of Balwearie, near Kirkcaldy, in Fife, who went on two embassies to Norway in 1290 and 1310. Camden, again (1580), asserts that he was a Cistercian monk of Holme Cultram in Cumberland; and Satchells, that in 1629 he had examined at Burgh-under-Bowness a huge tome which was held to be his *grimoire*. In Border folklore the 'wondrous wizard' of Sir Walter's *Lay* is credited with having 'cleft the Eildon Hills in three, and bridled the Tweed with a curb of stone;' and his grave is of course shown in Melrose Abbey. Nay, the 'Jingler's Room' in Oakwood Tower, near Selkirk, is pointed out as his, though Oakwood dates only from the 16th century. See monograph by J. Wood Brown (1897).

Scott, MICHAEL, author of *Tom Cringle's Log*, was born in Glasgow, 30th October 1789, and, after attending some classes at the university, went to seek his fortune in Jamaica. He spent a number of years in the West Indies, but in 1822 established himself in business in Glasgow, where he died, 7th November 1835. In 1829 he published anonymously in *Blackwood's Magazine* the brilliant serial story, *Tom Cringle's Log*, which, like *The Cruise of the Midge*, another of his contributions to 'Maga,' was republished separately. See Sir George Douglas, *The Blackwood Group* (1897).

Scott, ROBERT. See LIDDELL.

Scott, ROBERT FALCON (1868-1912), explorer, was born at Devonport, and entered the royal navy in 1882, eventually being promoted to captain in 1904. He commanded two expeditions to the Antarctic 1901-4 and 1910-12, on the second of which he reached the pole about a month after Amundsen. On the return journey Scott and his companions, Wilson, Oates, Bowers, and Evans, all lost their lives, a disaster due to exceptionally severe weather, resulting in slow travel and shortage of food supplies. The journal was afterwards published, *Scott's Last Expedition* (1913). See POLAR EXPLORATION.

Scott, THOMAS, commentator, was born the tenth of a grazier's thirteen children at Braytoft, in Lincolnshire, 16th February 1747. He studied hard in spite of drawbacks as a surgeon's apprentice and farm labourer, and received priest's orders from Bishop Green of Lincoln in 1773. He became curate of Weston Underwood, and in 1780 succeeded as curate at Olney the famous John Newton, whose characteristic Calvinistic theology he had already imbibed. In 1785 he became lecturer to the London Lock Hospital, and in 1803 was preferred to the rectory of Aston Sandford in Bucks, where he died, 16th April 1821. His *Force of Truth* (1779) has great autobiographic interest, and *Essays on the Most Important Subjects in Religion* (1793) long enjoyed and deserved celebrity, but his name is best remembered by his *Bible, with Explanatory Notes* (5 vols. 1788-92; 5th and best ed. 6 vols. 1822). The prospectus of the 1850 edition stated that already £500,000 had been paid by purchasers for copies of this work, which is beyond doubt a remarkable monument of sound learning and exegetical sagacity.

His complete Works, including sermons and treatises doctrinal and controversial, were edited by his son, the Rev. John Scott (10 vols. 1823-25), who also published a Life, partly autobiographical (1822). See Life by Downer (1909).

Scott, SIR WALTER (created a baronet in 1820), the greatest of Scottish men of letters, and probably the best-beloved author who ever lived, was born in the College Wynd of Edinburgh, beside the university, on the 15th August 1771. His father, Walter Scott, was a member of the society of solicitors called Writers to the Signet; his mother, Anne Rutherford, was the daughter of Dr John Rutherford, professor of Medicine in the University of Edinburgh. Scott thus sprung from the professional middle classes, but on both sides he came 'of gentle blood.' When he blazoned his quarterings on the roof of the entrance-hall of Abbotsford three shields of the sixteen had to be left blank, through a difficulty about the pedigree of the Rutherfords of Hunthill. Nevertheless, he came of the best blood on the Border, Scotts, Swintons, and Rutherfords. His great-grandfather was the grandson of Auld Wat of Harden, who married the Flower of Yarrow in 1567, and whose son again married Muckle Moud Meg of Elibank. The facts of Scott's history are too universally known to be

dwelt upon at length. An ingenious writer has tried to show that genius is a 'sport' or accidental variety of the consumptive and nervous temperament. It is certain that the first six children of Scott's father and mother died between 1759 and 1766. Locks of their hair, still glossy and golden, lay in Sir Walter's great desk, in his study at Abbotsford. Of the other six children only two, Walter and Thomas, left issue; the present descendants of Sir Walter Scott are the children and grandchildren of the Hon. Mrs Maxwell Scott, daughter of Mrs Hope-Scott, who again was the daughter of Sir Walter's daughter Sophia, who married Mr John Gibson Lockhart. The mother of Sir Walter survived all her children except the poet and Mr Thomas Scott. Scott himself, though one of the strongest men of his time, with a larger biceps, the Ettrick Shepherd tells us, than any man of the Rough Clan, nearly died in infancy 'in consequence of his first nurse being ill of a consumption.' At eighteen months he was suddenly affected with fever in teething, and lost the power of his right leg. In his third year he was sent to his grandfather's farm at Sandyknowe, where he was taught, not without difficulty, to read, and learned and shouted the ballad of *Hardyknute*. For about a year and a half he was at Bath, then returned to George Square, in Edinburgh, where he astonished Mrs Cockburn (a Rutherford of Fairnilee, and author of *The Flowers of the Forest*) by his infant genius. Still lame, he was taken to Prestonpans (aged eight), where he met a veteran named Dalgetty and Mr George Constable, from whom (and from himself) he drew Monkbarons, and heard of Falstaff. Thence he returned, 'a grandam's child,' to George Square, where he lived, always reading and repeating ballads and poetry. In 1779 he was sent to the High School of Edinburgh, where he suffered from the senseless Scottish system of giving 'removes' each year, and from the coteries formed in large classes. He amused the boys with tales; he was ready to fight, 'strapped to a board,' as he was lame; he made game of Burns's friend, the blackguard dominie, Nicol; he fought in bickers with Greenbrecks; he wrote some English verse; he learned some Latin from Dr Adam, the rector or head-master. His schooling was interrupted by a visit to Kelso, where he had the misfortune to become intimate with the Ballantynes. In Edinburgh the blind and venerable Dr Blacklock instructed his poetical taste, and he had his one famous meeting with Burns. He left the High School with a great knowledge of all that he had not been taught, but at Edinburgh University he did not improve his Latin, and, like St Augustine, he declined to learn Greek. His account of the studies of Waverley contains his regrets for wasted time, and his autobiography expresses his grief that he had turned away from Greek, 'considering what that language is, and who they were who employed it in their compositions.' Meantime his lameness was never cured, though he could walk thirty or forty miles in the day. His sweetness of temper did not suffer, as Byron's did from an infirmity which after all was not so great as to prevent Byron from bowling for Harrow. But Scott had not, like Byron, to feel that, but for this one defect, he would have been a perfect model of beauty. With red hair, an upper lip of unusual length, a brow like a tower, and rugged Border features, he had no temptation, as Byron had, to vanity. Yet a lady has left her evidence that 'young Walter Scott was a comely creature.' About 1785-86 he entered his father's 'office,' the weary 'office' which, like some fabled monster, gapes for the boys of Edinburgh. Here, at least, he learned to cover paper at such a pace as never man did, and in a hand which could put some seven hundred

words on one side of a sheet of foolscap. He studied Scots law sedulously, though his long fishing and antiquarian rambles made his excellent father (described in *Redgauntlet*) fear that he would never be better than 'a gangrel scrape-gut.' As a lawyer's clerk, superintending an eviction, he first entered the Highlands, where he already knew Invernahyle, of the '15 and the '45, and many another veteran, whose legends appear in his novels. In Edinburgh he won friendships which only ended with life, and, in the heat of youth, according to his own account, he was at least sufficiently convivial. Of all his friends the world best knows William Clerk of Eldin, the original of Darsie Latimer in *Redgauntlet*. Even now, it seems, the romance of his life had begun, and he loved the lady whom he loved till the end. 'This was the early and innocent affection to which we owe the tenderest pages, not only of *Redgauntlet*, but of the *Lay of the Last Minstrel* and of *Ekeby*. In all of these works the heroine has certain distinctive features, drawn from one and the same haunting dream of his manly adolescence.'

In the autumn of 1796 that dream had gone where dreams go, but it endured where dreams endure, in the heart. On October 12, 1796, one of his friends, who knew the story wrote, "'Men have died and worms have eaten them, but not for love.'" I hope sincerely that may be verified on this occasion.' Scott did not die, only his heart, as his *Journal* records, was broken for two years, then 'handsomely pieced,' 'but the crack will remain till my dying day' (*Journal*, December 18, 1825). '*Humana perpersi sumus*,' he adds, in his *Journal*, towards the end of his life. A short poem, *The Violet*, is almost the only direct allusion to this affair in his works. Not wholly unconnected with his hopes as a lover was his first publication, rhymed versions of ballads by Bürger (October 1796). The poems were admired, but 'proved a dead loss.' The spring of 1797 was spent in yeomanry drill. In July Scott made a tour into Tweeddale, and met David Ritchie, the Black Dwarf. Thence he wandered to Gilsland, where he first saw Miss Charlotte Margaret Carpenter, a lady of French extraction, but of English education. They soon became engaged, and were married at Carlisle on Christmas Eve 1797. Though not a regular beauty, Mrs Scott had large dark eyes, and an engaging air, with plenty of gaiety and sense. Hogg describes her as 'a brunette with raven hair and large dark eyes, but, in my estimation, a perfect beauty.' The marriage, founded on sincere affection, was happy, though some of Scott's friends feared that the successes which left him unharmed might turn the head of Mrs Scott.

Already (1792) Scott had made his first raid into Liddesdale, and every year till 1798 he repeated it, gathered legends, studied characters like Dandie Dinmont, and 'was making himself,' as Shortreed said. His country home was a cottage at Lasswade, agreeably described by Mr R. P. Gillies in his *Recollections*. Scott made M. G. Lewis's acquaintance, wrote for a collection of Lewis's *Glenfinlas* and the *Eve of St John*, and translated Goethe's *Goetz von Berlichingen*. At the end of 1799, after the death of his father, he was appointed sheriff of Selkirkshire. In hunting for ballads he made the acquaintance of Hogg, of Leyden, and of his dear friend and occasional amanuensis, William Laidlaw. In 1800 he suggested to James Ballantyne that he should remove from Kelso to Edinburgh. At the same time he announced that he would give Ballantyne the printing of *The Border Minstrelsy*. The first two volumes appeared in 1802. In the autumn of that year, on Lady Dalkeith's suggestion, he began what he meant for

a ballad. It became *The Lay of the Last Minstrel*, the first, perhaps the best, of his long poems. It was printed by Ballantyne in Edinburgh. The foundations of Scott's triumph and discomfiture were laid. The *Lay* made him at once the most popular author of the generation, and his share in the Ballantyne's business proved his ruin. From the moment that he entered as the secret but only moneyed partner into Ballantyne's business he was never free from financial complications. For these, and all the evil they wrought, it would be unjust to lay all the blame either on the Ballantynes, on Constable, or on Scott. Sir Walter was the last to shirk his own share of the responsibility. Perhaps an accountant can make sense of the controversy, in three pamphlets, between Mr Lockhart and the representatives of the Ballantynes (1838-39). To an ordinary reader it seems clear that Scott hoped to make money by the business of printing, and that he also had 'a kindness like an elder brother's love' for the Ballantynes. It appears quite certain that John Ballantyne, when he entered the firm with no capital, complicated it by his ambition as a publisher, and by a sanguine temper which would not face nor state difficulties. On the other hand, Scott had a century of literary inventions, editions and the like, which were often started to benefit poor working men of letters, but which nearly always failed, except when he himself was the editor. Thus the publishing business was overwhelmed with unsaleable 'stock.' Both Ballantynes were undeniably extravagant. John was recklessly so. Scott himself bought land, always at a price beyond its value, he bought curiosities, his hospitality was more than princely, his generosity was unstinted; he was the providence of poor literary men, and the guardian genius of his neighbourhood. Yet he has been too severely blamed for profusion. Up to 1821 his purchases of land had cost about £30,000, while his official income (as Clerk of Session and Sheriff) had been £1600 a year, 'and he had gained as an author £80,000.' Abbotsford is not 'a wide domain'—far from it—and the house was so far from being a palace that Mr Hope-Scott found it necessary to build a large additional wing thereto. The ruin came not so much from personal extravagance as through business conducted by London connections of Constable's house, in the wildest way, by 'bank accommodation' and bills, eternally renewed. James Ballantyne's own time was much occupied in the correction of Scott's proof-sheets rather than in attention to the details of his commerce. The value of his criticisms has been overestimated; his remarks on the proof-sheets of *Redgauntlet* are inept, and it cannot be said that he was a careful master-printer. Constable's own visionary character added to the complexities, and at last the crash came. Every one was in fault, every one was intoxicated by success. There is no more reason to doubt the uprightness of James Ballantyne than of Sir Walter, who finally paid his debts with his life. Admirers of Lockhart regret his tone towards the Ballantynes. To him it is clear they had ever been distasteful. He was as fastidious as Scott was almost over-tolerant, and the mere presence of the brothers must have been odious to him. But both had, with all their social defects and commercial demerits, a touching affection for Sir Walter.

We have anticipated the financial tragedy of Scott's life, or rather we have sketched its history from the moment when it began. Scott's prosperity never had a sound commercial basis. He was never really free from anxiety about money. How his sagacity and uprightness endured these bonds is a psychological mystery. In 1804 Scott, as sheriff of Selkirkshire, removed from Lasswade

to Ashestiel, a small house beautifully situated on a wooded 'brae' above the Tweed, about four miles from the influx of the Ettrick. Had he been able to purchase Ashestiel, Abbotsford might never have risen from the swamps of 'Clarty Hole.' Early in 1805 the *Lay* was published, and met a deserved success. Scott now busied himself with articles in the *Edinburgh Review*, with his edition of Dryden, and with the commencement of *Waverley*. The early chapters did not please a friend, probably Erskine, and it was not completed till 1813-14. In 1806 Scott was appointed Clerk of Session, and withdrew from the bar. He discharged the duties for some years without the emoluments, which went to his predecessor in the office. In 1806 *Marmion* was begun. The plot is partly based on perfectly fictitious documents, foisted on Scott by Mr Surtees of Mainsforth. He never discovered the fraud. *Marmion* appeared early in 1808. A review, a most quibbling and unfair review, of it was written by Jeffrey for the *Edinburgh*. This attack, and the whiggery of the *Edinburgh*, caused Scott to break off his connection with that serial, and to busy himself in starting the *Quarterly*. Jeffrey did not injure *Marmion*, and its popularity outdied even that of the *Lay*. Scott, who feared to take another 'scourging crop' of verse off the soil, now occupied himself with editing Dryden, Swift, and other classics. He quarrelled with Constable (the publisher of the *Edinburgh*), or rather with his partner, Mr Hunter, and in January 1809 he tells Southey that 'Ballantyne's brother' (John) 'is setting up here as a bookseller, chiefly for publishing.' Ballantyne was to be in alliance with Mr Murray, but this arrangement did not last, and the publishing business only added to financial complications. In 1810 the *Lady of the Lake* was finished, and over-crowned even Scott's former triumphs. A Highland poem had long been in his mind, alternating with the scheme of a Highland romance in prose. Scott now visited the western isles, and schemed out *The Nameless Glen*, afterwards called *The Lord of the Isles*. He also reconsidered *Waverley*, but seems to have made no progress with it. In 1811 he received at last the salary of his clerkship, and came into a legacy of £5000. Now, too, he bought his first farm, and began to turn the cottage on it into a mansion. The year 1811 saw him busy with *Rokeby*, which proved a comparative failure. *Childe Harold* had appeared; popularity had selected Lord Byron for its new idol. For a wonder, Scott did not rate *Childe Harold* much above its merits, but he entered into a friendly correspondence with Byron. He had never been much galled by *English Bards and Scotch Reviewers*. In 1813 (after *Rokeby* and the *Bridal of Triermain*) he declined the laureateship in favour of Southey. In 1814 he finished his *Life of Swift*, and published *Waverley*, writing the last two volumes in three weeks. *Waverley* took the world by storm, and Scott, who did not acknowledge the authorship, might well suppose he had found the purse of Fortunatus. The cold reception of *The Lord of the Isles* did not discourage him, and in January 1815, by way of a holiday, he began *Guy Mannering*, 'the work of six weeks at Christmas time.' It was published by Messrs Longman, but, with rare exceptions, Constable, with whom Scott had been reconciled, published the rest of his *Waverley* cycle. From this point space does not serve to retell the oft-told tale of Scott's amazing fertility. In 1817 a violent illness showed him that even his strength was mortal, but no malady clouds *Rob Roy* or *The Heart of Midlothian*. In 1819 a return of his complaint endangered his life, and in paroxysms of agony he dictated *The Bride of Lammermoor*, which, when printed, he read as the

work of a stranger. He did not remember a line of it. His health was in part re-established; he opened a new vein of gold in *Ivanhoe*, but failed to please his readers with *The Monastery*.

If it is na weel bobbitt
We'll bob it again,

he said. Novels poured from his pen, society flocked to Abbotsford, he seemed to Miss Edgeworth 'the idlest man alive.' Yet he never neglected his official duties; he toiled like a woodsman in his plantations, and he entertained all comers. As he said of Byron, 'his foot was ever in the arena, his shield hung always in the lists.' He managed the king's reception in Edinburgh, he heard cases at Selkirk, he took part in raising volunteer corps, he conducted an enormous and distracting correspondence, he cared for the poor with a wise beneficence, he had a great share in starting the Edinburgh Academy, he presided at the councils of the new gas company, he began the *Life of Bonaparte*, and still the novels flowed on. In 1825 he commenced his *Journal*, and for all that followed the immortal pages of that sad and splendid record must be consulted. *Woodstock* was in hand when the commercial crash came. Scott bore it like a stoic. From that hour all the energy not needed for public duties went into literature. He sometimes toiled for fourteen hours a day, led on by the hope of paying every penny of his debts. His labour cleared them, though not in his lifetime. Before his wearied eyes and worn brain the mirage of his complete success used to float at intervals, and who could grudge him these dreams through the ivory gate! It is needless to repeat the tale of his last days, his desolation when his publisher, Mr Cadell, disapproved of *Count Robert of Paris*, the insults heaped on him by the Jedburgh radical mob, his last voyage, his continued work at *The Siege of Malta*, his return home, his death. Few out of all who have read Lockhart or the *Journal* can have studied these chapters with tearless eyes. It is said that on the last morning of his life consciousness returned. He asked his nurse to help him to the window; he gave one last look on Tweed and said, 'To-night I shall know all.' That night he was 'Heaven's latest, not least welcome guest,' September 21, 1832.

In a brief record of his life it is impossible duly to estimate Scott, as an author or as a man. The greatness of his heart, the loyal affection and kindness of his nature, are at least as remarkable as his astonishing genius. There is only one voice as to his goodness. He was the most generous, the most friendly, the most honourable of men. In no relation of life did he fall short of the highest excellence. The magnetism (as we may call it for want of a better word) of his personality endeared him not only to mankind, but to the lower animals. Dogs, cats, and horses took to him at once. He was even persecuted by the affection of grotesque friends, pigs and chickens. He is one of the few who retain, after death, this power of making us love those 'whom we have not seen.' Nor was he less sagacious, in all affairs but his own, than he was sympathetic. As a man of letters he was more than generous, far from being envious, he could hardly even be critical, and he admired contemporaries in whom the judgment of posterity has seen little to approve. In his lifetime the Whigs, as Whigs, did not love him. He was a Tory. With a sympathy for the poor, which showed itself not only in his works, but in all his deeds, and in all his daily life, he believed in subordination. All history showed him that equality had never existed, except in the lowest savagery; and he could not believe in a sudden reversal of experience. His tastes as a poet also attached him to the antique world. His ideal was, perhaps, a feudalism in which every order

and every man should be constant to duty. Absentee landlords he condemned as much as callous capitalists. He had seen the French Revolution, he had witnessed various abortive 'risings' in the west country, and his later years were saddened by apprehension of a *Jacquerie*. He hated the mob as much as he loved the people, his own people, the kindly Scots. He was a sturdy Scotchman; but, says Lockhart, 'I believe that had any anti-English faction, civil or religious, sprung up in his own time in Scotland, he would have done more than any other living man could have hoped to do to put it down.'

As a writer it is a truism to say that, since Shakespeare, whom he resembled in many ways, there has never been a genius so human and so creative, so rich in humour, sympathy, poetry, so fertile in the production of new and real characters, as the genius of Sir Walter Scott. To think of the *Waverley* novels is to think of a world of friends, like the crowd whose faces rise on us at the name of Shakespeare. To say this is to say enough, but it must be added that scenes as well as people, events as well as characters, are summoned up by his magic wand. There is only one Shakespeare, however, and he possessed, what Scott lacked, every splendour and every glory of style. Of both men it might be said that 'they never blotted a line;' but the metal flowed from the furnace of Shakespeare's brain into many a mould of form, all magical and immortal in their beauty. Scott 'never learned grammar,' as he said, and his style is that of an improviser. Its recklessness, and occasional flatness, he knew as well as any of his critics. But again and again, in published work, as in unpublished letters, he owns himself to be incapable of correcting, and impatient of the labour of the file. In proofs he corrected freely, but seldom to improve the style. It is often lax, and even commonplace; it rarely approaches distinction. It is at its best, absolutely perfect indeed, in his Scotch dialogue. Nor was he more careful of his plots. In the Introduction to the *Fortunes of Nigel* he shows us exactly how he worked, incapable of laying down the lines of a plot, and sticking to them, following always where fancy led him, after Dugald Dalgetty, or Bailie Nicol Jarvie. Delay, painstaking, would not have made him a more finished writer, and would have deprived us of many a *Waverley* novel. Every man must do his work as he may: speed was Scott's way. The only real drawback to his unapproached excellence, then, is this congenital habit of haste, this quickness of spirit, which, as Lady Louisa Stuart said, made him weary of his characters long before his readers were weary. Yet his genius triumphs in his own despite, and what he wrote for the amusement of a generation is fashioned for immortality, living with the fiery and generous life of his own heroic heart. Scott's poetry suffers more from his 'hasty glance and random rhyme' than his prose, because from poetry more exquisite finish is expected. That finish is only to be found in his lyrics, the freshest, most musical, most natural and spirited of English verses. In his metrical romances he has spirit, speed, ringing cadences, all the magic of romance, all the grace of chivalry. Since Homer no man has written so much in Homer's mood, so largely, so bravely, with such delight in battle. But 'the grand style' is absent, save in the more inspired passages. Scott's lays are lighted with the Border sun, now veiled in mists, now broken with clouds: we are not here in the wide and luminous ether of Homer and of Hellas.

Wild as cloud, as stream, as gale,
Flow forth, flow unrestrained, my tale!

he exclaims, in lines addressed to Erskine, conscious of his fault, but impenitent. His fame must suffer

in some degree from his own wilfulness, or, rather, from the incurable defect of a genius which was rich, but not rare; abundant, but seldom fine. It may suffice for one man to have come nearer than any other mortal to Shakespeare in his fiction, and nearer than any other mortal to Homer in his verse. His influence on literature was immense. The Romantic movement in France owed nearly as much to him as to Shakespeare. Alexander Dumas is his literary foster-child, and his only true successor. To him also is due the beginning of a better appreciation of all ancient popular antiquities, and a more human understanding of history.

The best source for information about Scott's life is, necessarily, Lockhart's biography (2d and best ed., 10 vols., 1839). It has been supplemented by the *Journal* (2 vols., 1890), and by the *Familiar Letters* (2 vols., 1893). The *Ballantyne Humbug* and the *Refutation* may be studied, by people who must study them, in various editions of 1838-39. There is much interesting matter in R. P. Gillies's *Recollections of Sir Walter Scott* (1837), and some amusing anecdotes in Hogg's *Domestic Manners and Private Life of Sir Walter Scott* (1834), though the Shepherd is a garrulous and graceless witness. Carruthers's *Abbotsford Notanda* contains a few facts worth noting, and so does the Catalogue of the Centenary Exhibition. The Catalogue of the Abbotsford Library is a valuable index to his studies, and there are letters of some importance in *Archibald Constable and his Literary Correspondents* (1873). In 1872 Hope-Scott published a reprint of Lockhart's condensed version of the Life, with a prefatory letter to Gladstone. There are lives of Scott by R. H. Hutton (1879), Saintsbury (1897), W. H. Hudson (1900), Norgate (1906), the writer of this article, Andrew Lang (1906), and Wyndham (1908). See also W. S. Crockett, *The Scott Country* (1902), Mrs Maxwell Scott, *Personal Relics of Sir W. Scott* (1893), Canning, *History in Scott's Novels* (1905), and Husband, *Dictionary of Characters in the Waverley Novels* (1910).

Scott's works, especially the novels, have been translated into almost every civilised tongue, and he has had imitators in all languages. See also the articles in this work on Abbotsford, Dryburgh, Ballantyne, Constable (Archibald), Laidlaw, Lockhart, Hope-Scott, Ballard, and Novels.

Scott, W. BELL. See SCOTT (DAVID).

Scott, WINFIELD, an American general, was born near Petersburg, Virginia, 13th June 1786. He was educated at William and Mary College, studied law, and was admitted to the bar at Richmond in 1807. Feeling, however, greater aptitude for military life, he obtained a commission as captain of light artillery in May 1808. At New Orleans he was court-martialled for disrespectful remarks about his commanding officer, and suspended for a year. When war was declared against Great Britain in 1812, Scott, being made lieutenant-colonel, was ordered to the Canadian frontier. Crossing the Niagara River in October, he fought at Queenstown, and was taken prisoner, but was exchanged after three months. In May 1813 he was wounded at the capture of Fort George, and in July 1814 at Lundy's Lane; from this battle his commission as major-general was dated. The attempts to invade Canada proved failures, but Scott's personal achievements were regarded by his countrymen as redeeming features in the record.

During the ensuing years of peace Scott framed the 'General Regulations' for the army, and introduced the French system of tactics. In various local troubles his tact in preventing outbreaks was shown, especially during the Nullification excitement in South Carolina in 1832, and in the dispute about the boundary of Maine in 1839. He succeeded to the chief command of the army in 1841. In 1847 General Scott was given the command of the army for the invasion of Mexico; and on 9th March, with about 12,000 troops, he invested

the city of Vera Cruz. After a heavy bombardment, the city and the strong castle of San Juan de Ulloa capitulated on the 26th. Scott then hastened to the tablelands, defeated Santa-Ana at the pass of Cerro Gordo, and captured Jalapa and Puebla. Here from May till August he was obliged to wait for and drill reinforcements. When he resumed the march the battles of Contreras and Churubusco opened the highway to the city of Mexico, but a vain attempt to negotiate a treaty caused some weeks' delay. On 13th September the castle of Chapultepec was carried by storm; Santa-Ana fled from the capital, and Scott entered in triumph on the 14th. Here he remained until the following February, when the treaty of peace was signed. On this war General Scott's fame rests; he boldly claimed that his campaign had been 'successful as to every prediction, plan, siege, battle, and skirmish.'

Scott had in politics belonged to the Whig party, and in 1852 was its candidate for the presidency, but was easily defeated, owing both to the disintegration of the party and to his own blunders as a politician. In 1855 the rank of lieutenant-general was revived in his favour. Scott was always a firm supporter of the Union, and in the crisis of 1860-61 remained true to his allegiance even when his native state seceded. Though crippled by the infirmities of age, he retained nominal command of the army until October 1861. He died on 29th May 1866, at West Point, and was buried there. Scott was a man of imposing presence, 6 feet 4 inches high. Though undeniably vain and pompous, he was a sincere patriot and of unblemished integrity. His military genius was evidently adequate for a grander field than that in which it was exercised. But his fame has been obscured by the glare of the civil war, in which the officers trained under him had greater opportunities to display their powers. His *Memoirs*, published in 1864, unfortunately rather emphasised his vanity than vindicated his fame; see Keyes's *Fifty Years of Observation* (1884). There are Lives by Headley and Victor (1861), and Wright ('Great Commanders Series,' 1894).

Scottish Philosophy. Scotsmen taught philosophy in Paris and other foreign universities during the middle ages and as late as the 16th century, and in some cases they returned to academic positions in their native land. When it is added that David Hume, the greatest name which Scotland has contributed to philosophy, is not included in the Scottish school, it will be apparent that the designation is not merely a mark of nationality, but expresses definite doctrines, or at least a definite tendency, in philosophy. The school may, for all practical purposes, be said to take its rise in the revulsion headed by Reid (1710-96) against the conclusions of the great sceptic. Antiquarian research has sought to place the foundation of the school earlier, in the teaching, for example, of Gershom Carmichael, who was professor in Glasgow from 1694 to 1729, or George Turnbull, Reid's teacher at Aberdeen, who lectured from 1721 to 1748. Francis Hutcheson, who succeeded Carmichael in Glasgow, and lectured from 1729 to 1746, is more frequently mentioned as the founder of the school, but he has a place rather among the succession of English moral philosophers, while the two other names are too obscure to be of any real account. Reid's answer to Hume appeared in 1764 under the title *An Enquiry into the Human Mind on the Principles of Common Sense*. Hence the current but somewhat misleading designation of Reid and his followers as the Common Sense (q.v.) school, which seems to imply an appeal from philosophical conclusions to the unreasoned verdict of ordinary consciousness. No

doubt a certain warrant for this view of the Scottish philosophers may be found in certain passages of Reid himself, and still more in the diatribes of the lesser men, like Beattie and Oswald, who joined in the outcry against Hume. But common sense meant to Reid simply the common reason of mankind, as constituted by certain fundamental judgments which are expressed in the very structure of human language, and which are intuitively recognised by the mind as true. Reid's answer to Hume thus consists in traversing his reduction of experience to unconnected ideas. He attempts to show by a deeper analysis of experience that the having of ideas, or rather of knowledge, implies certain primitive or fundamental judgments as irreducible elements. This constitutes his attack upon what he calls 'the ideal theory,' that is to say, upon the presuppositions which he finds common to Descartes, Locke, Berkeley, and Hume; and in this, its most philosophical aspect, his theory may be compared with Kant's vindication of the categories as elements necessary to the constitution of the simplest experience. The weakness of Scottish philosophy has lain in its tendency to treat these rational elements as isolated intuitions. The reiterated appeal to 'the testimony of consciousness' is a short and easy method of disposing of an opponent, but it is apt to leave the opponent unconvinced. The natural dualism or natural realism which forms such an outstanding feature of Scottish philosophy asserts, against subjective idealism, that the object or the non-ego is given in knowledge along with the subject. But this important epistemological position degenerates too often into a crude metaphysical dualism of mind and matter as two heterogeneous substances.

Scottish philosophy has not produced anything like a metaphysical system, but its inductive method of procedure has led to a large amount of valuable psychological observation both in the intellectual and moral sphere of mental activity. This is mainly what we find in Dugald Stewart (1753-1828), accompanied by a power of persuasive eloquence which made philosophy a force and a tradition in the national life. Dr Thomas Brown (1778-1820), his successor in the Edinburgh chair of Moral Philosophy, was led by his acute psychological analysis so far in the direction of English associationism that he can hardly be counted a continuator of the school. The most eminent successor of Reid and Stewart was Sir William Hamilton (1788-1856), who endeavoured to combine the traditional Scottish doctrine with the negative results of the Kantian critique of knowledge. Apart from his contributions to psychology and logic, his philosophy is in the main an assertion of the relativity of human knowledge, and the impossibility, therefore, of reaching a coherent metaphysical view of the universe. This position, however, has been disclaimed by M'Cosh and others as savouring too much of agnosticism, and as inconsistent with the original position of Scottish philosophy in regard to our immediate knowledge of mind and matter. Scottish philosophy has had a wide influence not only in Scotland and America, but also in France, through Cousin and his 'spiritualistic' followers.

See M'Cosh, *The Scottish Philosophy from Hutcheson to Hamilton* (1874); and A. Seth Pringle-Pattison's *Balfour Lectures on Scottish Philosophy* (1885).

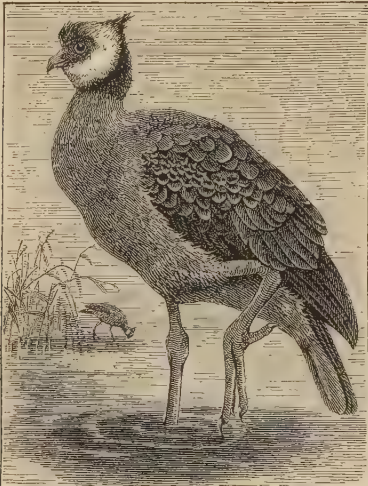
Scotus. See DUNS SCOTUS, ERIGENA, SCHOLASTICISM.

Scouts. See BOY SCOUTS.

Scranton, the third city of Pennsylvania, and capital of Lackawanna county, is on the Lackawanna River, 144 miles by rail NW. of New York. It lies in an important anthracite basin,

and is a busy railway and distributing centre. Its trade in coal is enormous, and it has car and carriage works, and great iron and steel manufacturing, turning out locomotives, boilers, machinery, stoves, and edge-tools, also factories for clothing and silk and woollen goods. Scranton is well built, its streets wide, with many handsome public buildings, though coal-mining too near the surface has caused subsidence. It was founded in 1840, and became a city in 1856. Pop. (1860) 9223; (1880) 45,850; (1900) 102,026; (1920) 141,451.

Screamer (*Palamedea*), a genus of birds of rather doubtful affinities, probably most nearly allied to the Anseres (ducks and geese). The bill is rather short, conical, curved at the extremity; there is a bare space around the eyes; the toes are long; each wing is furnished with two strong spurs. There are several species, sometimes referred to two genera—*Palamedea* and *Chauna*. The Horned Screamer, or Kamichi (*P. cornuta*), inhabits swamps in Brazil and Guiana, and feeds on the leaves and seeds of aquatic plants. It is of a blackish-brown colour, nearly as large as a turkey, and has somewhat the appearance of a gallinaceous bird. It receives its name from its loud and harsh cry. From the head, a little behind the bill, there rises a long, slender, movable horn, for which no use has been conjectured. The spurs of the wings are supposed to be useful in defence against snakes and other enemies.—The Crested Screamer (*Chauna* or *Palamedea chavaria*)

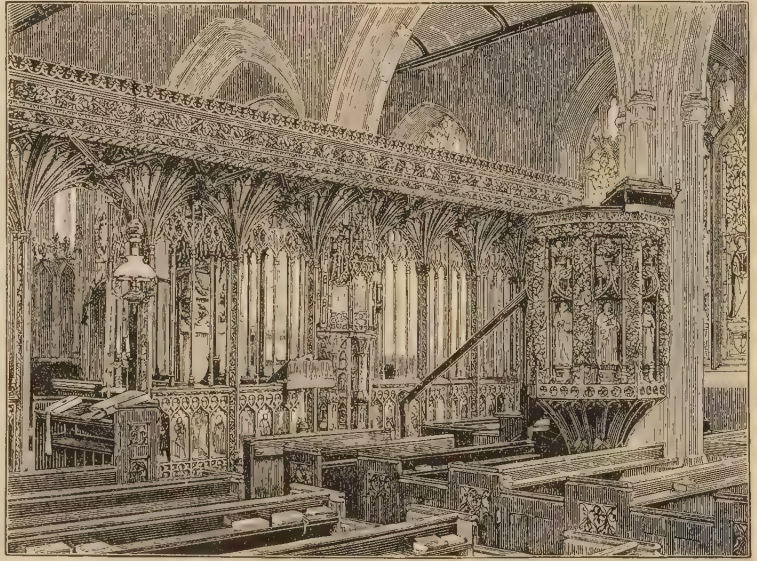


Crested Screamer (*Chauna chavaria*).

is a native of Brazil and Paraguay, the head of which has no horn, but is adorned with erectile feathers. The plumage is mostly lead-coloured and blackish. The wings are armed with spurs.

It is very capable of domestication, and is sometimes reared with flocks of geese and turkeys, to defend them from vultures, being a bold and powerful bird. Very closely allied to this is the Derbian Screamer (*C. derbiana*).

Screen, in Architecture, an enclosure or partition of wood, stone, or metal work. It is of frequent use in churches, where it shuts off chapels from the nave, separates the nave from the choir, and frequently encloses the choir all round. Such choir-screens are sometimes much ornamented, the lower



Rood-screen in Harberton Parish Church.

part being solid, and the upper very often perforated. The rood-screen (see ROOD) is that on which most labour is usually bestowed. It derives its name from the rood or cross which stands, or in churches now Protestant once stood upon it. The rood screen usually forms the division between the nave or transept and the choir. It has generally an ornamental gateway in the centre. In Catholic churches it may have an altar at each side, and is frequently a structure of some size, with a staircase leading to the rood-loft on the top, where the cross or crucifix stands conspicuous at the entrance to the choir. The loft is also used for certain religious functions and ceremonies. In England many beautifully carved screens in stone, enriched with pinnacles, niches, statues, &c., remain, such as those of York, Lincoln, Durham, &c.; and specimens in wood, carved and painted, are common in parish churches, that at Harberton, near Totnes, which is represented in our illustration, being one of the finest in the kingdom. In France the screen round the choir is sometimes the subject of beautiful sculptures, as at Amiens and Paris. In halls of castles and mansions there was usually a wooden screen at one end to separate the entrance-door and a passage from the hall. Over this was a gallery. The term 'screen of columns' is also applied to an open detached colonnade.

Screw. Under ROTATION it is pointed out that the most general displacement which a rigid body can experience may be represented by a screw motion about and along a definite axis. The kinematic characteristic of screw motion is easily studied by help of any ordinary screw working in

its nut. We may fix the nut and consider the motion of the screw; or fix the screw and consider the motion of the nut. In either case we find a certain translation associated with a proportional amount of rotation. The ratio of the translation to the associated rotation is called the *pitch* of the screw. In an ordinary single-threaded screw the practical measure of the pitch is the distance between the threads, and is simply the translation for one complete rotation. In dynamics it is more scientific to take the pitch as the translation for a rotation through the radian or unit angle (see CIRCLE). The ratio of the scientific to the practical pitch is the same as the ratio of the circumference of a circle to its radius. The smaller the pitch, the less is the translatory motion for a given rotation; and when the pitch is made zero, the screw motion is reduced to a pure rotation. On the other hand, the larger the pitch, the greater is the translation for a given rotation; so that a screw of infinite pitch corresponds to a pure translation. Thus screw motion includes all possible kinds of motion, translation and rotation being limiting cases.

Dynamically, screw motion is said to be produced by a *wrench*, which is the most general quantity of the force type. When the screw motion is reduced to translation, the wrench becomes force in the usual sense of the word; and couple, which produces rotation, is the other limiting case of wrench. The simplest conception of a wrench is obtained from the combination of pushing and twisting needed to bore holes with a gimlet.

The screw is a very important element in machinery. In itself, however, it is not complete, being only half of the *screw-pair* or elementary mechanism to which it belongs. The complete mechanism is well illustrated by the combination of screw and nut. By making the pitch zero, we pass to the one limiting case known as the *turning-pair*; and by making the pitch infinite we get the other limiting case—viz. the *sliding-pair*. These three combinations form the simple elements of all machines.

One of the most important uses of the screw (as in the screw-press) is to apply or sustain a large pressure in the direction of its axis by means of a comparatively small couple acting about its axis. We shall suppose the couple to be applied by a force, F , acting at the end of a lever attached to the screw; and that the result is a thrust, P . If a is the arm of the lever, and p the pitch, the principle of work (see ENERGY) gives us the relation $Fa = Pp$. Hence the smaller the pitch the greater the pressure exerted by the screw for a given couple acting round its axis. The pitch is diminished by making the thread of the screw finer. But, as this also makes it weaker, we see that there must be a practical limit to increasing the advantage of the screw in this way. So far we have neglected friction, which must, however, be considerable in all screw-pairs because of the great pressures existing between the opposed faces of the threads of the screw and nut. The power applied, Fa , must, therefore, be greater than the effective work done. In some cases, when the pitch is small, the efficiency, or ratio of useful work done to work expended, may be reduced to one-third. If the pitch is very large the action of the screw may be reversed, the driving force being the thrust, P , and the resistance the couple, Fa , opposing the rotation of the screw. In most cases the pitch is too small for reversal, the couple brought into play by the friction always being sufficient to prevent motion. It is this non-reversibility that gives the screw its peculiar virtue in holding together parts of a frame or machine. For the screw-propeller, see SHIPBUILDING.

Screw Bean. See MEZQUITE.

Screw-nails, called in the trade 'wood-screws,' are made from mild steel and iron; or from brass, copper, and zinc, when others would be destroyed by rust. Wood screws were in use long before the year 1760, when the brothers Wyatt obtained a patent for cutting screws by machinery. Before 1817, wood screws, being nearly all forged and then shaped by hand, were very expensive; but at that time a patent was granted to John Colbert, a German watchmaker, who made the first automatic machinery for this purpose. In the year 1854 a greatly improved machine was introduced from America, which may be said to have revolutionised screw-making. In a worming-machine a cutter passes several times along the blank and forms the head and gimlet point. For another method two reciprocating plates, or revolving discs, are made from hard steel, and grooved at an angle; the screw blank is rolled between them under great pressure, receiving the reverse impression of the grooves which form the thread.

Screw Pine (*Pandanus*), a genus of plants of the family Pandanaceæ, natives of the tropical parts of the east and of the South Sea Islands. Many of them are remarkable for their adventitious roots, with large caps, which their branches send down to the ground, and which serve as props. Their leaves are sword-shaped, with spiny edges, and are spirally arranged in three rows. In general appearance, when unbranched, they resemble gigantic plants of the pine-apple, whence their popular name. *P. utilis* is a widely-diffused species; a spreading and branching tree of 25 or 30 feet high, much used in India for hedges. It grows readily in a poor soil, and is one of the first plants to appear on newly-formed islands in the Pacific. The male flowers are in long spikes, the female flowers in shorter branches. The flowers are frequently gathered before expanding, and boiled with meat are regarded as an aphrodisiac. Their delightful and very powerful fragrance has made the plant a favourite everywhere. Oil impregnated with the odour of the flowers, and the distilled water of them, are highly esteemed East Indian perfumes. The seeds are eatable; and the fleshy part of the drupes, which grow together in large heads, is eaten in times of scarcity, as is the soft white base of the leaves. The terminal buds are eaten like those of palms. The roots are spindle-shaped, and are composed of tough fibres; they are therefore used for making baskets and coarse paint-brushes; and in Japan they are used as corks. In Mauritius, from continual cropping of its leaves, the tree is usually dwarfed to 6 or 10 feet. The fibres of its leaves are used for making the *Vacoba* bags, which rival in cheapness and usefulness the gunny-bags of India. The leaves are cut every second year. Immediately on being cut off the leaves are split into fillets, which are nearly an inch broad at the base, but taper to a point, and are 3 or 4 feet long.

Scriabine. See SKRIABIN.

Scribe (Heb. *Sofer*), among the Jews, originally a kind of military officer, whose business appears to have been the recruiting and organising of troops, the levying of war-taxes, and the like. Later the Hebrew name *sofer* seems to have been especially bestowed on a copyist of the law books (Gr. *grammateus*). After the exile, under Ezra, apparently the copyist became more and more an expounder of the law (Gr. *nomodidaskalos*). In Christ's time the name had come to designate learned men, or doctors of the law. Christ himself recognises them as legal authorities (Matt. xxiii. 2); they were the preservers of traditions, and formed a kind of police in the Temple and synagogues, together with the high-priests; and the people revered them, or were expected to reverence them, in an

eminent degree. They were to be found all over the country of Palestine, and occupied the rank and professions of both lawyers and theologians. Their public field of action was thus probably threefold: they were either assessors of the Sanhedrin, or public teachers, or administrators and lawyers. Many of these teachers had special classrooms somewhere in the Temple of Jerusalem, where the pupils destined to the calling of a rabbi sat at their feet. The calling of a scribe being gratuitous, it was incumbent upon every one of them to learn and to exercise some trade. Those scribes who were not eminent enough to rise to the higher branches of their profession, to enter the Sanhedrin, to be practical lawyers, or to hold schools of their own, occupied themselves in copying the Book of the Law or the Prophets, in writing phylacteries, contracts, letters of divorce, and the like. Much of the Halacha, Haggada, and Mishna were due to them. As a rule they were Pharisees (q.v.), and, in their zeal to keep the law pure from any foreign influence, even Chasidim (q.v.). Amongst famous scribes are to be reckoned Hillel, Shammai, and Gamaliel.

See JEWS, PHARISEES, EKEGESIS, MISHNA, SANHEDRIN, TALMUD; also the histories of the Jews by Ewald, Graetz, and others; and Schürer's *History of the Jewish People in the time of Jesus Christ* (Eng. trans. 1886-90).

GENERAL: see Max Seligsohn in *Jew. Enc.*, vol. xi. p. 125; also refs. (under *Sopherim*) on p. 338 of R. Travers Herford's *Pharisaism* (Lond. 1912). RISE AND DEVELOPMENT: see J. Z. Lauterbach, pp. 176-198 of *Studies in Jew. Lit. in honour of K. Kohler* (Berlin, 1913); S. Funk, *Die Entstehung des Talmuds* (Leipzig, 1910). CONFLICT WITH JESUS and estimate of their character, see refs. in C. G. Montefiore's *Synoptic Gospels*, p. 1117 (Lond. 1909; new ed. in Press); also refs. (under *Schriftgelehrte*, &c.) on p. 864 of vol. ii. of H. L. Strack and P. Billerbeck's *Kommentar z. N.T.* (Munich, 1922-26). MANNERS AND THOUGHT: see I. Abrahams, 'Pharisaic delicacies,' ch. xiii., in *Studies in Pharisaism*, vol. ii. (Camb. 1924; the other essays in this and the earlier vol. should be noted); J. M. Myers, *Story of the Jewish People*, vol. i. (Lond. 1909: popular but accurate). BIOGRAPHIES: see W. Bacher, *Agada d. Tannaiten* (Strassburg, 1890).

Scribe, AUGUSTIN EUGÈNE, a French dramatic writer, son of a wealthy silk-merchant of Paris, was born in that city on 24th December 1791, and died there on 20th February 1861. Although educated for the legal profession, his whole life was given to the 'manufacture' of stage-pieces of all kinds. His first play that can be identified was a failure, in 1811, and it was not until 1816 that he had any success to boast of. From that time, however, his productions were so greatly in demand by theatrical managers that he established a sort of dramatic manufactory, in which numerous *collaborateurs* were constantly at work under his supervision. His plots are interesting and his dialogue light and sparkling; and not a few of his pieces have been adapted for the English stage. As literature they have little value. The best known are *Le Verre d'Eau*, *Adrienne Lecouvreur*, *Une Chaîne*, and *Batailles de Dames*. Scribe also wrote various novels, and composed the *libretti* for a considerable number of well-known operas, including *Masaniello*, *Fra Diavolo*, *Robert le Diable*, *Les Huguenots*, *Le Prophète*, and *L'Africaine*. His *Œuvres Complètes* were published in 76 vols. in 1874-85. See Life by Legouvé, a collaborator (1874); Arvin, *Eugène Scribe and the French Theatre* (1924).

Scriblerus. See ARBUTHNOT.

Scribner, CHARLES, publisher, was born in New York City, 21st February 1821, graduated at Princeton in 1840, and in 1846 joined in founding the publishing firm of Baker & Scribner. His partner died soon after, and the firm became Charles Scribner & Co. *Hours at Home*, first

issued in 1865, in 1870 was merged in *Scribner's Magazine*, which was sold by the firm in 1881, and re-christened the *Century Magazine*. Charles Scribner had died in 1871 (August 26), and the firm in 1879 became Charles Scribner's Sons; and these in 1887 began a new *Scribner's Magazine*, in addition to their large publishing (as distinguished from printing and publishing) business.

Scrivelloes. See IVORY.

Scrivener, FREDERICK HENRY AMBROSE, New Testament critic, was born at Bermondsey, 29th September 1813, and educated at St Olave's, Southwark, and Trinity College, Cambridge. He was assistant-master at Sherborne, head-master of Falmouth School (1846-56), rector of Gerrans (1861-76), vicar of Hendon and a prebendary of Exeter. One of the New Testament revisers from the beginning, he died at Hendon, 26th October 1891.

Scrivener's Palsy, another name for Writer's Cramp. See CRAMP.

Scrofula is a term whose significance has varied much at different periods and in the usage of different writers. The term is not used by modern writers because it has been found that a weakly state of nutrition, combined with chronic enlargement of glands, disease of bone, &c., is so commonly associated with the presence of the tubercle bacillus that the term 'tuberculosis' has come to be used instead. The term 'king's evil' was also applied to scrofula because of the superstition that it was cured by the royal touch. The older physicians (Hippocrates, Celsus) restricted scrofula practically to a swelling of the *lymphatic glands*, more especially about the neck. Though frequent attempts were made to widen its significance so as to include supposed kindred processes in other structures, the old view remained dominant both in lay and medical parlance till recently. Most pathologists nowadays regard the tubercle bacillus as the one essential cause of so-called scrofula, and hold the latter (when used in the more limited sense of Hippocrates) as synonymous with a *localised tuberculosis*. Other authorities regard the weakness, loss of appetite, and general poor nutrition from which children often suffer as a pretubercular manifestation which renders them liable merely to contract this disease, a suitable soil being offered by the weak tissues in which the tubercle bacillus, when once it has gained access, flourishes and multiplies, giving rise to tuberculosis proper. This subject will be therefore more fully treated under Tubercle (q.v.). Scrofula is synonymous with struma.

This disease for centuries was thought capable of being cured by the touch of a king, and it was claimed that this power was of English growth, commencing with Edward the Confessor, and descending only to such foreign sovereigns as could show an alliance with the royal family of England. But the kings of France claimed the gift, and it was certainly practised by Philip I., although he was allowed to have lost the power through his immorality. Laurentius, physician to Henry IV., claims that the power commenced with Clovis I., and says that Louis I. added to the touch the sign of the cross. He tells us also that Francis I. even in captivity preserved the power. In France it did not fall completely into disuse till 1776; and Louis XVI. at his coronation touched as many as 2400 persons. William of Malmesbury is the first to mention the gift of healing in England and to attribute it to that most miserable of saints, Edward the Confessor. From his time down to Henry II. there is no account of the practice, but it reappears under Henry II., John, Edward II., Edward III., Richard II., Henry IV., V., VI., VII., and VIII., its truth guaranteed by grave and credible writers like

Archbishop Bradwardine, Sir John Fortescue, and Polydore Virgil. Henry VII. was the first to institute a particular service of ceremony on the occasion of the touching; that used in Queen Anne's time will be found in the contemporary Prayer-books. In Henry's reign also the presentation of a piece of gold was first generally introduced, usually the angel-noble; but after the reign of Elizabeth the size of the coin was reduced for the sake of economy. James I. and Charles I. both touched, and we are told that the latter sometimes gave as his touch-piece silver instead of gold. But the practice reached its greatest height under Charles II., who even touched 260 persons at Breda before crossing to England, and we learn from the *Chorisma Basilicon*, the third part of the *Adeno-choiradelogia* (1684) of the royal surgeon John Browne (1642-1700), that no fewer than 92,107 persons were touched between 1660 and 1682. Yet we learn from the Bills of Mortality that more persons died of scrofula during this period than any other, the evil having greatly increased during the king's absence. Browne's work is the best contemporary account of the rite that we possess. It is interesting that Sir Thomas Browne does not allude to the royal gift of healing, although there are allusions in his domestic letters to the practice of touching and to his granting the ordinary certificate as a physician. James II. also touched for the evil, but William III. put an end to the practice. Anne renewed it, and we read how on March 30, 1714, she touched 200 persons, among



Touch-piece (time of Queen Anne).

them Samuel Johnson, whom, however, she did not heal. With the accession of the House of Brunswick the practice entirely ceased, but it seems that the Pretenders for some time attempted to maintain it, and we are told that the prince Charles Edward touched a child at Holyrood in 1746, which was healed within 21 days after, and even practised the art as late as 1770. In 1748 the nonjuring historian Thomas Carte lost his subsidy from the Common Council of London for a note in the first volume (December 1747) of his *History of England* to the effect that a man had been cured of the king's evil by the touch of the Pretender at Avignon in November 1716. We find frequent allusions to the practice in Pepys and Evelyn, and indeed it was for centuries an article of popular belief, so that we need not wonder at the credulous warmth of Heylin, Sergeant-surgeon Wiseman, and Jeremy Collier. See Dr Raymond Crawford, *The King's Evil* (1911), and Marc Bloch, *Les Rois Thaumaturges* (1926), for the superstition.

Scroggs, SIR WILLIAM, became Chief-justice of the King's Bench in 1678, and was specially notorious for cruelty and partiality during the trial of the unfortunates accused of complicity in the alleged Popish Plot (see OATES). In 1680 he was impeached by the Commons, but removed from office by the king on a pension. He died in 1683.

Scroll, an ornament of very common use in all styles of architecture. It consists of a band arranged in convolutions, like the end of a piece of paper rolled up. The Greeks used it in their Ionic

and Corinthian styles, the Romans in their Composite; and in mediæval architecture, and all styles which closely copy nature, it is of constant occurrence as in nature itself.

Scrope, a famous family of the north of England that produced, amongst others, Richard le Scrope, Chancellor in 1378 and 1381-82; Richard Scrope, Archbishop of York, who joined in the conspiracy against Henry IV., and was beheaded at York in 1405; and Lord Scrope of Bolton, Warden of the West Marches under Queen Elizabeth.

Scrope, GEORGE POULETT, geologist, was born in London in 1797, and was educated at Harrow and Cambridge, and on his marriage in 1821 exchanged his own name, Thomson, for that of his wife's family. He made studies of volcanic phenomena at Vesuvius, in central France, and elsewhere, and expounded his views in *Considerations on Volcanoes* (1825) and *Geology of the Extinct Volcanoes of Central France* (1827; 2d ed. 1858). As member of parliament for Stroud from 1833 to 1868 he became famous as a writer of pamphlets in the interests of the agricultural labourer. A Fellow of the Royal Society and other learned associations, he died 19th January 1876.

Scrophulariaceæ, a family of dicotyledons, chiefly herbaceous and half-shrubby plants. The family is a very large one, containing between 2000 and 3000 known species, which are distributed over the whole world, both in cold and warm climates. The flowers are commonly zygomorphic and lipped, but may be almost regular as in *Verbascum*, or, as in *Veronica*, the corolla may be rotate, with the two posterior petals united, the posterior sepal wanting. Commonly there are four stamens, sometimes five (*Verbascum*) or two (*Veronica*). The ovary is bilocular, with axile placentæ. Acridity, bitterness, and astringency are prevalent characteristics, and many species are poisonous. Mucilage, resinous substances, and essential oils are also products of many of the species. Some are root parasites. Some are admired and cultivated for their flowers; some are used medicinally. *Digitalis* or Foxglove, *Calceolaria*, *Mimulus*, *Verbascum* or Mullein, *Antirrhinum* or Snapdragon, *Gratiola*, *Scrophularia* or Figwort, *Veronica* or Speedwell, and *Euphrasia* or Eyebright are familiar examples. Very different from these humble herbaceous plants is *Paulownia imperialis*, a Chinese tree, 30 to 40 feet high, with trunk two or three feet in diameter, and flowers in panicles, about as large as those of the common foxglove; the tree is hardy in the milder parts of England, and is a beautiful ornament of shrubberies from London southwards.

Scrub. See AUSTRALIA.

Scruple (Lat. *scrupulum*, 'a small, sharp stone') was the lowest denomination of weight among the Romans, and with them denoted the 24th part of an ounce (*uncia*), or the 288th of a pound (*libra*). As a measure of surface it was also the 24th part of the *uncia* (see OUNCE). In Apothecaries' Weight a scruple contains 20 Troy grains, is the third part of a drachm, the 24th of an ounce, and the 288th of a Troy pound. See WEIGHTS AND MEASURES.

Scudéry, MADELEINE DE, an interminable French novelist, was born at Havre in 1607, her father of Provencal origin. Left an orphan at six, she received a careful education from an uncle, and, still young, came up to Paris, where she soon became a notable figure in the brilliant society of the Hôtel Rambouillet. She was plain, if not ugly, thin, dark, and long-faced, full of vanity and prudishness, a 17th-century Madame de Genlis *plus* virtue, as Sainte-Beuve styles her. But blue-stocking as she was she had a woman's heart, and loved after the fashion of her heroines, with an exalted and chaste affection, the ill-

favoured but learned Pellisson, in whom she had inspired a passion. Her half-crazy brother Georges (1601-67) left the service in 1630 to devote himself to literature, and, being gifted with fatal facility, posed as a rival of Corneille, and wrote many pieces long since securely forgotten. To Christina of Sweden he dedicated one poem, *Alaric*, of 11,000 verses. A kind of swashbuckler among men of letters, he wrote prefaces that read like cartels of defiance to any who had the temerity to doubt his genius. His sister used to help him in his writing, and Tallemant ascribes to her the entire responsibility of *Ibrahim ou l'illustre Bassa*, a romance in four large volumes, which he signed and published in 1641. Similarly *Artamène ou le Grand Cyrus* (10 vols. 1649-53) and *Clélie* (10 vols. 1654-60) both bore the name of Georges de Scudéry, although he contributed only the framework of the two, that is to say, the part which is the worst in both. Mdlle. de Scudéry lacked real invention, and took her figures from her acquaintance and from the society of the day, travestying them as Romans, Greeks, Persians, or Carthaginians—thus, she has half-painted herself as Sapho in vol. x. of the *Grand Cyrus*. Victor Cousin discovered a key (1657) which named all the figures definitely, as Artamène for Condé, Mandane for Mme. de Longueville, Parthénie for Mme. de Sablé, &c. But she had real skill in polished conversation, and, in later days when her stories had gone out of fashion, she reproduced ten volumes (1680-92) of these taken from her novels. Madame de Sévigné writes her daughter, 'Mdlle. de Scudéry has just sent me two little volumes of conversations; it is impossible that they should not be good, now that they are not drowned in a great romance.' The *Grand Cyrus* is one of the masterpieces amongst the *romans de longue haleine*, as their order has been felicitously named, but a modern reader seldom strays far into its 15,000 pages. The incidents follow in the most helpless monotony and lack of verisimilitude, but the naïveté of the reflections completely disarms the critic. The virtuous authoress prided herself on her ability to fathom all the depths of love without having sounded them in her own experience, and the famous 'Carte de Tendre' in *Clélie, histoire Romaine*, is a fantastic but pretentious attempt to construct an analysis and guide to the whole kingdom of Love. It was not an invention of Mdlle. de Scudéry, but due to the collaboration of the superfine ladies and gentlemen who frequented her Saturdays. She lived till the age of ninety-four, respected and honoured to the last, dying at Paris, 2d June 1701. The etherealised sentiment of her novels had already wearied the world, but the death-blow waited to be dealt by the hand of Boileau. Cousin calls her, but not happily, 'a sort of French sister of Addison.' As a woman it should not be forgotten to her honour that her brave devotion to friends like Mme. Longueville and Fouquet survived their fall; and none could ever be an object of indifference to the world of whom Madame de Sévigné could write, 'In a hundred thousand words I could tell you but one truth, which reduces itself to assuring you, Mademoiselle, that I shall love you and adore you all my life; it is only this word that can express the idea I have of your extraordinary merit. I am happy to have some part in the friendship and esteem of such a person. As constancy is a perfection, I say to myself that you will not change for me; and I dare to pride myself that I shall never be sufficiently abandoned of God not to be always yours.'

See Victor Cousin, *La Société Française au Dix-septième Siècle* (1858); Sainte-Beuve, *Causeries du Lundi*, vol. iv.; André Le Breton, *Le Roman au Dix-septième Siècle* (1890); and chapter iii. of Amelia Gere Mason's work, *The Women of the French Salons* (1891).

Scudo (Ital., 'shield'), an Italian silver coin corresponding to the Spanish Piastre (q.v.), the American Dollar (q.v.), and the English Crown (q.v.). It was so called from its bearing the heraldic shield of the prince by whose authority it was struck, and differed slightly in value in the different states of Italy, the usual value being about four shillings.

Sculling has two senses, a river sense and a sea sense. In its fresh-water acceptation sculling is the propulsion of a boat with a pair of sculls or light oars by one man (see ROWING). Among seafaring men, however, to scull is to drive a boat onward with one oar, worked like a screw over the stern.

Sculpin, a name given to the Dragonet (q.v.), and also in the United States to various marine species of Cottus or Bull-head—notably to *C. octodecimspinosus* and *C. scorpius*; the 'Daddy-Sculpin' being *C. grœnlandicus*.

Sculpture has been practised in all ages and by all races. There is no savage so untutored but can scratch a rude design upon a flat surface (the beginning of relief) or fashion a stone into the rugged semblance of a god. The sculptures of palæolithic man (see ART) fall but little short of those of archaic Greece. Such backward races as remain in the state of barbarism from which the more highly developed emerged countless centuries ago still aim at the innocent realism of prehistoric times. But these furtive attempts have little in common with art; their interest is more anthropological, though some of the African negro sculpture in wood, apparently no longer produced, is well worthy of consideration. The present article, however, treats of sculpture as it has been pursued by craftsmen with a certain control of their material and a consciousness of the effect it is theirs to produce. The sculpture of India, for instance, is merely fantastic; its preoccupation is religious rather than artistic. When viewed in relation to the great stream of tradition which connects the work of Rodin or Gilbert with the colossal figures of Egypt, it is but a shallow backwater. But from the time when the great Sphinx was set up at Gizeh until yesterday a countless succession of men have expressed their ideals in clay, bronze, marble, and other more or less stubborn substances, with a deliberate intention and tutored sense of dignity or beauty which entitle them to be revered as artists and their works to be treasured as masterpieces. With their achievement we are alone concerned; the ingenious scratchings of the savage—whether ancient or modern—and the fantasies of the Oriental mystic are for the curious to consider.

The material of sculpture is as various as the methods of its treatment. Wood, marble, basalt, granite, bronze, gold, and ivory are but a few of the substances which have been fashioned into beautiful and stately forms. Here at once we discover one determining element of style. An artist who works in porphyry or granite cannot express his fancy with freedom. A largeness and dignity is forced upon him by the rigid substance upon which he has chosen to work. So we find in the works of ancient Egypt a severe and monumental repose which would be out of place in figures of a modest size and more malleable material. It has ever been the supreme merit of the sculptor perfectly to adapt his means to his end. The Greeks of the 5th century expressed in marble the most beautiful lines and shapes which the material could suggest. Where there was no place for common or familiar ideas all was simple and restrained. On the other hand, the artists of Tanagra, working in the ready and pliant medium of terra cotta, did not venture beyond a scale and a technique

which, though perfectly consonant to their purpose, have the grace and elegance of the masterpiece in little. The artist does not carve and slash his marble as though it were paper, nor does he break up its surface into a thousand furrows as though it were putty; but, still within the bounds of taste and knowledge, he gives to his work a breadth and simplicity which are at war neither with art nor with nature. Indeed the problem of sculpture may be defined as the translation of the forms of the visible world into the language suggested by the material employed. Many of the grandest sculptures that time has spared were composed to fill certain spaces in wall or pediment. Their purpose being thus decorative, it follows that there is another force by which the artist is controlled. The variety of pose and contour which distinguishes the Elgin marbles was suggested by the varying depth of the pediment they were destined to adorn. So also the flowing harmony of the Parthenon frieze proceeds from the subtlest adaptation of the design to the space. It is only necessary to contrast the masterpieces of Greek art with some of the outrages upon taste which have defaced Westminster Abbey since the 18th century to recognise how much beauty depends upon a sense of fitness. To represent closed aspects of animal forms which are in discord neither with their material nor with the site they occupy, this is the end of the sculptor, and in its attainment a sense of beauty must always conquer the interest of facts, and a respect for tradition must forbid the play of ingenious artifice.

The Egyptians were the most prolific sculptors. Their temples and palaces were covered with reliefs; innumerable statues of gods and heroes stood upon their plains. The Sphinx (q.v.) is the product of an art already mistress of her resources. There is not a tentative touch in this noble monument; it is not an experiment like the seated figures from Branchidæ, which only preceded the efflorescence of Greek sculpture by a few centuries, but a work as finished in its grand impassiveness as the Theseus (so called) of the Parthenon. But Egyptian art, as it seems perfect in the beginning, knew no progress but decay. Its purpose was consistently the same. It did not advance, like Greek sculpture, from naïveté to accomplishment, from hieratic restraint to artistic enfranchisement. The school of Memphis is already a school of the decadence. And yet its artists are still for the most part bound in the chains of hieratic tradition. Their seated figures are always posed in the attitudes sanctioned by custom, the elbows firmly planted against the sides, the hands set forward upon the knees. Their reliefs also are stiff and archaic. While they display a knowledge of anatomy and an observation of the human figure in action, the head and legs are presented in profile, while the upper part of the body faces the spectator. This peculiarity was the result not of incompetence, but of a fierce conservatism. The reliefs, the figures of which either project from the ground or are depressed beneath it, were always coloured; indeed polychromy was invariable when the material was not naturally veined or coloured. But excavations at Boulak have shown that under the Memphis dynasty, despite the influence of the ancient school, realistic portraiture was practised with amazing success. Such a figure as the wooden *Sheik-el-beled* (see EGYPT, Fig. 6) is neither stately nor beautiful, yet there is little doubt that it is a speaking likeness; and so much may be said for a dozen masterpieces treasured at Bulak. The first Theban school, which flourished from the 10th to the 16th dynasty, drew its inspiration from the school of Memphis. The same respect for tradition, the same interest in portraiture were piously preserved. Indeed Egyptian

art clung to the ideals of grandeur and formality until the advance of Greece introduced a fresh science and a fresh civilisation. By its very austerity no less than by its balanced union of observation and convention the sculpture of Egypt displays a grandeur and impressiveness which it shares with no other manifestation of art. Its hybrid colossi and monstrous deities, hewn out of the stubbornest material, are still noble in spite of their ugliness; and that even the formal Egyptian was not incapable of representing graceful types the portrait of Menephtah and Queen Taia remain to show. And yet from the classical period the Sphinx alone survives (see figures in the articles EGYPT, ABU-SIMBEL).

Assyrian sculpture, which grew out of the ruder art of Chaldaea, like Egyptian, knew neither progress nor development. Its earliest monuments date from the 12th century B.C., but the magnificent series of reliefs in the British Museum are not earlier than the 9th and 8th centuries, and they display the inflexible characteristics of the most ancient period. The kings and viziers, who figure in the reliefs, conform to an invariable type. The monarch is recognised by his square-cut beard and jewelled tiara. He is often represented, like the figures of Egyptian reliefs, partly fronting the spectator, partly in profile. There is no attempt at portraiture, not a suggestion of naturalism. But in the treatment of animals the Assyrian allowed himself complete freedom. The lion-hunts are masterpieces of observation and execution. The finest reliefs prove that even before the matchless frieze of the Parthenon there were artists who could model the horse with animation and understanding. The Assyrians delighted also in hybrid forms; the portals of their palaces were guarded by colossal winged bulls with human heads, admirable specimens of which may be seen at the British Museum from the palace of Sargon (721-705 B.C.). Assyrian art in fine, despite its many conventions and inveterate symbolism, lacked the grandeur and the nobility of Egyptian sculpture. On the other hand, the artists of Assyria display a sense of life and movement, especially in their treatment of animals, unknown before them (see figures in the articles ASSYRIA, BABYLONIA).

Cretan art, as far as sculpture is concerned, confined itself to a few reliefs in wood or stone frescoes, and to small figures in pottery, metal, or ivory. Large sculpture in the round was unknown. The origins of Greek sculpture are still in dispute. Some there are who would have us believe that the art which culminated in Phidias derived directly from Egypt or Assyria; others assert that it was autochthonous. The question does not admit of a positive answer. That the archaic Greeks were influenced by the art of the Orient is incontestable, but it seems no less certain that, the influence being superficial, Greek sculpture followed a natural course of development. In the treasure-house at Mycenæ are certain scabbards and sword-hilts of eastern design, if not of eastern workmanship, and there is no reason why the Phœnicians, the bagmen of antiquity, should not have carried these precious wares to Argolis. The famous Lion-gate, too, is Assyrian in character, and many examples of primitive Greek art are conspicuously Oriental. But both history and common sense are opposed to the view that the early masters of Selinus or the authors of the primitive Apollo statues (so called) owed a direct debt to Egypt. It has been pointed out that Egyptian art, when we first meet it, was finished and complete; its ideal was attained in obedience to hieratic laws. The sculptors of archaic Greece were too naïve to be the mere imitators of a classical style. Their aim was realism, so far as their limited resources and control of

marble or bronze would carry them. The early history of Greek art is shrouded by the Greeks themselves in a veil of legend. With characteristic anthropomorphism the ancient critics were wont to represent each epoch in the development of art by a purely mythical hero. The Cyclopes, the Telchines, Dædalus, Butades, and Kore, to whom the invention of modelling is ascribed, are one and all very pretty fictions. Even Rhœcus and Theodorus, the inventors of bronze-casting, and Glaucus, who invented the soldering of iron (σιδήρου κόλλησιν), are names and no more. Indeed it is impossible until a comparatively late period to connect extant works with the name of their authors. When we examine the archaic monuments, such as the earliest metopes of Selinus, which are as old perhaps as 600 B.C., we find a style awkward and ingenious even to barbarity. While the figures of Perseus and Medusa front the spectator, the feet are planted from left to right, and the mason, so far from aiming at symmetry of design, was doubtless content with a vague semblance of humanity. The seated figures from Branchidæ, which may be as late as 540 B.C., are merely blocked out, and the seated Athena, ascribed to Endœus (550 B.C.), gives no promise of the golden age which followed less than a century later. The celebrated Lycian reliefs, known as the Harpy Tomb, mark a distinct step in advance. There is charm and dignity in their stiff elegance and beautiful drapery; and yet are they not still marred by the clumsy ingenuousness of the true primitive? At Athens art was born late and lived a brief, if brilliant, life. Nor is the *stèle* of Aristocles much better than an archaic experiment; though the relief of a woman stepping into a chariot, which may have been a metope of the Hecatompedon, has at least the suggestion of freedom and mastery. There exists a group of statues—called Apollo—which were fashioned in obedience to the same convention. They are rigid and clumsy in handling; the arms are fixed firmly to the side; and yet the surface is treated with breadth and simplicity, and there is an unmistakable Hellenism in the flow of the lines. That of Orchomenus is probably the most ancient, and may date from the 7th century; the most advanced in style is the so-called Strangford Apollo—now in the British Museum—which is doubtless not much older than the Ægina pediments.

The marble statues which adorned the gable-ends of the temple of Aphaia at Ægina, and are now the chief ornament of the Glyptothek at Munich, form the first great monument of Greek art which has come down to us. Each pediment represented the struggle of two opposing forces over a dead warrior. Though there is an archaic touch in the spare proportions and rigid attitudes of the figures, they are evidently the work of a master who understood his craft, and it is possible that the stern handling and the archaic smile were deliberate. The author is unknown. The eastern pediment is freer, and possibly later than the western, and the historians have ascribed it to Onatas, a sculptor whose name is preserved in the texts. But there is not a shred of definite evidence, and we can only describe these fine statues as the best specimen of Greek sculpture half a century before the advent of Phidias. The style of Myron and Polyclethus is known to us only by copies; that of Kalamis not at all, unless the Choiseul-Gouffier Apollo (so called) be a copy of his famous Apollo Alexikakos. All three were older contemporaries of Phidias, and concerning them all the ancient critics waxed eloquent. If we may believe a hundred epigrams, Myron aimed at realism and illusion rather than at beauty. His disc-thrower has been celebrated through all the

ages, although, if the copy be accurate, Quintilian described it accurately as *distortum et elaboratum*. Polyclethus, on the other hand, was a true academic, and would have imposed a canon on the world. The well-known *Doryphorus* and *Diadumenus* are copies of his works; and though we may not determine therefrom his technique, we may at least realise the square proportion to which he bade his contemporaries conform.

In Phidias the art of sculpture culminated. Born at the most fortunate moment of the world's history, the artist of the Parthenon was a worthy contemporary of Sophocles and Plato. To his personal genius must be ascribed the marvellous efflorescence of art which conferred a unique glory upon the 5th century B.C. Cupidity and barbarism have effaced the monumental Chryselephantine (q.v.) figures of Athena and Zeus, which antiquity esteemed his masterpieces. The bronze colossus—Athena Promachos—no longer stands upon the Acropolis to strike fear into the heart of invading Goths. But the sculptured decorations of the Parthenon have been preserved, though not unhurt by time, for our admiration. In style there is a profound difference between the metopes, which are marked by a dry archaism, and the magnificent works which are still the supreme expression of the art. Maybe the metopes preceded the rest by some years, and there is at least a mastery and sureness in their handling which separates them by a long interval from the Æginetan sculptures. But the frieze and such groups from the pediments as have survived the shocks and explosions of history are the work of a hand and brain balanced and complete. Here breadth, simplicity, and finish unite; there is ever an exquisite quality of surface; plane is related to plane with amazing subtlety; the accidental is rigidly excluded; nature and the convention of the art are happily blent; a sense of dignity, beauty, and control is everywhere apparent; not only is each figure perfect in itself, but each is perfectly adapted to the space it fills; the structure of the pediment compelled the sculptor to set his figures in exquisitely varied pose, so that the composition of the groups—which represented episodes in Athena's career—was at once flowing and coherent. The march of the frieze—a procession in the Pan-athenaic festival—is as large and stately as its details are exquisite (see figure in article ELGIN MARBLES). Phidias (q.v.) remains to-day one of the greatest sculptors of the world; and his school handed on the torch he had given into their hands. The restrained elegance of the Caryatides of the Erechtheum, the graceful Victories, with their beautiful draperies, which adorned the temple of Nike Apteros, the refined grandeur of a dozen *stelæ*, the charming movement of the Phigalian frieze, are the outcome of Phidias' serene example. The sculptured figures of the temple of Zeus at Olympia, the shrine of the gold and ivory statue, are an interlude in the history of art. Legend in ascribing the east pediment to Pæonius (the author of the famous Nike), the west to Alcamenes, is almost certainly false; and, if judgment may be based upon style, these figures are earlier in date than the Parthenon. The so-called Neo-Attic school marks the decadence. Still beautiful in their decay, the works of Scopas (390–350), and of Praxiteles, his contemporary, have already declined from the austere and classic style of Phidias. Their works lack something of the repose and impartiality which distinguish the masterpieces of the Parthenon. Though both produced an immense quantity of works, we know little else than copies and the ancient texts can tell us. The one undoubted work of Praxiteles which still remains to us is the Hermes, discovered

at Olympia in 1877; while the handiwork of Scopas may be seen in the sculptures of the Mausoleum. To the same period perhaps belong the incomparable Venus (q.v.) of Milo, and the grave Demeter of Cnidos now in the British Museum. Lysippus, the court sculptor of Alexander, followed with his new canon of small heads and jimp figures, and then the school of Pergamum, beginning the revolt against Attic repose, inflicted an irremediable injury upon the art of sculpture. The school of Rhodes, with its much bepraised Laocoön (q.v.), the school of Tralles, with its impossible Farnese bull, completed the glory of the unsculpturesque. The capital of art was then shifted from Athens to Rome, and the industrious band of *Græculi esurientes* fashioned for us the excellent if uninspired copies to which we owe so much of our knowledge of Greek sculpture. To catalogue their names were superfluous; they were not wont to sign them themselves. But they preserved for future ages such admirable works as the Amazon and the Doryphorus; and if the Apollo (q.v.) Belvedere and the Venus de Medici have since been monstrously overrated, their authors are not to blame. Lastly, mention must be made of Pasioteles, who, in the time of Pompey, made a determined effort—like the Pre-Raphaelites of England—to revive an archaic style, and even succeeded in establishing a school.

And then the art of sculpture suffered eclipse. In the early centuries of Christianity the attempt to model the human form was condemned as idolatrous, and such poor barbarous experiments as were made may be passed over in silence. In the 6th century a revival was inaugurated at Byzantium, and flatterers compared a monument erected by Justinian in 534 A.D., in honour of a victory over the Persians, to the masterpieces of Phidias. But the Christian spirit invading, Byzantine sculpture, truly the very lees of classicism, must needs take refuge in an elaborate symbolism. The use of gems and precious metals gave a certain splendour to the best examples of Byzantine art, and its influence was universal. No country in Europe escaped it, and until the 12th century its reign was undisputed. In the Gothic period sculpture was, as it were, rediscovered. Commonly somewhat rude and barbarous, often resigned to a vigorous realism, it was not an art deliberate and complete as was the sculpture of the Greeks. Its conventions grew up with its growth, and save in France it was rarely emancipated from the fetters of experiment. In England such monumental sculpture as belongs to the Gothic period is undistinguished and maladroit. William Torell's Queen Eleanor (13th century) will serve as an example as well as another, and the sculptured decoration of Henry VII.'s chapel at Westminster shows the Gothic style as it was before the Renaissance reached England. In France there is another tale to tell. The manifold figures which adorn the cathedrals of Chartres and Rheims, though Gothic in spirit, were produced under the influence of classical art. Their freedom and simplicity is a complete contrast to the barbarous productions of the previous century. However, there is no difficulty in the supposition that the French artists of the 13th century were familiar with Roman art, and to this acquaintance with a good school they owed their superiority both to their predecessors and to their contemporaries in other parts of Europe. The 14th and 15th centuries were a period of decline; the northern spirit gained a complete ascendancy, and with the exception of the works of Claux Sluter, which may be studied at Dijon, there is little to note before the Renaissance. Germany escaped from the thralldom of Byzantium in the 12th century, but she produced little work in the Gothic

period that is either beautiful or sculpturesque. Not until the 15th century, when Syrlin, Dürer, and Wohlgemut practised wood-carving, is there any notable advance. To Adam Kraft (1430-1507) a feeling of beauty and rhythm was denied. His figures are square and squat, his drapery is arranged after the German method in stiff, hard-cornered folds. The Visscher family—Peter Visscher (1455-1529) was the greatest—made no conspicuous progress. They were still true to the Gothic ideal, and though their best work, such as Peter Visscher's portrait of himself, displays a bluff realism, it was based upon an inartistic convention and possessed no vital inspiration.

In Italy the classical tradition did not die, and such Gothic sculpture as the Italians produced was either of foreign origin or tintured strongly with a feeling of classicism. Niccolò Pisano, who was born in 1205, was a devout student of classical models. In much of his work the two styles were ingeniously blent—in the pulpit at Pisa, for instance—and he was profoundly influenced by Roman sarcophagi. Niccolò's son, Giovanni, followed in his father's steps, and, though still a primitive, conferred fresh glory upon the Pisan school, which the ingenious Orcagna (born 1329) brought to an end. Giacomo della Quercia (born 1374), the author of the celebrated Fonte Gaja at Sienna, marks the transition from the old to the new, from the middle ages to the Renaissance. A student of nature, he only half understood the possibilities of the great revival, but his design for the gate of the baptistery at Florence (1401) was placed next in order after the designs of Ghiberti and Brunelleschi, and therefore he may be said to have heralded the re-birth of art. In Italy, where the Goth had never dominated, the Renaissance was a development rather than a revolution. The spirit had always been the same, and Ghiberti (born 1381), the first master of the new school, may hardly be called an innovator. His famous gates at Florence occupied the larger part of his life. The first was begun in 1403; the second was not finished until 1452. The work is marked by a suavity of line and a certain elegance in individual figures. But it is entirely pictorial; the design is rarely thought out with reference to the necessities and limitations of the art of sculpture, and there is scarce a panel in either gate that is not overcrowded with figures.

In 1386 was born Donatello, by far the greatest sculptor of the 15th century. Endowed richly with the artistic temperament, learned in all the new learning, Donatello was also an indefatigable observer of nature and a master of design. His work is Greek in the best sense; large, simple, and restrained. He did not, like Ghiberti, overstep the limits of his art; he did not, like Michelangelo, a man of far rarer genius, use sculpture to express the passions of a violent brain. Content to aim at perfection in his art, he produced a series of masterpieces, which for feeling of rhythm, sense of proportion, and architectural adaptation may scarce be matched save in the golden age of Athenian sculpture. Simplicity of plane, breadth of style, harmony of line, dignity of pose—these are the qualities which confer everlasting distinction on his St George, his equestrian statue of Gattamelata, and his incomparable reliefs. Michelangelo (1475-1564) has been discussed at length under his own name, and no more need be said of him here than that his gigantic personality has dominated the modern world; that his knowledge of the antique was so profound, his technical mastery so complete, that nothing save restraint was impossible to him; that he produced a series of extraordinary masterpieces in paint and marble;

and that he founded a school which, beggared of his genius, did but exaggerate his more obvious faults. Luca della Robbia, the author of the 'Singing Boys' (1399-1482), is better known as the inventor of the famous Robbia ware than as a sculptor; while Benvenuto Cellini (1500-71), though he modelled the Perseus, is chiefly eminent as goldsmith and swashbuckler. The school of Michelangelo culminated in that most accomplished craftsman and mediocre artist Lorenzo Bernini (1598-1680), whose love of exaggerated forms and fantastic devices rendered his indubitable talent of no avail, though the unbounded influence which he exerted upon his contemporaries easily compassed the triumph of lawlessness and vulgar taste. Meanwhile the influence of the Renaissance was felt throughout Europe. In the 16th century, while Goujon imitated Cellini in France, Torrigiano inspired the English with an admirable taste in decoration, and Adrian de Vries reproduced in Germany the unchastened vigour of Giovanni da Bologna. In the 17th century there followed a universal decadence. Bernini's theatricality bore abundant fruit. Coyzevox, Clodion, Adam, the Coustous, Pigalle, and the rest, in spite of their eminent talent, always suffered from lack of repose and the lust of effect. Yet are they by far the most distinguished sculptors of the 17th century. In England nothing memorable was produced save the still-life of Grinling Gibbons (q.v.; 1648-1721); while Andreas Schlüter (1662-1714) best represents the art as it was pursued in Germany. The flamboyant style lived through the first half of the 18th century. A group of foreigners—Roubiliac, Scheemakers, and Rysbrack—practised their trade in England with a certain success. But the one great artist of the age was a Frenchman, Jean-Antoine Houdon (1741-1828). This distinguished artist, despite his education, avoided on the one hand the dry frigidity of effete classicism, on the other the cheap ingenuity of the imitators of Bernini. A naturalist, he never surrendered the dignity of his art to catch a fleeting resemblance. Above all he was from first to last a sculptor. His modelling is always large and simple; and though in his bust of Glück he attempted to reproduce the texture of a mottled skin, he was justified by the event. He was the greatest portrait-sculptor of his own or indeed of any age; he invented the type of Molière, and the great men of the great age live today as he created them. And then came Canova (1757-1822), who drove sculpture back into an antique channel. Neglecting the achievement of the Renaissance, he revived the Græco-Roman style with an insipid triviality, which has been a law to several generations of industrious workmen. In England Gibson, Macdowell, Chantrey, Wyatt, and a hundred others proceeded from Flaxman and the new classic school. In France Chaudet, Pradier, and Rude (by far the most accomplished of them all) neglected Houdon for Canova. Thorwaldsen, relying upon this false example, built up an amazing reputation, which did not, however, long survive him. A tasteless imitation, an incapacity to observe, a flabby modelling mark out the achievement of the whole school as a warning to sculptors, and serve to prove that salvation never comes by an unthinking adherence to a dead tradition.

The reaction came with the second half of the 19th century. In Alfred Stevens (1817-75), the author of the superb monument to the Duke of Wellington, who added an unflinching sense of decoration to a profound study of Michelangelo, Britain found her greatest sculptor. Alfred Gilbert (b. 1854), whose Piccadilly monument was for some time so grossly neglected, united a fanciful imagination with a cultured interest in metal-work and other arts. The output of this British school was

considerable. The work of Sir T. Brock and Sir Hamo Thornycroft is harmonious and dignified, while that of Alfred Drury and of A. G. Walker tends to decorative effect. Sir G. Frampton specialised in polychrome work, and Onslow Ford in portraiture. Leighton and Watts both did some important sculpture. Pittendrigh Macgillivray founded the Scottish school of sculpture, while the names of the Australian, Mackennal, and the Canadian, Proctor, are worth mentioning. It was in France, however, that the break-away from Italian influence was most apparent. Barye was a brilliant *animalier*, and Carpeaux infused astonishing vitality into the marble; but the greatest name in modern times is, of course, that of Rodin (1840-1917), whose work, eminently Gothic in character and unconventional in treatment, is outstanding for its terrific dynamic power and emphasis. The versatile Antoine Bourdelle has been quoted as the successor of Rodin, and Aristide Maillol came under the influence of Cézanne, but both confine themselves definitely to plastic ideas. Falguère, Dubois, and Bartholomé lean more on tradition, but always stressed the importance of fine modelling, while Dalou had an enormous influence on British art during the seventies and eighties. In the works of the Belgian, Constantin Meunier (1831-1905), the working-classes came into their own, and beauty was found to be present in the commonest phases of human life and action. The 'impressionism' of the Italian, Rosso, probably influenced the Balzac of Rodin. Von Hildebrand (1847-1921), Antokolsky (1845-1902), and Saint Gaudens (1848-1907) were the pioneers in the modern revival of sculpture in Germany, Russia, and the United States respectively. Other prominent late 19th-century sculptors are Vincotte and Lambeaux in Belgium, Trentacoste in Italy, Max Klinger in Germany, von Zumbusch in Austria, and Daniel French and Stirling Calder in the United States; while of those whose work has been done mainly in the 20th century there must be mentioned the Spaniard, José Clara, and the Frenchman, Paul Landowski, who both discard decoration in favour of naturalism; the German, Wilhelm Lehmbruck, with his curious elongated figures; the Serbian, Ivan Meštrović, whose profound and heroic works became largely known during the Great War; the Pole, de Świecinski, whose style has been described as 'hieratic'; and the Englishman, Derwent Wood, the author of many works of great individuality and power. Dobson and Reid Dick each have their own followers; the originality, sometimes very striking, sometimes very ugly, of Jacob Epstein has aroused much controversy; Céline Lepage reverts to Greek principles in identifying sculptured figures with pilasters or columns; while Archipenko applies the principles of cubism to sculpture, usually with very odd results. After the Great War, the erection of numerous memorials in various countries gave an impetus to the production of sculpture. A significant characteristic of the modern work generally has been the predominance of blocks of unhewn marble serving as background, or actually incorporated into the subject of the work. In monumental work, the connection between architecture and sculpture is very close, but proportion of subject-matter and treatment is infinitely more desirable than mere hugeness, and the uncouth has not always necessarily an aesthetic value. Further, it is worth noting that while funerary work, such as that of Bistolfi, is characteristic of Italian work, and portrait busts of Belgian and French, in Germany activity is directed more to the making of fountains, memorials, and town and house adornment. It must be

admitted that, generally speaking, more official recognition and more private encouragement are given to sculpture on the Continent than in Great Britain.

See the articles on various individual sculptors, and the books there cited. See also the general histories by Lübke (trans. 1872) and Short (1907); books on *Ancient Sculpture* by Mitchell (1883), on that of the *Renaissance and Modern Times* by Scott (1886), and on that of *To-day*, by Kington Parkes (1921). For Egyptian sculpture, see EGYPT, and various books by Maspero (1912, &c.). For Greek sculpture, see histories in German by Brunn and Furtwängler, in French by Colignon (1892-97), and in English by Waters (1906); also various books by Gardiner, including his *Handbook* (rev. ed. 1915). There are books on Greek and Roman sculpture by Perry (1882) and von Mach (1905). For Italian sculpture, see various books by Perkins, including his *Handbook* (1883); works by Lord Crawford (1909) and Waters (1911); books on Renaissance work (in Ger.) by Bode (1887), and on Baroque work (in Eng.) by Ricci (1912). See also Spielman, *British Sculptors of To-day* (1901); Bénédict, *Les Sculpteurs français contemporains* (1901); Voge, *Deutsche Bildwerke* (1910); Cloquet, *Les artistes wallons* (1913).

Sculptured Stones, a general name given in Britain to a class of monuments of the early Christian period, many of them being mere unhewn stones, with sculpturings of rude inscriptions, or symbols, or ornamental designs, corresponding in style and patterns to the illuminated decorations of Celtic manuscripts of the Gospels. The rude stones erected for memorial purposes in pagan times (unless under Roman influence) are uninscribed and unornamented (see under STANDING STONES). The sculptured stones of Britain may be divided into two classes—those that are simply incised and those that bear sculpture in relief, the former being the earlier method. Sculptured stones of the incised or earlier class may be subdivided into two sections, inscribed or uninscribed, irrespective of their bearing symbols and ornamentation. The advantage of this division is that the inscribed monuments can be arranged in chronological order by their paleographical characteristics, and the uninscribed examples bearing similar symbols and ornamentation to those found on the inscribed examples will follow the same sequence. We know from paleographical data that the earliest lapidary inscriptions in Britain are in Roman capital letters, and that the minuscules, or small letters, do not make their appearance till about the 6th century. Hence we have a means of dividing the inscribed stones into an earlier and a later group according as they are written in capitals or minuscules, while those that are mixed or partly in capitals and partly in minuscules will represent the middle or transition period. But many of the inscribed monuments bear inscriptions which are written in a character peculiar to the British Isles, and known as Ogam (q.v.). Sometimes the Ogam inscription is associated with an inscription in Roman letters on the same stone, sometimes the monument bears an Ogam inscription only. In the latter case it is frequently associated with sculptured ornamentation in relief of the most advanced type, and therefore we have another means of dividing the inscribed stones into two groups, one of which is demonstrably later than the other. Of these four groups, which are (1) inscribed in Roman capitals only; (2) inscribed in Roman letters and in Ogams, or bilingual and bilateral; (3) inscribed in Ogams only; and (4) inscribed in Roman minuscules or small letters, the first and second have their chief development in Wales, and the third and fourth in Ireland.

Stones of the first group are in general rude undressed pillar-stones or oblong boulders from 4 to

9 feet in height, the inscriptions generally incised vertically. They are always in the Latin language, and usually consist of the name of the deceased, preceded by one or other of the varieties of the distinctively Christian formula 'Hic jacet,' &c. The greater number of these stones are found in association with ancient ecclesiastical sites, and some bear also incised crosses of the earliest known type. A well-known example is the Cat Stane near Kirkliston, west of Edinburgh (fig. 1), which stands in a cemetery of early Christian graves, and bears the inscription, IN [H]OC TIVMVLTO JACIT VETTA F[ILIUS] VICTI. One of a group of three at Kirkmadrine in Wigtownshire commemorates two priests, Viventius and Mavorius, probably of the church founded there by St Ninian in the 5th century. The greater purity of the forms of the letters and the style of the Latin



Fig. 1.—The Cat Stane.

of the inscriptions of this group indicates their closer proximity to the period of the Roman occupation. The characteristic of the second group of inscribed stones is that they bear two inscriptions, one in the Latin language and in Roman letters (capitals as a rule), and the other in the vernacular in Ogam letters, one inscription being always an echo of the other. Two examples will show the general character of their inscriptions. One in Pembrokeshire has, in debased Latin capitals, SAGRAMNI FILI CVNOTAMI, reading from the top of the stone downwards on one face, and on one edge the answering inscription in Ogam letters, SAGRANI MAQI CVNOTAMI, *magi* being the usual form in these inscriptions for son. Another in Carmarthenshire reads in Latin AVITORIA FILIA CVNIGNI, while the answering Ogam has AVITORIGES INIGINA CUNIGNI—*inigina* standing for daughter, and answering to the modern Gaelic *ingen*, as *magi* answers to *mac*. The third group of inscribed monuments, those bearing Ogams only, lies chiefly in Ireland. Many examples are associated with early forms of the cross incised on the same stone. From their nature these Ogam inscriptions are peculiarly difficult to decipher; but when the reading is clear they are usually of the same brief character as the bilingual inscriptions of the group previously described. The fourth group of inscribed monuments comprises those in minuscules or small letters of the Roman alphabet, chiefly in the forms of those letters adopted by the Irish scribes. The largest group in Ireland is in the ancient cemetery of Clonmacnois, where there are over eighty examples, many of which can be dated by the names of the persons commemorated. They are chiefly undressed slabs laid flat on the graves, and incised sometimes with the inscriptions only, sometimes also with crosses, and more rarely with Celtic ornamentation. Of the names which can be identified from the Irish annals four belong to the 7th century, six to the 8th, twenty-eight to the 9th, eighteen to the 10th, and the same number to the 11th century. The earliest bear nothing but the inscriptions and plain crosses. Ornamentation does not begin to be added till the 9th century. In Ireland the inscriptions are usually in the ver-

naacular, with the formula *oroit do* — and its contractions, or *oroit ar anmain* — and its contractions, meaning 'pray for —' or 'pray for the soul of —.' In Wales, however, the inscriptions of this group are usually in Latin. Though the majority of these stones are sepulchral monuments, others have been erected for different purposes, commemorative or terminal, to mark the boundaries of church lands or sanctuaries. In the Anglo-Saxon parts of Britain the inscribed stones bear inscriptions in Anglian runes, and in the Isle of Man and the northern and western isles of Scotland, colonised from Scandinavia, the inscriptions are in Scandinavian runes. The monuments with Anglian runes are chiefly sepulchral slabs of small size, incised with a cross and the name of the deceased. In a few cases, however, they are great commemoration crosses, covered with sculptured ornamentation, and bearing elaborate inscriptions. The finest of these crosses are at Bewcastle (q.v.) in Cumberland and Ruthwell (q.v.) in Dumfriesshire. The shaft only of the Bewcastle cross remains, 14½ feet in height; the Ruthwell cross measures 17½ feet in height. Both are so similar in design and in style of ornamentation that they must be attributed to the same period. Both have long runic inscriptions—that on the Ruthwell cross being associated with a series of inscriptions in Roman capitals descriptive of the scriptural scenes carved on the panels of its two broad faces, while the runes are on the borders of the long panels on the sides of the cross, enclosing scrolls of foliage. They contain twenty-one lines of an Anglo-Saxon poem—'The Dream of the Holy Rood'—which was not known to exist in any other form until a South Anglian version was discovered in a manuscript at Vercelli in 1823, and attributed to Cynewulf, though Professor



Fig. 2.—Sculptured Stone at Nigg.

Stephens of Copenhagen maintained that a line of runes on the top of the cross, now obliterated by exposure, gave the authorship to Caedmon. The inscription on the Bewcastle cross is less legible, and has been read as recording its erection in

honour of Alcfrith, king of Northumbria, in the 7th century, though the opinion is gaining ground that the dates of both these crosses must be placed considerably later than his time.

The monuments included generally under the name of the sculptured stones of Scotland are for the most part uninscribed. But they are profusely decorated (as will be seen from the annexed figure of one of the most ornate, at Nigg in Ross-shire), and their chronological place in the general group of the early Christian monuments of Britain falls to be determined partly from the relations of their general system of ornamentation to that of the illuminations of the Celtic manuscripts of the Gospels of the 7th to the 10th and 11th centuries, and partly by the characteristics of the few inscriptions they do bear. Taken by themselves, they exhibit peculiar characteristics, which show that, although they form part of the general group which is peculiar to the British Isles, they have been affected by strong local influence. They present a peculiar set of symbols, not one of which is known to have occurred beyond the Scottish area, while the special form of the erected cross-bearing slabs, and the partiality to the representation of conventional beasts as part of their decoration, distinguish them from the English, Welsh, and Irish groups. The Scottish sculptured stones, of which over 370 are known, are divided into three varieties: (1) rude undressed pillar-stones or oblong boulders incised with unexplained symbols; (2) erect shaped slabs of headstone form, sculptured generally in relief, with a cross on one face and figure subjects and symbols on the other; and (3) high crosses with figure subjects and Celtic



Fig. 3.—Symbols on the Sculptured Stones of Scotland.

ornamentation similar to those of the cross-bearing slabs, but without the symbols. The rude pillar-stones of the first variety occur chiefly along the eastern side of Scotland from the Firth of Forth to the Orkney and Shetland Isles, being most numerous in the district between the Tay and the Spey. Outlying examples, however, occur as far south as Dumfriesshire and as far west as the outer Hebrides. The unexplained symbols incised on these stones are more easily represented than described. Those of most common occurrence are represented in fig. 3. Some of these are arbitrary symbols, to the development and meaning of which there is no clue. Others—such as the serpent, and the mirror and comb—are representations of existing objects, apparently used with a symbolic meaning. Some of the arbitrary symbols occur also on silver ornaments of the same period. On stones of the second variety, sculptured in relief, and presumably of later date, these symbols are associated with well-known symbols of the Christian faith, such as the cross and the fish, and with the ornamentation so characteristic of the illuminated pages of Celtic manuscripts of the Gospels. The figure subjects on the stones of this variety are partly scriptural and mostly related to the general cycle of early Christian symbolism. Among the scriptural subjects are the Temptation of our First Parents by the Serpent, Daniel in the Den of Lions, the Destruction of

Pharaoh's Host in the Red Sea, the Raising of Lazarus, Jonah disgorged by the Whale, the Virgin and Child, &c. Along with these are hunting scenes, including the chase of the stag, wild boar, &c., and groups of animals evidently taken from the Bestiaries of the early middle ages, a species of natural history spiritualised, in which the characteristics of the various animals, real and fabulous, were set forth as symbolising the spiritual condition of man as related to the scriptural plan of salvation (see **BESTIARY**). Of the third class of sculptured stones, the high crosses, there are but few in Scotland, and they are nearly all characterised by the presence of scriptural subjects. There are no data by which the age of the stones of the first variety, bearing only the incised symbols peculiar to Scotland, can be estimated. But there seems no reason for assigning to them a higher antiquity than that of the inscribed stones of the first and second classes, which seldom bear ornamentation or symbols, except the early form of the cross. The style of the ornamentation of the second variety, sculptured in relief and arranged in panels, is similar to the decoration of the illuminated Celtic manuscripts of the Gospels of the period ranging from the 7th to the 10th century. The third variety, consisting of high crosses with pure Celtic ornamentation, may range from the 10th to the 12th century. This form of monument—a high cross—with local variations and a remarkable development of foliaceous ornamentation common to the recumbent sepulchral slabs of the same district, continued in the West Highlands from the 13th to the 16th century.

See Stuart, *Sculptured Stones of Scotland* (Spalding Club, 1856-67); Westwood, *Lapidarium Wallie* (1879); Stokes, *Christian Inscriptions in Ireland* (1878); Anderson, *Scotland in Early Christian Times* (1881); Romilly Allen, *Early Christian Symbolism* (1887), *Early Christian Monuments of Scotland* (1903), and *Celtic Art* (1904); and *Monumental History of the Early British Church* (1889). See also the article **CUP-MARKINGS**.

Scurf. See **PITYRIASIS**.

Scurvy, or **SCORBUS**, is a disease in which there is great debility of the system at large, with a tendency to congestion, hæmorrhage, &c., in various parts of the body, and especially in the gums. It still breaks out every spring in the northern regions of Russia, following on six months' deprivation of fresh vegetables, sunshine, &c. It has probably existed from the earliest times, but the first distinct account of it is contained in the history of the crusade of Louis IX. in the 13th century against the Saracens of Egypt, during which the French army suffered greatly from it. In the 16th century it prevailed endemically in various parts of the north of Europe, and it seems only to have abated towards the close of the 18th century. It was in badly-fed armies, in besieged cities, and on board ship that its ravages were most appalling, and it is believed that more seamen perished from scurvy alone than from all other causes combined, whether sickness, tempest, or battle. For instance, only 1512 sailors and marines were killed in all the naval battles of the Seven Years' War; but 133,708 died of disease or were missing, and scurvy was the principal disease. Whole crews were prostrated by this scourge, as in the well-known case of Lord Anson's (q.v.) memorable voyage. It is now met with under similar conditions, though cases are comparatively rare (in 1873 only 19 cases were reported to the Board of Trade, in 1881 as many as 99), and also among the lower classes in large towns, navvies engaged in railway work, &c., when they confine their dietary to tea, bread, ham, salt-fish, &c., to the exclusion of fresh vegetables and meat.

The first effect of the disease is generally a decline in the general health, and the patient becomes depressed, is easily fatigued, and has a peculiar sallow complexion. After a variable period the more characteristic symptoms appear, the chief of which are hæmorrhages and sponginess of the gums. The hæmorrhages closely resemble those of *Purpura* (q.v.), and occur into and under the skin, where they give rise to red or purple discolorations which change colour like the marks of bruises; into the muscles and other deeper tissues, where they cause brawny swellings; and into internal organs or cavities. Hæmorrhage also frequently takes place from the mucous membranes of the nose and alimentary canal. The affection of the gums is still more characteristic, and is rarely absent, except in the very young or very old, who are without teeth. The gums are swollen, discoloured, detached from the teeth, and bleed extremely easily, while the breath becomes very fetid. This condition sometimes precedes but often follows the occurrence of hæmorrhage in other situations.

The cause of scurvy is now well known to be an improper dietary, and particularly an insufficient supply of fresh vegetable food. The disease is never known to have occurred in anyone who had eaten freely and habitually of such articles of diet. Even preserved vegetables, if kept in a juicy condition, prevent the occurrence of the disease. In the absence of vegetables abundant fresh meat and in a less degree milk are antiscorbutic. But the most efficient protective if fresh vegetable food is not attainable is fresh lemon or lime juice; and the constant use of these during long voyages prevents the occurrence of scurvy when it would otherwise be inevitable. It is more apt to affect those who are deprived of fresh air and sunlight, are mentally depressed, and have had their health enfeebled by previous disease. In what way the deprivation of fresh vegetables acts on the blood to produce scurvy is as yet unknown. It appears certain, however, that the important factor is the absence of principles known as 'vitamines,' which are found in fresh meat, milk, or vegetables, but which are destroyed by long desiccation or by boiling. See **VITAMINS**.

Although the virtues of lemon-juice in scurvy were known in England as far back as 1636, when John Woodhall, Master in Surgery, published *The Surgeon's Mate, or Military and Domestic Medicine*, this invaluable medicine was not made an essential element of nautical diet till 1795, the author of the change being Sir Gilbert Blane (q.v.). The effect of this official act may be estimated from the following numbers. In 1780 the number of cases of scurvy received into Haslar Hospital (a purely naval hospital) was 1457, while in 1806, as also in 1807, there was only one case. Many naval surgeons of the present day have never seen a case of the disease. The potato possesses almost equally great antiscorbutic properties, and fortunately potatoes when cooked still possess considerable activity. Dr Baly (1814-61), to whom we are indebted for this discovery, states that 'in several prisons the occurrence of scurvy has wholly ceased on the addition of a few pounds of potatoes being made to the weekly dietary.' For the cure, as for the prevention of the disease, the diet is by far the most important agent; lemon, orange, or lime juice should be given freely. Sometimes the condition of the mouth prevents the administration of potatoes and other vegetables; but when possible they should be given freely. Washes of chlorate of potash, tannin, or Condry's fluid should be used for the gums; and rest in bed with tonic treatment is necessary for the muscular and cardiac weakness accompanying the severer cases.

Scurvy-grass (*Cochlearia*), a genus of plants of the family Cruciferae, having small white flowers and many-seeded pouches. They are annual or biennial, rarely perennial plants; of humble growth, with branched smooth stems, smooth simple leaves, and terminal racemes of flowers. They have an acrid, biting taste, containing the same pungent volatile oil which is found in horse-radish, and are valued for their antiscorbutic properties. Common Scurvy-grass (*C. officinalis*) is sometimes a foot high; the root-leaves are stalked and heart-shaped, the pouches globose, ovate, or elliptical. It is a variable plant, and some of the other species described by botanists are probably not essentially different. Scurvy-grass is very common on the shores of Britain, growing both on rocks where there is little soil and in muddy places. It is also found on high mountains. It is a very widely distributed plant, and, being found on the shores of almost all temperate parts of the world, was of great benefit to sailors in times when the modern precautions against scurvy at sea were unknown.

Scutage, or ESCUAGE (Lat. *scutum*, 'shield'), a pecuniary fine or tax sometimes levied by the crown in feudal times as a substitute for the personal service of the vassal.

Scutari (Italian or Levantine form of the Turkish *Usküdar*), (1) a town of Asiatic Turkey, on the eastern shore of the Bosphorus, immediately opposite Constantinople, of which it is considered a suburb. It is built on the slopes of a hill, and bears a great resemblance to Constantinople, though its streets are wider. It contains several handsome mosques, bazaars, and baths, and a college of howling dervishes, and manufactures silks and cotton fabrics and leather goods. It has long been famed for its extensive cemeteries, adorned with magnificent cypresses, the chosen resting-place of many of the Turks of Constantinople from attachment to the sacred soil of Asia. Pop. about 60,000. During the Crimean war the enormous barracks built by Sultan Mahmud on the southern outskirts of the town were occupied as barracks and hospital by the English troops, and formed the scene of Miss Nightingale's labours. On the cliffs bordering the Sea of Marmora stands a marble obelisk marking the site of the densely-filled English burial-ground. A white tower (90 feet high) near the shore, now used as a lighthouse, is known as Leander's Tower (see **HERO**). Scutari occupies the site of the ancient *Chrysopolis*; and about two miles to the south lies the village of Kadiköi, the ancient *Chalcedon*.

(2) A town of Northern Albania, situated at the southern end of the Lake of Scutari, 16 miles from the Adriatic, with which it is connected by the river Bojana. It is overlooked by an old Venetian citadel on a commanding height, has the cathedral of a Catholic archbishop, manufactories of arms and cotton goods, and carries on a considerable trade, especially in wool, skins, and sumach. There is some fishing. Scutari was the scene of much fighting during the Balkan wars and the Great War. Pop. about 32,000.

Scylla and Charybdis, according to the Homeric legend, were two sea-monsters who dwelt on opposite sides of a narrow sea-strait. Scylla possessed twelve feet, six long necks and mouths, each with three rows of sharp teeth, and barked like a dog. Charybdis thrice every day sucked down the water of the sea, and thrice threw it up again; she dwelt under a cliff on which grew a conspicuous fig-tree. Ulysses passed between these voracious monsters, and Scylla snatched six seamen from his ship. There are other versions of the myth. In later times the names were applied to a

couple of 'races' or rapids in the Strait of Messina, Scylla being the one next the Italian shore. From the supposed difficulty of navigating the strait without getting into the one or the other of these dangerous spots arose the proverbial 'To shun Charybdis and fall into Scylla.' But the dangers of these 'races' have been very greatly exaggerated.

Scyphomedusæ. See JELLYFISH.

Scythe. See REAPING.

Scythian Lamb. See BAROMETZ.

Scythians, a nomad race of Asia known to the ancient writers. They were originally either of Mongolian or of Iranian origin—opinion is divided on the subject, but if the latter, certain Uralo-Altaic influences were certainly present. They moved westward and first came into historical prominence in the 7th century B.C., when they dispossessed the Cimmerians of the rule of the Russian steppes, and eventually controlled the vast treeless plain from the Danube to the Volga. It must be clearly understood that the Scythians formed a ruling military caste—only an aristocratic minority of the population, but some of the ancient writers indiscriminately termed Scythians all the tribes living north of the Euxine. The Scythians proper lived mostly in the territory between the rivers Dnieper and Don, kept herds of horses, cattle, and sheep, lived in tent-covered wagons, wore coats, breeches, and boots, fought with bows and arrows on horseback, made drinking-cups of the skulls of their slain enemies, were filthy in their habits, and worshipped without images various gods like those of the Aryan Greeks. In the 7th century B.C. some of the Scythians invaded Media, and were only got rid of after ten years' occupation by Cyaxares making all their chiefs drunk at a banquet, and then slaying them. About the same period (626) certain fair-haired men from the north invaded Palestine and Egypt (see **SCYTHOPOLIS**); these have been identified with the Scythians, and may have been the same as the riders and bowmen of whom the prophet Jeremiah speaks (chaps. iv.-vi.). In 515 Darius (q.v.) crossed the Hellespont and went north over the Danube, probably solely with the intention of making a demonstration of Persian power, so as to be free to carry on his projected conquest of Greece. In the 5th century the Scythians reached their highest power. From the Greek colonies established north of the Euxine, they learnt many of the arts of civilisation (one of their kings, Anacharsis (q.v.), even going to Athens to learn at the feet of Solon); trade followed, and 4th century funerary monuments round the Sea of Azov reveal splendid metal work of both Scythian and Greek design and manufacture. The presence of a stable power on the north of the Euxine (and also partly on the south) contributed greatly to the prosperity of the Greek colonies, but indeed the help was mutual. At this time, however, the far-reaching influence of the Scythians began to lessen owing to pressure from the Thracians on the west and from the Sarmatians on the east, but it was not till the second half of the 3d century B.C. that the latter definitely superseded the Scythians, who henceforth cease to count in European history. The Scythians of Asia, however, after about 128 B.C. overran Parthia (Persia), routed several Parthian armies, and levied tribute from the Parthian kings. They founded also in the east of the empire the kingdom of Sacastane, so that that part of Asia was long known as Indo-Scythia. During the first century before and the first century after Christ hordes of Scythians, having overthrown the Bactrian and Indo-Greek dynasties of Afghanistan and India (125-25 B.C.), invaded Northern India; and there they maintained themselves with

varying fortune for five centuries longer. Their kings were warm supporters of northern Buddhism; indeed an attempt has been made to show that Buddha was of Scythian descent. The Jats of India, and the Rajputs, have both been assigned the same ancestry. Greek influence told strongly on the Scythian conquerors: Greek was even used as the official language of several dynasties in Bactria and the Punjab.

See Rawlinson's and Sayce's editions of Herodotus; Neumann, *Die Hellenen im Skythenlande* (1855); Müllenhoff and Cuno, *Die Skythen* (1871); Fressl, *Skythe Saken* (1886); Mahaffy, *The Great World under Roman Sway* (1890); Minns, *Scythians and Greeks* (1913); Rostovtseff, *Iranians and Greeks in South Russia* (1922); and the article ART.

Scythopolis (*Beth-shean* in the Old Testament, *Bessan* during the Crusades, *Beisan* in modern times), a small town of Palestine, 55 miles NNE. of Jerusalem. It was on the main route from Egypt through Palestine to Damascus and the Euphrates, and 20th century excavation has revealed many important Egyptian remains, notably a great XIXth dynasty temple to Ashtaroah, attributed to Amenophis IV. (probably that referred to in 1 Samuel xxx. 10), standing over an earlier temple, perhaps of Thothmes IV. (XVIIIth dynasty). The fortress eventually fell into the hands of the Philistines, who took Saul's body there after the battle of Gilboa; but strong Minoan influences had been present as early as 1375 B.C. The Greeks called it Scythopolis, but there is not enough evidence to prove any permanent Scythian occupation (see SCYTHIANS). Later, it became the chief city of the Decapolis and an independent town of the Roman empire.

Sea. All primitive peoples appear to have experienced a feeling of dismay when they braved the dangers of the sea. The great majority of the civilised nations of antiquity took but little interest in the physical phenomena of the ocean. The few facts that were known with reference to the sea were limited to maritime nations like the Phœnicians. Among the learned men of antiquity two views were held with reference to the distribution of land and water. The Homeric school—to which Eratosthenes and Strabo belonged—regarded the old world as a single island surrounded by the ocean. The Ptolemaic school, on the other hand, looked on the Atlantic and Indian Oceans as enclosed seas like the Mediterranean, and held that the east and west points of the known world approached so close to each other that a ship sailing from Spain might easily reach the eastern coasts of Asia. This mistaken notion led, fourteen centuries after Ptolemy, to the discovery of America by Columbus. The discoveries of Columbus, Vasco da Gama, and Magellan, during the thirty years from 1492 to 1522, added a hemisphere to the chart of the world. These voyages doubled at a single bound all that was previously known of the surface of the globe, and in a special manner enlarged our knowledge of the sea. Down to the time of the *Challenger* and similar recent scientific expeditions all our knowledge of the sea might, literally speaking, be called superficial; it was limited to the upper layers of oceanic waters and to the shallower depths surrounding continents and islands. Owing to the recent introduction of improved apparatus and methods, the most profound depths of the ocean have been examined with precision and success, so that we now possess a large amount of definite information concerning the physical and biological conditions of all regions of the ocean.

Area.—The waters of the sea cover about 139,000,000 sq. m., or about five-sevenths of the surface of the earth, of which the Pacific occupies about 69 millions, the Atlantic about 41 millions,

and the Indian Ocean about 29 millions of square miles.

Depth.—The solid globe or lithosphere, viewed as to its superficial aspect, may be regarded as divided into two great planes of average level: one of these corresponds to the dry land or upper surface of the continental masses, and occupies about two-sevenths of the earth's surface; the other, corresponding to the abysmal regions of the ocean, is depressed over $2\frac{1}{2}$ miles below the general level of the continental plane, and occupies about four-sevenths of the earth's surface. The transitional area, uniting these two planes, forms the sloping sides or walls of the ocean basins, and occupies about one-seventh of the earth's surface: it is called the area of 'continental slope and continental shelf.' The depressed regions of the globe, represented by the ocean basins, are filled with seawater up to within about 375 fathoms (2250 feet) of the general level of the continents, the average depth of the water in the ocean basins being on the other hand about 2080 fathoms (12,480 feet). Were the solid crust of the earth to be reduced to one uniform level by removing the elevated continental masses into the depressed abysmal areas, the surface of the earth would then be covered by a universal ocean or hydrosphere with a depth of about 2 miles. This depth of 2 miles below sea-level has been called by Dr Mill the mean sphere level. The average depths of the main divisions of the ocean are:

Pacific Ocean	2500 fathoms.	Southern Ocean	2100 fathoms.
Atlantic "	2200 "	Antarctic "	680 "
Indian "	2300 "	Arctic "	630 "

The greatest depth recorded is 5348 fathoms in the North Pacific (1912), near the Philippine Islands; in the Atlantic the greatest depth is 4662 fathoms, near the West Indies; and in the Indian Ocean the greatest depth is 3828 fathoms, near the East Indies. By far the larger portion of the sea-floor lies between the depths of 1000 and 3000 fathoms, equal to nearly 78 per cent., while about $15\frac{1}{2}$ per cent. is found in depths less than 1000 fathoms, and about $6\frac{1}{2}$ per cent. in depths greater than 3000 fathoms. The bulk of water in the whole ocean is estimated at 323,800,000 cubic miles, and it is probable that the volume of water in the ocean has been increasing throughout geological time.

The limited regions of ocean floor which are more than 3000 fathoms in depth are called 'deeps.' There is a remarkable tendency, in all the oceans, for the deeps to be situated on the margins, rather near to the land. In general the oceans are shallower in their central regions than round the margins. Recent geophysical research traces this to a process of warping of the ocean beds which is set up by the secular cooling of the earth's crust.

Temperature.—The temperature of the surface-waters of the ocean varies from 28° F. in the polar regions to 85° or 86° in equatorial regions. In many places the surface-layers are subject to great annual changes due to the seasons and the direction of the wind. The temperature of the water at the bottom of the ocean over the abysmal areas ranges from 32.7° F. to 36.8° F. In some large basins separated from each other by low ridges the temperature may differ to the extent of one or two degrees, but the temperature is apparently constant at any one spot throughout the year. The great mass of the ocean consists of cold water—i.e. of water below 40° or 45° F.; at a depth of little over half a mile the water in the tropics has generally a temperature below 40° F. In the open ocean the temperature usually decreases as the depth increases, the coldest water being found at the bottom. Some temperature observations

immediately over the bottom-deposits appear to indicate a slight rise of temperature. In enclosed or partially enclosed seas, cut off by barriers from the great ocean basins, the temperature remains uniform from the height of the barrier down to the bottom; for instance, in the Mediterranean the temperature is about 56° from 200 fathoms down to 2000 fathoms; in the Sulu Sea, 50·5° from 400 fathoms to 2500 fathoms; in the Celebes Sea, 38·6° from 800 fathoms to the bottom in 2600 fathoms. In regions where there are heavy rains, or where rivers pour fresh water into the sea, alternating layers of colder and warmer water have been observed within a hundred fathoms from the surface.

Circulation.—The circulation of oceanic waters is maintained by the action of the prevailing winds on the surface-layers. In the oceanic areas the prevailing winds are governed by the large anticyclonic areas situated towards the centres of the North and South Atlantic and North and South Pacific. The winds blow out from and around these anticyclonic areas. For instance, in the southern hemisphere the warm salt water of the tropical regions is driven to the south along the eastern coasts of South America, Africa, and Australia, till on reaching a latitude of between 50° and 55° S. it sinks on being cooled, and spreads slowly over the floor of the ocean to the north and south. A similar circulation takes place in the northern hemisphere, although much modified by the peculiar configuration of the land-masses; for instance, the cold salt water at 30° F. which occupies the deeper parts of the Arctic basin is largely made up of the dense Gulf Stream water, which sinks to the bottom on being cooled in the Norwegian Sea. The water evaporated from the sea-surface is borne to the land-masses and condensed on the mountain-slopes. It is estimated that over 6500 cubic miles of this water is returned to the sea by rivers annually, bearing along with it a burden of soluble salts and earthy matters in suspension; in this way the ocean has in all probability become saltier in the course of ages. The saltiest waters are found in the regions of greatest evaporation; for instance, in the Red Sea, Mediterranean, and in the trade-wind regions of the great ocean basins. It has been shown that by the action of off-shore winds cold water is brought up from the deep sea to supply the place of the surface-water carried seawards off the west coast of Africa and America, and off Cape Guardafui on the east coast of Africa; and the absence of coral-reefs off these coasts is believed to be due to the great range and variation in the temperature of the water thus produced. It has been shown that a similar vertical circulation takes place in the lochs of the west of Scotland.

Composition of Sea-water.—It is probable that every element is in solution in sea-water; the great majority are, however, present only in exceedingly minute traces. Sea-water contains about 35 parts per thousand of solid substances altogether, in the proportions shown in the following table:

	Parts per Thousand.	Percentage of Total Solids.
Sodium chloride (NaCl).....	27·213	77·76
Magnesium chloride (MgCl ₂).....	3·807	10·88
Magnesium sulphate (MgSO ₄).....	1·658	4·74
Calcium sulphate (CaSO ₄).....	1·260	3·60
Potassium sulphate (K ₂ SO ₄).....	0·863	2·46
Calcium carbonate (CaCO ₃).....	0·123	0·34
Magnesium bromide (MgBr ₂).....	0·076	0·22
	35·000	100·00

Here the acids and bases are arbitrarily combined, but it is now known that the dissolved substances in sea-water are present mainly as ions,

and it is usual to write the composition of sea-water thus:

	Parts per Thousand.	Percentage of Total Solids.
Na.....	10·722	30·64
Mg.....	1·316	3·76
Ca.....	0·420	1·20
K.....	0·382	1·09
Cl.....	19·324	55·21
SO ₄	2·696	7·70
CO ₃	0·074	0·21
Br.....	0·060	0·19
	35·000	100·00

The total amount of sea-salts may vary greatly in different samples of sea-water, but it has been shown by hundreds of carefully conducted experiments that the ratio of the constituents of sea-salts is very similar in all seas, with one significant exception, that of lime, which is in slightly greater proportion in the water from the deeper parts of the ocean basins. Recent research has shown the very great importance of some substances that exist in sea-water in very small quantities: these are nitrites, nitrates, and ammonia; silica and phosphates. At no time is any one of these substances present in greater abundance than about two parts per million of open sea-water, yet they rule the production of organic substance by marine plant life, and therefore the production also of all marine animal life. Owing to the constant circulation in the ocean, the gases of the atmosphere, which are everywhere absorbed at the surface of the sea, are carried down to the greatest depths, and thus living organisms may flourish throughout the whole extent of the ocean. Nitrogen remains at all times and places nearly constant; not infrequently the proportion of oxygen is much reduced in deep water, owing to the processes of oxidation and respiration. Carbonic acid free or loosely combined is abundant, and plays a most important rôle in the economy of the ocean, combining with and rendering soluble normal carbonates of lime and magnesia to solution in the form of bicarbonates. Water, as is well known, is but slightly compressible, and almost any substance that will fall to the bottom of a tumbler of water will in time fall to the bottom of the deep ocean. Still the compressibility of water must not be neglected in oceanographical questions. In the deeper parts of the ocean the pressure amounts to four or five tons per square inch; hence, in an ocean with a depth of 5 miles, were the action of gravity suddenly to cease, the ocean waters would rise 500 feet above their present level from expansion. There is evidence of very extensive chemical action on some regions of the sea-floor, and it has been suggested that this action is much intensified by the great pressure in the deeper parts of the ocean. It is probable, however, that all the reactions here alluded to may be accounted for by the decomposition of organic substances on the seabed in the presence of the sulphates in sea-water, and the long periods of time to which the materials on the sea-bed have been exposed to the action of sea-water in regions where there is a slow rate of deposition.

Life.—The colour of pure sea-water is a light shade of blue; it has, however, frequently various shades of green and brown, owing to the presence of organisms and matters in suspension. It has been definitely established that life in some of its many forms is universally distributed throughout the ocean. It has long been known that marine plants and animals abound in the shallow waters surrounding continents and islands. Algae dis-

appear from the sea-bed at depths between 100 and 200 fathoms, but a great abundance of animals has been procured in the greater depths. A *Challenger* trawling in a depth of over a mile (1000 fathoms) yielded 200 specimens of living animals belonging to 79 species and 55 genera. A haul in about two miles (1600 fathoms) yielded 200 specimens belonging to 84 species and 75 genera. A trawling in about three miles depth (2600 fathoms) yielded 50 specimens belonging to 27 species and 25 genera, not counting Protozoa. Even in depths of over four miles fishes and animals belonging to all the chief invertebrate groups have been procured. The term 'Benthos' is now used for all the animals and plants which live attached to or creep over the bottom of the ocean, 'Plankton' (q.v.) being the term for all the plants and animals which are carried along by the currents of the ocean, and 'Nekton' for all pelagic animals able to swim against the currents. In the great body of oceanic waters life is most abundant in the surface and sub-surface waters down to about 100 fathoms. Pelagic algae, such as diatoms and oscillatoria, are abundant in this region, and are the principal and original source of food for many pelagic and nearly all deep-sea animals. In the intermediate depths of the ocean life though present is less abundant. Within a few hundred fathoms of the bottom life again becomes more abundant, crustaceans and cuttle-fish being especially numerous. A very large number of the organisms which belong to the pelagic Plankton, such as diatoms, radiolaria, foraminifera, and molluscs, secrete silica or carbonate of lime to form their shells and skeletons: these in falling to the bottom after the death of the organisms make up a large part of the marine deposits in many regions of the ocean.

Deposits.—The explorations of the *Challenger* and other expeditions have resulted in a great extension of our knowledge of marine sediments, especially of those now forming in the deep sea. All marine deposits may be divided into three classes—viz. those made up principally of the debris from the solid land of the globe, laid down in greater or less proximity to the shores of continents and islands, called 'terrigenous' deposits; those made up predominantly of the shells, or skeletons, of marine invertebrates and laid down mainly on sea-bottoms less than about 100 fathoms deep: these are called 'neritic' deposits; and those in which this continental or organic debris is nearly or quite absent, laid down in the abyssal regions of the ocean, called 'pelagic' deposits. Commencing with the former, there are first the littoral and shallow-water deposits, forming around the land-masses from the shore down to a depth of about 100 fathoms, consisting of sands, gravels, and muds derived almost entirely from the disintegration of the neighbouring lands. The littoral deposits, laid down between tide-marks, cover about 63,000 sq. m., and the shallow-water deposits, between low-water mark and 100 fathoms, about 10,000,000 sq. m. Proceeding seawards from an average depth of about 100 fathoms, the deposits gradually change in character, the proportion of land detritus decreasing, while the remains of oceanic organisms increase in abundance, until at a considerable distance from land and in comparatively deep water the terrigenous deposits pass insensibly into truly pelagic deposits. The terrigenous deep-sea deposits—i.e. those formed at depths greater than 100 fathoms—may be briefly summarised as follows:

Blue Mud, the most extensive, is grayish or bluish in colour, with usually a thin reddish upper layer, and is characterised by the presence of fragments of rocks and mineral particles coming from

the disintegration of the land, of which quartz is the principal species; the remains of marine organisms may be present in varying proportions, increasing with depth and distance from the land. Blue mud is found along the coasts of continents and continental islands, and in all enclosed and partially enclosed seas; in some places, as in the Yellow Sea, but notably off the coast of Brazil, the mud may be of a red colour from the large amount of ferruginous matters brought down by the rivers, and it is then called Red Mud. Blue mud is estimated to cover about 14,500,000 sq. m. of the earth's surface. Red mud covers about 100,000 sq. m. off the coast of Brazil.

Green Mud and Sand are similar to the blue muds, but are characterised by the presence of the mineral glauconite in isolated grains or in small concretions; the dead shells of calcareous organisms are usually filled with the glauconite, which gives the green colour to the deposits. The sands occur in the shallower water nearer the coast, and in them the grains are larger than in the muds. These deposits are found usually off high and bold coasts where no very large rivers enter the sea; for instance, off the east coast of Australia, off South Africa, and off the west coast of North America. Green mud and sand cover about 1,000,000 sq. m.

Volcanic Mud and Sand are deposited around the oceanic islands of volcanic origin, and the name is derived from the presence of fragments and particles of volcanic rocks and minerals, which are larger and more numerous nearer the islands, when the deposit is called a sand, becoming smaller and mixed with a larger percentage of pelagic organic remains in the deeper water farther removed from the coast, when the deposit is called a mud. Volcanic mud and sand cover about 750,000 sq. m.

Coral Mud and Sand occur similarly around the oceanic coral islands and off those coasts and islands fringed by coral-reefs, and are characterised by the greater or less abundance of coral fragments from the reefs. The sands are found in the shallower water nearer the reefs, as in the case of the volcanic sands. Coral mud and sand cover about 2,700,000 sq. m.

Of pelagic deposits there are five types, four of organic origin, receiving their designations from the distinctive presence of the remains of calcareous or siliceous organisms, the fifth and most extensive being of inorganic origin.

Globigerina Ooze is so called from the presence of the dead shells of pelagic Foraminifera, those belonging to the genus *Globigerina* predominating, which live in the surface and sub-surface waters of the ocean, being especially abundant in tropical regions, and the shells of which after death fall to the bottom and there accumulate in moderate depths. The percentage of carbonate of lime in the deposit due to these shells and other calcareous fragments varies from 30 to over 90, and there is usually an admixture of minute mineral particles and remains of siliceous organisms. The depth at which *Globigerina* ooze is found varies from less than 500 to over 2500 fathoms, the average depth being about 2000 fathoms; but there is a marked difference between a sample collected in comparatively shallow water near land and one from deep water towards the central regions of the ocean basins, the point of union being the presence of a considerable proportion of carbonate of lime shells. *Globigerina* ooze covers about 49,520,000 sq. m.

One of the facts brought out by oceanographical researches is the gradual disappearance of these calcareous shells from the deposits of the deep sea with increasing depth in regions where they may appear to be equally abundant at the surface. In depths of over 3000 fathoms these shells are rare, and often there is not a trace of carbonate of lime even

in lesser depths, the Globigerina ooze being then replaced by one of the other kinds of pelagic deposits.

Pteropod Ooze resembles Globigerina ooze in all respects, except that there is a greater abundance of the dead shells of pelagic Mollusca, such as Pteropods and Heteropods; it is usually found in lesser depths than the Globigerina ooze. Pteropod ooze covers about 400,000 sq. m., principally in the Atlantic.

The names applied to these oozes are not intended to convey the idea that they are wholly made up of the organisms indicated by the names, or that these organisms form a preponderating proportion, for no deep-sea deposit can be said to be strictly homogeneous. Neither is there a sharp dividing line between the various kinds of deposits; they merge insensibly the one into the other. Often it is difficult to locate a sample, one or other of the names being equally applicable.

Diatom Ooze is distinguished by the presence of numerous remains of siliceous organisms, principally Diatoms, though fragments of siliceous Sponge spicules and Radiolaria and Foraminifera are rarely absent. It is found in the Antarctic and Southern Oceans, with a small area in the north Pacific. Diatom ooze covers about 10,880,000 sq. m.

Radiolarian Ooze in like manner contains a varying proportion of siliceous remains, in this case principally Radiolaria and their fragments. Calcareous organisms and mineral particles are nearly always present in both these oozes, being usually more numerous and the mineral particles larger in the Diatom ooze than in the Radiolarian ooze, which latter generally occurs in greater depths than the former. The *Challenger's* deepest sounding, already mentioned, brought up a typical Radiolarian ooze, and it is found in the deeper water of the central Pacific and Indian Oceans. Radiolarian ooze covers about 2,290,000 sq. m.

Red Clay occupies nearly the whole of the deeper abysses of the ocean, occurring in its most characteristic form in the central regions of the Pacific, far removed from continental land. It is of a reddish or chocolate colour, due to the presence of the oxides of manganese and iron. Fragments of calcareous organisms are sometimes tolerably abundant in the shallower depths, but in a typical red clay there is usually not more than a trace of carbonate of lime. Siliceous remains are generally present, and there is a small proportion of minute mineral particles of volcanic origin, principally derived from disintegrated pumice. Mineral particles of secondary origin, arising from the decomposition of volcanic debris, are associated with the red clay, and in some regions of the central Pacific isolated crystals and spheroidal groups of phillipsite of secondary origin formed *in situ* make up a considerable quantity of the deposit. Concretions of manganese and iron are very characteristic of the red clays, and may be of all sizes, sometimes a large quantity of the size of marbles, and sometimes the size of potatoes, being procured. These concretions are formed around various nuclei, such as sharks' teeth, earbones of whales, and pieces of pumice. The *Challenger* sometimes procured over one thousand sharks' teeth and sixty earbones of whales in a single haul. The presence of the remains of vertebrates, some of them belonging to extinct species lying alongside others belonging to existing species, as well as the formation of manganese nodules and zeolitic crystals *in situ*, and the presence of metallic and chondritic spherules of cosmic origin, appear to indicate that the red clay accumulates at a very slow rate. Red clay covers about 51,500,000 sq. m. Prof. Joly found that deep-sea deposits are much richer in radioactive substances than terrestrial rocks, Red clay and Radiolarian ooze laid down in deep water far

from land containing more than the calcareous oozes and terrigenous deposits.

It is shown now that no geological formations are known that are similar in nature to the oozes lying on the deep ocean beds. The inference is that no abysmal ocean bed has ever been elevated to form dry land. On the other hand, there is evidence that continental land has been submerged and has become abysmal ocean bed.

See the articles in this work on the Arctic, Antarctic, Atlantic, Pacific, and Indian Oceans; those on the Red Sea, Dead Sea, &c.; also CHALLENGER, CORAL, GEOGRAPHY, GEOLOGY, GULF STREAM, PHOSPHORESCENCE, PLANKTON, POLAR EXPLORATION, SAND, SEAWEEDS, SOUNDING, STORMS, TIDE, UPHEAVAL AND SUBSIDENCE, WAVE, WINDS, WRECKS.

THE SOVEREIGNTY OF THE SEA.—Blackstone lays it down that the main or high seas are part of the realm of England, as the Courts of Admiralty have jurisdiction there. But the law of nations, as now understood, recognises no dominion in any one nation over the high seas, which are the highway of all nations, and governed by the public law of the civilised world. Such a right has, however, long been claimed over the four seas surrounding the British Isles. It was strongly asserted by Selden, and denied by Grotius, and measures were taken to vindicate the right in the reign of Charles I. The Dutch claimed the supremacy of the seas in Cromwell's time, but were worsted by Blake (q.v.). Every nation has undoubtedly a right to the exclusive dominion of the sea within a certain distance from the shore, now fixed at three miles. This right of lordship includes the right to free navigation, to fishing, to taking wrecks, the forbidding passage to enemies, the right of flag, of jurisdiction, &c. By the law of England the main sea begins at low-water mark; and between low and high-water mark the common law and admiralty have a divided jurisdiction, one on land when left dry, the other on the water when it is full sea. The right of seal-fishing in the Behring Sea was the subject of lengthened diplomatic controversy and arbitration between the United States and Great Britain (see SEAL). For inshore fishery regulations, see FISHERIES. See further INTERNATIONAL LAW, BLOCKADE, ENEMY, NEUTRALITY, SEASHORE; also RULE OF THE ROAD.

Sea Anemone. See ANEMONE. In like manner for Sea-bream, Sea-otter, &c., see BREAM, OTTER, &c.

Sea-bass, a name applied to some perch-like marine fishes—e.g. *Cynoscion nobilis*, an important food-fish on the western coasts of North America; *Pogonias chromis*, abundant off the coasts of Carolina, Florida, and the Gulf of Mexico; *Centropristis fulvus* and *atrarius*, along the eastern coasts of North America.

Sea-bat (*Platax*), a genus of Teleostean fishes allied to the Pilot-fish, and included among the Carangidae or horse-mackerels. The name refers to the very long dorsal, anal, and ventral fins.

Sea-beaches. See BEACHES.

Sea-bear. See SEAL.

Sea-birds' Preservation. See WILDBIRDS.

Sea-blubber. See JELLY-FISH.

Sea-Buckthorn, or SALLOW-THORN (*Hippophaë*), a genus of the family Elæagnaceæ, consisting of large shrubs or trees with gray silky foliage and entire leaves. They have dioecious flowers: the perianth is tubular, becomes succulent, encloses an acheneum, and forms an acid fruit. *H. rhamnoides* is a large thorny shrub or low tree, a native of parts of the sandy seacoasts of England and the continent of Europe, ranging as far as the Altai Mountains. It is sometimes used for hedges near

the sea, growing luxuriantly where few shrubs will succeed. The berries are orange-coloured, and are



Sea-Buckthorn (*Hippophaë rhamnoides*):

a, branch of the female plant, in fruit; b, branch of male plant, in flower.

gratefully acid. They are used for making fish-sauce, jellies, and condiments in some places.

Seabury, SAMUEL, the first Bishop of Connecticut, was born in that state, at Groton, 30th November 1729, graduated at Yale in 1748, studied medicine for a year at Edinburgh, and received deacon's and priest's orders in England in 1753. For some time he was a missionary of the S. P. G.; in 1757 he was promoted to the 'living' of Jamaica, Long Island, and ten years later to that of Westchester, New York. The Whigs, however, prevented his ministering, and once imprisoned him for six weeks at New Haven. He then removed to New York, where he made his medical knowledge contribute to his support, acted as chaplain of the King's American Regiment, and wrote a series of pamphlets which earned for him the special hostility of the patriots. In 1777 Oxford made him D.D. On 25th March 1783 the clergy of Connecticut met at Woodbury and elected Seabury bishop; and for sixteen months he waited vainly in London for consecration, the archbishops, though personally favourable, being timid and indisposed to move without the sanction of the civil authority. On 14th November 1784 he was consecrated in the upper room of a house at Aberdeen by Bishops Robert Kilgour, Arthur Petrie, and John Skinner, of the Scottish Episcopal Church, whose connection with the state had been severed nearly a century before. Bishop Seabury's jurisdiction embraced (by consent) Rhode Island as well as Connecticut, and he acted also as rector of St James's Church, New London. In 1792 he joined with three bishops of the English succession in consecrating a fifth, Bishop Claggett, through whom every American bishop derives from Seabury and the Scottish Episcopal Church. Seabury's further services included the securing to the episcopate of an increased share in the government of the church, and the restoring of the oblation and invocation to the Communion Office (from the Scottish Office). He died 25th February 1796. See his *Life and Correspondence*, by Dr E. E. Beardsley (Boston, 1881; Lond.

1884); and W. J. Seabury's *Memoir of Bishop Seabury* (1909).

Sea-cat is a name for the Wolf-fish (q.v.) and the Chimæra (q.v.), as Sea-cow is for the Manatee (q.v.) and Rhytina (q.v.). 'Sea Cucumbers' are Holothurians (q.v.); the Sea-eagle is the Osprey (q.v.; and see EAGLE); the Sea-elephant is better called the Elephant-seal (q.v.); and the Sea-fan is a Gorgonia (q.v.).

Seaford, a small and ancient watering-place on the Sussex coast, 3 miles E. of Newhaven by rail. It was a dependency of the Cinque Port of Hastings in the 15th century; and when it was disfranchised in 1832, had long been notorious for electoral corruption. Of late it has grown in size and prosperity. Pop. 7000.

Seaforth, LOCH, an arm of the sea, 14 miles long, on the east side of the island of Lewis-with-Harris (q.v.) in the Hebrides, which long gave the title of Earl (attainted in 1716) to the family of Mackenzie.

Sea-fox. See FOX-SHARK.

Sea-grape (*Ephedra*), a genus of shrubby plants of the Gnetaceæ. They are much-branched switch plants of warm temperate regions, with opposite connate leaves reduced to scales, the stems performing the functions of leaves. The most notable is *E. distachya*, a small shrub inhabiting the Mediterranean coasts, with some remarkable inland stations, and penetrating into Asia. It is believed by some to be the Soma (q.v.) plant. Its sweetish mucilaginous berries, in some pharmacopœias called *Uva maritima*, are eaten by the Russian peasants. In medicine they are regarded as astringent, as are the young tops of the shoots. The family Gnetaceæ, sometimes rather unhappily named Joint-firs, forms by itself an order of Gymnosperms, showing affinities to Angiosperms. The Gnetaceæ are characterised by the occurrence of a perianth in the usually dioecious flowers, the absence of resin and resin ducts, and the presence of vessels in the secondary wood. Otherwise the three genera have little in common. *Welwitschia* is separately treated. *Gnetum* consists of climbing (or sometimes erect) tropical shrubs and small trees, with leathery evergreen opposite leaves resembling those of dicotyledons. The type plant *Gnetum Gnemon* is a dioecious tree of Papua, the Solomon Islands, and the Malay Archipelago. The fruits and young leaves are eaten; the bast serves for nets. The tropical American *G. urens* has stinging hairs.—The name of sea-grapes is also given to the grape-like clusters of eggs laid by *Sepia* and some other cuttle-fish. See also SEASIDE-GRAPE.

Sea-grass, a name for Grasswreck (q.v.).

Seagull. See GULL.

Seaham Harbour, a seaport in the county of Durham, 6 miles S. of Sunderland. Founded in 1828 by the Marquis of Londonderry, it communicates by railway with neighbouring collieries, and has ample docks and quays, besides blast-furnaces, an iron-foundry, and chemical works. Pop. (1851) 3538; (1891) 8856; (1921) 16,957.

Sea-hares are nudibranch Gasteropoda (q.v.). 'Sea-hedgehog' is a Globe-fish (q.v.). The 'Sea-hog' is the Porpoise (q.v.), and 'Sea-horse' is used both of the Hippocampus and of the Walrus.

Sea-holly. See ERYNGO.

Sea Islands, an archipelago of low sandy or marshy islands on the south-east shores of the United States, along the South Carolina coast from Savannah to Charleston, on which—as also on part of the mainland coast strip of Georgia and Florida—rice and the famous long-stapled 'Sea Island' cotton are grown (see COTTON).

Sea-kale (*Crambe maritima*; see CRAMBE), a seashore plant with large roundish leaves, whose blanched sprouts are a favourite esculent. In winter it is forced in dark sheds or pits heated with



Sea-kale
(*Crambe maritima*).

fermenting manure or leaves, or with hot water in pipes. The plants to be treated thus are reared annually from cuttings of the roots or from seed; the latter is sown in March in rows 18 inches asunder, the seed being dropped, three or four together, at 15 inches apart, the seedlings to be thinned to one at each point. The cuttings are dibbled into the ground at the same distances apart, and by liberal cultivation they are quite strong enough to be forced the following winter. Of course the roots are lifted when to be forced in this way, and are thrown away afterwards. When they are to be blanched in the position in which they grow the rows are planted at 3 feet by 2 feet apart, the plants are covered with pots or boxes, which are also covered with leaves, tan, spent hops, or mildly fermenting manure. Plantations treated

in this way last for several years. Darkness is essential to the proper blanching of the sprouts.

Seal (Lat. *sigillum*, Fr. *sceau*), an impression on wax or other soft substance made from a die or matrix of metal, a gem, or some other material. The stamp which yields the impression is sometimes itself called the seal. In Egypt, Mesopotamia, and India seals are of very high antiquity (see GEM, RING). Devices of a variety of sorts were in use at Rome, both by the earlier emperors and private individuals. The emperors, after the time of Constantine, introduced *bullae* or leaden seals, and their use was continued after the fall of the western empire by the popes, who attached them to documents by cords or bands. On the earlier papal seals are monograms of the pope; afterwards the great seal contained the name of the pope in full and a cross between the heads of St Peter and St Paul, while the Papal privy-seal, impressed not on lead but on wax, known as the *Seal of the Fisherman*, represents St Peter fishing. In the 9th and 10th centuries we find Charlemagne, the Byzantine emperors, and the Venetian doges occasionally sealing with gold, and we have an instance as late as the 16th century of a gold seal appended to the treaty of the Field of the Cloth of Gold, between Henry VIII. and Francis I.

The most complete series of royal seals is that of the kings of France, beginning with the Merovingian dynasty. Seals were not much used in England in Anglo-Saxon times, but they came into general use after the Norman Conquest. The earliest regular great seal is that of Edward the Confessor, modelled on the contemporary French



Great Seal of William the Conqueror.

pattern. On the royal great seals was the king in armour on a caparisoned horse galloping, his arms being shown on his shield after the period when arms came into use; and the reverse represented the king seated on a throne. The great seals of Scotland begin with Duncan II. in the end of the 11th century, and have also for subject the king on horseback; the counterseal, with the seated figure, being used first by Alexander I., and the earliest appearance of the arms of Scotland being on the seal of Alexander II. In both countries there were also the privy-seals with the royal arms only.

Ecclesiastical seals first appear in the 9th century, and attained great beauty in the 13th and 14th. They are of the pointed oval form known as *Vesica piscis*, and have for subjects a figure of the bishop, sometimes of the Trinity, the Virgin, or a

patron saint, seated under an elaborate architectural canopy. The arms of the bishop are often added.

Under the Norman monarchs of England sealing became a legal formality necessary to the authentication of a deed; and from the 13th century onwards the seals of all persons of noble or gentle birth represented their armorial ensigns. The seal was generally appended to the document by passing a strip of parchment or a cord through a slit in its lower edge; and the ends being held together, the wax was pressed or moulded round them a short distance from the extremity, and the matrix impressed on it. Occasionally the seal was not pendent, but the wax was spread on the deed. The coloured wax with the impression was sometimes imbedded in a mass of white wax forming a protective border to it. In England a seal is still an

essential to all legal instruments by which real estate is conveyed; but since subscription has also become necessary the practice of sealing has degenerated into a mere formality. The custom was gradually introduced of covering the wax with white paper, on which the impression was made, and latterly wafers have been considered a sufficient substitute for seals. In Scotland, where sealing is not now required (see DEED), every freeholder was obliged by statutes of Robert III. and James I. to have his seal of arms; and among the Scottish armorial seals of the 14th and 15th centuries are some of wonderful beauty of execution. In most of the states of the American union neither wax, wafer, nor anything corresponding to a seal is required for deeds.

The use of corporate seals by towns and boroughs dates as far back as the 12th century. The earlier corporate seals bear the town gates, city walls, or some similar device; the use of corporate arms did not begin till the later half of the 14th century. The study of mediæval seals is of great importance and interest in connection with many branches of archaeology, including heraldic and genealogical investigations. Seals are still customarily appended to various kinds of formal and official documents, ecclesiastical, academic, masonic, &c.

The *Great Seal*, the specific emblem of sovereignty, is appended only to the most important class of public documents, such as writs for summoning parliament, treaties, and official acts of state. A new one is made for each new sovereign (or on occasion of a change of arms or style), the old one being solemnly broken. The original custodian of the English seal was the Lord Chancellor (q.v.), but by-and-by the seal was frequently put into the charge of a special official called the Lord Keeper (q.v.). Since 1757 the Chancellor is the only keeper of the Great Seal; though the seal may be put into Commission, and entrusted for the time to Lords Commissioners. It was long a rule that the Great Seal should not be used for any document without prior authority under the Privy-seal (see below). When in 1642 the Lord Keeper (Littleton) joined Charles I. at York, he carried the Great Seal with him; whereupon the parliament (illegally, no doubt) ordered a new one to be made. Charles II. had one made for himself after his father's death. James II. on his flight threw the Great Seal into the Thames opposite Lambeth, but it was soon recovered. At the union with Scotland it was provided there should be only one Great Seal for Great Britain; but a seal is provided to be used in Scotland for grants concerning offices, commissions, and private rights in that kingdom only. This seal is commonly called, for brevity, the Great Seal of Scotland, and is now held *ex officio* by the Secretary of State for Scotland. No special provision was made after the union with Ireland.

The *Privy-seal* is the seal appended to grants which are afterwards to pass the Great Seal, and to documents of minor importance which do not require the Great Seal. The officer who has the custody of the Privy-seal was at one time called the Keeper, and afterwards the Lord Privy-seal. The Lord Privy-seal is now the fifth great officer of state, and has generally a seat in the cabinet. His office is conferred under the Great Seal during pleasure. Since the reign of Henry VIII. the Privy-seal has been the warrant of the legality of grants from the crown, and the authority for the Lord Chancellor to affix the Great Seal. Such grants are styled letters-patent, and the office of the Lord Privy-seal is one of the departments through which they must pass to secure their validity. Until recently all letters-patent for the grant of appointments to office under the crown,

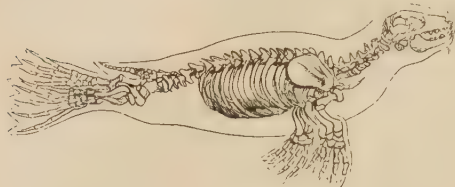
of patents of invention, charters, naturalisations, pensions, creation of honours, pardons, &c. required to pass from the Signet Office to the Privy-seal Office, in the form of Signet bills, verified by the Signet Seal and superscription; and on the Privy-seal being attached to them they were forwarded to the Lord Chancellor, by whom the patents were completed in the office of the Great Seal. By the Act 47 and 48 Vict. chap. 30, it is now unnecessary for any instrument to be passed under the Privy-seal, a warrant under the royal sign-manual duly countersigned being sufficient authority for passing any instrument under the Great Seal. There is a Privy-seal in Scotland, which is used to authenticate royal grants of personal or assignable rights. Rights such as a subject would transmit by assignation are transmitted by the sovereign under the Privy-seal. The Quarter Seal, known also as the Testimonial of the Great Seal, pertains to the Director of Chancery; the Signet is mainly used in initiating proceedings in the Supreme Court; and there are various Seals of Court.

See also BULL, GEM, RING, DEED; Wyon, *Great Seals of England* (1888); Birch, *Scottish Seals* (1905-7); Bloom, *English Seals* (1906); Armstrong, *Irish Seal-matrices* (1913); and books (in Ger.) by Ewald (1914) and (in Eng.) by Kingsford (1920).

Seal, the name commonly applied to all the Pinnipedia except the Morse or Walrus (q.v.). The Pinnipedia have many of the essential characters of the Carnivora (dogs, cats, lions, bears, &c.), in which order they are, therefore, classified. They may accordingly be described as carnivorous mammals adapted to a marine existence. They are not, however, so completely marine as the Cetacea, but pass part of their lives and perform certain functions—viz. the reproductive—on shores or on ice-fields. The structural peculiarities of the Pinnipedia are the following: The brain-case is smooth and rounded, the face small and short. The supraorbital processes are largely developed. The external ear is wanting altogether or very small. The skin is well covered with hair, which takes the form of fur in some species. The limbs are modified to form paddles for swimming, but still are capable of use in climbing out of the water and moving somewhat clumsily on land. The upper divisions of the limbs are shorter than the lower, and do not project beyond the skin of the body. There are five toes on each limb, and all are united together by strong webs extending to the extremities. The inner toe of the fore-foot is largest, the rest gradually decreasing, while in the hind-foot the inner and outer toes are both very long, and the intermediate ones somewhat shorter. The nails are straight, and may be reduced in number or wanting. The incisor teeth are pointed, and vary in number in the different genera. The molars and premolars are similar, and have not more than two fangs. There is a short, small tail, which is united beyond its middle to the hind-legs by the skin. The toes, particularly those of the hind-feet, are capable of being spread out very widely in swimming, so as to give great propulsive power.

The movements of seals in the water are very rapid and graceful; on land they are very peculiar, even the fore-feet in the Phocidæ being little used, but the body contracted by an upward bending of the spine, and so thrown forward by a succession of jerks; in which way, however, a seal makes its escape very rapidly from an assailant. The flexibility of the spine in seals is very remarkable, and depends on the very large intervertebral cartilages, formed of fibrous concentric rings. The muscles, which are connected with the spine on all sides, are of great strength. Seals have a remarkable

habit of swallowing large stones, for which no probable reason has yet been conjectured. Their stomachs are very often found to be in part filled with stones. The stomach is quite simple; the



Skeleton of Seal, with outline of the figure.

gullet (*œsophagus*) enters it at the left extremity; the cæcum is short, the intestinal canal long.

The respiration of seals is extremely slow, about two minutes intervening between one breath and another, when the animal is on land and in full activity. A seal has been known to remain twenty-five minutes under water. Their slowness of respiration, and power of suspending it for a considerable time, is of great use, as enabling them to pursue their prey under water. The fur of seals is very smooth, and abundantly lubricated with an oily secretion. There is in some species an inner coating of rich fur, through which grow long hairs, forming an outer covering. Another adaptation to aquatic life and cold climates appears in a layer of fat immediately under the skin—from which *Seal Oil* is obtained—serving not only for support when food is scarce, but for protection from cold, and at the same time rendering the whole body lighter. The nostrils are capable of being readily and completely closed, and are so whilst the seal is under water; and there is a similar provision for the ears; whilst the eye, which is large, exhibits remarkable peculiarities, supposed to be intended for its adaptation to use both in air and water. The face is provided with strong whiskers, connected at their base with large nerves. Seals produce their young only once a year; sometimes one, sometimes two, at a birth. Not long after their birth the young are conducted by the mother into the sea. Many of the species are polygamous. Terrible fights occur among the males.

Seals are very much on their guard against the approach of man where they have been much molested; but where they have been subjected to no molestation they are far from being shy, and approach very close to boats or to men on shore,



Common Seal (*P. vitulina*); attitude when swimming.

as if animated by curiosity. They are much affected by musical sounds. A flute is said to attract seals to a boat, where they have not learned caution from sore experience; and the ringing of the church bell at Hoy, in Orkney, has very often caused the appearance of numerous seals in the

little bay. Seals possess all the five senses in great perfection. The common seal and some of the other species are very intelligent; but there is considerable difference in this respect among the species. The common seal and some others have often been tamed, and are capable of living long in domestication if freely supplied with water. They become very familiar with those who attend to them, are very fond of caresses and of notice, recognise their name like dogs, and readily learn many little tricks, of which advantage has been taken for exhibitions.

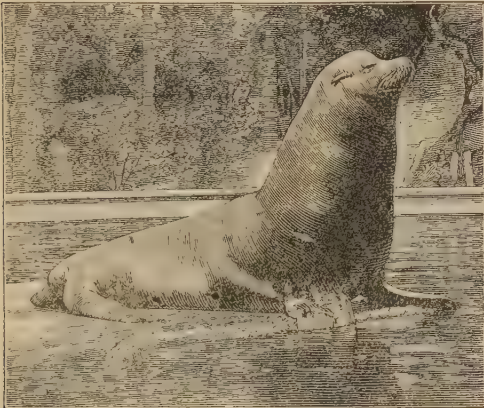
Seals, excluding the walrus, are divided into the two families Phocidæ, which have no external ears, and Otariidæ, which possess distinct though small representatives of these organs. The Otariidæ are, however, considered by modern specialists to be more closely related to the Walrus (*Trichecidæ*) than to the Phocidæ, notwithstanding the great tusks and peculiar dentition of the former. The Otariidæ, like the walrus, are capable of standing on all four legs, the hind-limbs being turned forward in walking on land, while in the Phocidæ the hind-limbs are trailed behind both on shore and in the water, and cannot be used to support the body when the animal is on land. The Earless Seals are supposed to be monogamous, and, excepting the Sea-elephant (or ELEPHANT-SEAL), exhibit little difference in size between the sexes. They bring forth their young on shore or on ice-floes, but do not resort to special breeding-places nor remain for any length of time out of the water. The Eared Seals (the Otariidæ), on the other hand, are polygamous, and resort with invariable regularity to particular breeding-grounds, where they remain for months till the calves are able to travel; then they all depart and become pelagic for the rest of the year. The males are much larger than the females. The Common Seal (*Phoca* or *Callocephalus vitulina*) occurs on British coasts, and extends southward to the Mediterranean. It is common on the north-western shores of Europe and eastward along the arctic shores. It is very common in Greenland and on the arctic shores of North America, its southern limit on the western side of the Atlantic being New Jersey. On the east side of the Pacific it extends from southern California to Behring Strait, and probably occurs also on the western shores of the North Pacific. This species is always found on shores and not on ice-floes. It is hunted in Newfoundland and Greenland for its skins, which are much valued, though the covering is hair, not fur, and for its oil and flesh; but its numbers are not very great. The Harp-seal (*P. grœnlandica*), so called from a crescent-shaped



Harp-seal (*Phoca grœnlandica*).

dark stripe on each side of the back in the adult, ranges through the arctic regions of the Atlantic, and is said to occur also in the North Pacific, in Kamchatka. It is very abundant in Newfoundland and Greenland, and numerous on the arctic coasts

of Europe—e.g. Finmark, Spitsbergen, and Novaya Zemlya. This species is very gregarious, and breeds on ice-floes in spring. Enormous numbers are killed for the sake of their oil and skins. The Harp-seal has been taken on British coasts. It grows to 8 or 9 feet in length, but its ordinary length is about 6 feet. The Bearded Seal (*Phoca barbata*) is another species of the North Atlantic which occurs on British coasts; it reaches 9 or 10 feet in length. The Ringed Seal (*P. hispida*) also occurs as a straggler on British shores but normally lives on the arctic shores of both hemispheres. It is not of great commercial value, but is highly prized by the Greenlanders and Eskimos, who depend largely on its skin, oil, and flesh. It is a small species. Seals occur in large numbers in the Caspian and Aral Seas, where they are regularly hunted by the Cossacks. The species of this region is distinguished under the name *P. caspica*. Another species, *P. siberica*, occurs in Lake Baikal, which consists of perfectly fresh water, and is situated at a great elevation above sea-level. *Halichærus grypus*, the Gray Seal, is confined to the coasts of Europe, occurring on the shores of Scandinavia, Ireland, and Scotland; it reaches a length of 8 feet. In Denmark, after about 1890, an effort was made to exterminate the seals, in the interests of the fisheries, and a



Sea-lion (*Otaria stelleri*).

(From a Photograph by Gambier Bolton, F.Z.S.)

reward of three kroner per head paid for all killed (810 in the first ten months).

The distribution of the Phocidæ extends to the tropics. *Monachus albiventer*, called the Monk Seal, inhabits the shores of the Mediterranean, and of Africa as far south as Madeira. Another species of the same genus, *M. tropicalis*, exists in the West Indies, where it was formerly abundant, though now rare. *Cystophora cristata*, the Crested or Hooded Seal, has a remarkable dorsal dilatation of the nose, which can be inflated with air or depressed as the animal pleases; when distended, it extends backwards towards the top of the head. This species has the same geographical range as the Greenland or Harp Seal, but is not so numerous or so highly valued. Allied to the Crested Seal is the great Sea-elephant, which owes its name to its size and to the elongation of its nose, which forms a short curved proboscis. The males of this species reach a length of 20 feet, while the females never much exceed 10 feet. The Sea-elephant or Elephant-seal (q.v.; *Macrorhinus leonina*) lives on the antarctic islands and ice-fields, and is hunted for its blubber and skin. Another species of Sea-elephant (*M. angustirostris*) occurs in the northern hemisphere, having been formerly abundant on the

coasts of California and western Mexico; it is now scarce. Other species of Phocidæ in the antarctic regions called Sea-leopards, are *Stenorhynchus leptonyx* and *Leptonyx weddellii*.

The second family of Pinnipedia, the Otariidæ, are frequently distinguished as Sea-lions and Sea-bears, names corresponding to differences in their hairy covering; the former carry only long coarse hair, while the latter have in addition a short and soft, delicate fur, beyond which the coarse hairs project. It is this fur which, under the name of seal-skin, is so highly valued in commerce. Sea-lions are sometimes distinguished as hair-seals, and Sea-bears as fur-seals; but the name hair-seals would apply equally well to all the Phocidæ also.

The Otariidæ are about equally represented in the arctic and antarctic regions. By Dr J. E. Gray a large number of genera were distinguished, but recent students of the species unite them under one or two genera. The Sea-lions are as follows: *Eumetopias (Otaria) stelleri*, the Northern Sea-lion, inhabits both shores of the Northern Pacific from California and Japan northwards, and breeds on the Aleutian and other islands in the Behring Sea. The male is about 16 to 18 feet in length, and the female about half that size. *Otaria jubata*, the southern Sea-lion, inhabits the west coast of South America, the islands in the neighbourhood of Cape Horn, and the Falkland Islands. *Zalophus gillespii*, the Californian Sea-lion, is considerably smaller than *E. stelleri*.

Of the Fur-seals there are two genera, one belonging to the northern hemisphere, *Callorhinus*, the other to the southern, *Arctocephalus*. Of the former there is but one species, the celebrated northern Fur-seal, *Callorhinus ursinus*, which during 1885-92 became the subject of such complicated diplomatic controversy between the United States, the British Empire, and European nations. This seal is entirely confined to the North Pacific, no fur-seal existing in the North Atlantic. The habits of the northern fur-seal were first thoroughly investigated by H. W. Elliott, an American naturalist. This species (with three sub-species) breeds annually on two of the Pribylov Islands in the Behring Sea, and on two of the Commander Islands farther west, and on Robben Island south of Sakhalin. The seals arrive on these islands in June and July, the males in the former month, the females in the latter, and they leave them with their young about the middle of September, not returning till the following year. During the breeding time they remain on the low-lying land bordering the sea. In 1870, after the transfer of Alaska from Russia to the United States, the Pribylov Islands were leased by the United States government to the Alaska Commercial Company for twenty years, and this company also rented the Commander Islands from Russia. The company were allowed to take not more than 100,000 seals from the Pribylov Islands per annum, and the seals killed were exclusively young males, not breeding males or any females. The company paid to the government \$50,000 per annum as rent, and in addition a tax of \$2 on each skin shipped from the islands. The value of fur-seal skins shipped from the territory and sold in the London market during the first twenty-three years of American occupation is reported to have reached nearly \$33,000,000. In 1890 a new lease of the islands under similar conditions was granted to the North American Fur-sealing Company. In the earlier part of the year the vast herds of these seals, on their way to the breeding-grounds, pass the coast of Washington and British Columbia, and were there hunted at sea in former times by the Indians. But British, American, and Japanese hunters killed very large numbers there and in Behring

Sea; and the attempt of the United States government to assume exclusive rights over the Behring Sea gave rise to diplomatic controversy. Meanwhile, after 1880, the killing of the seals in the ocean developed to such an extent that it was feared the careful regulation of the slaughter on the breeding islands would not be sufficient to prevent the extermination of the species. Between 1882, when systematic pelagic sealing began, and 1910 the available numbers were calculated to have been reduced from 2,000,000 to 185,000. A settlement arrived at in 1893 between the countries concerned somewhat restricted pelagic seal-taking. And the Pelagic Sealing Conference between Britain and Canada, Russia, the United States, and Japan resulted in 1911 in an arrangement by which pelagic sealing was prohibited, Canada and Japan each receiving 15 per cent. of the skins killed on the Russian and United States rookeries on shore. It was hoped thus to restore the balance between the sexes, and prevent the fighting that goes on between the males for the possession of the females. Pelagic sealing destroyed the females on their way to and from the feeding grounds, and the death of every female meant the death of two cubs, one on the rookery and one unborn. The males used to have from ten to a hundred females each, but the destructive methods of unregulated pelagic sealing have made the numbers of the sexes about equal.

Of the important Antarctic seals, *Arctocephalus nigrescens* may be said to belong to the South Pacific, though it extends also into the South Atlantic. At the beginning of the 19th century this species was abundant on nearly all the islands off the west coast of South America from Cape Horn to the equator, and was killed in large numbers at Juan Fernández, Más-a-Fuera, St Felix, St Ambrose Islands, and the Galápagos. It was also abundant at the South Shetlands, Falkland Islands, South Georgia, Sandwich Group, Kerguelen, and Heard Island. Fur-seals were also formerly abundant on islands off the west coast of Africa from the Cape of Good Hope northward. The seal in this region has been distinguished as a separate species under the name *Arctocephalus pusilla*. It is almost extinct at the present day. Fur-seals were also abundant formerly on Stewart's Island, Antipodes Island, and others to the south-east of New Zealand, but are now scarce. The skins of the fur-seal were at first imported into England for tanning, the wool and hair being scraped off together. It was in 1796 that Thomas Chapman invented a method for 'extracting by the root the whole of the inconceivable quantity of coarse hair that grows intermingled amongst the fur on the skin of the South Sea seal.'

Sealed Orders, in the Navy, are orders which are delivered to the commanding officer of a ship or squadron sealed up and only to be opened after the ship or squadron has put to sea, and proceeded to a certain locality previously designated. When it is considered necessary to despatch a ship or squadron on any secret service, in order to prevent the destination and the object of the expedition becoming known the commanding officer is sent to sea under sealed orders. These orders may be sent direct from the Admiralty, or may be given by any senior officer. The officer who has to act under them is generally directed to proceed a certain distance out to sea, or to a certain latitude and longitude, before he breaks the seal and acquaints himself with the orders in question; he himself equally with others under his command thus putting to sea in ignorance of his destination or the nature of the service to be performed.

Sea-lemon. See DORIS.

Sealing-wax. Before the composition of

ordinary sealing-wax was known in Europe coloured beeswax was used for sealing letters and for attaching the impressions of seals to documents. Sealing-wax with Lac (q.v.) as the principal ingredient was probably first made in India or China, since it is only in these and neighbouring countries that the lac insect is found. Beckmann states that the use of sealing-wax made of lac was apparently very common among the Portuguese about the middle of the 16th century. The best red sealing-wax consists of shellac from 5 to 6 parts, Venice turpentine 3 to 4 parts, vermilion 3 to 4 parts, to which is frequently added $1\frac{1}{2}$ part of magnesia, chalk, or gypsum, or a mixture of some of these. Inferior but still fairly good kinds have a considerably less amount of shellac and vermilion in their composition. Parcel-wax is made of shellac 3 parts, common resin 7 parts, turpentine $5\frac{1}{2}$ parts, chalk and gypsum together $3\frac{1}{2}$ parts, and either vermilion 3 parts, or red-lead 6 parts. Bottle-wax is often made of pine-resin, turpentine, chalk, and some colouring matter; but it is very brittle unless about 10 per cent. of shellac is added.

In making sealing-wax the shellac and other materials are carefully melted in metal pans, and quickly stirred to prevent heavy colouring matter such as vermilion from falling to the bottom. The melted sealing-wax is then poured into metal moulds to form it into sticks, which are removed when cold. By one method the sticks are polished by spreading them on a table and passing a red-hot bar of iron over them. Another way is to hold them into a stove, and in either case till the surface just begins to melt. Sealing-wax is made in various colours, the finer qualities, however, being most largely in red. White, used to be chiefly coloured by subnitrate of bismuth, but a special kind of white-lead is now employed. Black is made by the addition of lampblack or vine-black to the other materials. For brown, umber is added; for blue, artificial ultramarine or Berlin blue; for green, Berlin blue and chrome-yellow; for yellow, either chrome-yellow (which will not stand a high heat) or ochre. For common wax some cheaper colouring materials are used, such as baryta for a white. Aniline colours have been tried with some promise of success.

Sea-lion. See SEAL.

Seal Islands, a name for Lobos Islands (q.v.).

Sealkote. See SIALKOT.

Seaman, SIR OWEN, poet and parodist, was born in 1861, and was educated at Shrewsbury and Clare College, Cambridge. He taught at Rossall, was professor of Literature (1890) at the College of Science, Newcastle-on-Tyne, began writing for *Punch* in 1894, joined the staff in 1897, became editor in 1906, and was knighted in 1914. Collections of brilliant parodies, *Horace at Cambridge* (1894), *Tillers of the Land* (1895), *In Cap and Bells* (1899), *Salvage* (1908), &c., rank him as a worthy successor to Calverley, while *Made in England* (1916) and *From the Home Front* (1918) comprise some stirring verses written during the Great War.

Sea-margins. See BEACHES.

Sea-mat (*Flustra*), a very common genus of Polyzoa (q.v.), various species of which are among the commonest objects in the wrack of the seashore. The colonies are somewhat seaweed-like, but all over the flat leaf-like growth may be seen the minute chambers in which the individuals lived. The texture is horny, whence another common name—hornwrack. Those found on shore are usually dead, having been torn from their natural moorings on rocks, seaweed, shells, and the like. Fresh specimens have a characteristic musky odour.

Seamen are technically those persons, below the rank of officer, who are employed in navigating decked vessels on the high seas. See CRIMP, DESERTION, NAVY.

Sea-mew. See GULL.

Sea-milkwort. See GLAUX.

Sea-mouse (*Aphrodite*), a genus of *Chætopod* worms, well represented by *A. aculeata*, the common British species. This worm has a compact oval body, 4 to 6 inches in length by 1 to 2 in breadth, and is thickly covered with silky hairs, whose structure is such as to produce brilliant iridescence. Along the back these hairs form a matted feltwork, protecting a double row of flat plates, in part respiratory. The ventral appendages, by means of which the sea-mouse creeps along the floor of the sea, bear bundles of very strong bristles. The head bears tentacles and eyes. Internally the animal is remarkable on account of the very much branched character of the gut. The home of the sea-mouse is at the bottom of fairly deep water, but storms often throw them ashore.



Sea-mouse
(*Aphrodite aculeata*).

Sea-nettle. See ACALEPHÆ.

Sea-owl, a name for the Lumpsucker (q.v.).

Sea-pen, a name sometimes applied to *Pennatula* (q.v.), sometimes to the chitinous, quill-like structure which lies along the posterior surface of the squid and some related cuttle-fish.

Sea-pie. See OYSTER-CATCHER.

Sea-pike (*Centropomus undecimalis*), an edible American fish, occurring on the Florida and Texas coasts. The genus includes several somewhat pike-like fishes, at home in the warm American seas, though often thriving in fresh water. In reality they are allied to the perches, not to the pikes. On British coasts the term sea-pike is sometimes applied to the garfish or gar-pike (*Belone*); and gar-pike is also a name for the American *Lepidosteus*.

Sea-pink. See THRIFT.

Sea-porcupine. See DIODON.

Search-warrant, an authority granted to an officer of police, empowering him to enter premises and to search for and seize property. In England such warrants seem to have been illegal at common law; they were first permitted by statute for seizing stolen goods in 1782. Under acts now in force a justice of the peace may grant warrants to search for stolen goods, false coin, forged bank-notes, &c.; he may give a warrant to search any place where there is reasonable cause to suspect that an explosive substance or machine is concealed for a felonious purpose; he may also give a warrant to search any place where there is reasonable cause to suspect that any child or young person is being ill-treated or neglected, or any place where a woman or girl is being unlawfully detained for immoral purposes.

The right of searching ships on the high seas indisputably belongs to belligerents (see ENEMY, CONTRABAND OF WAR, NEUTRALITY). The right claimed by England to search United States ships for British subjects on board, with a view to

impress them into the British naval service, was one of the causes of war in 1812; and the right of search for slaves on board suspected slave-traders was repeatedly a source of difficulty. The case of the *Trent* (see TRENT AFFAIR) in 1861 nearly led to war between Britain and the United States.

The proper officers have a right to search the persons of apprehended thieves, &c.; and custom-house officers are entitled to search for smuggled goods, not merely ships but all persons on board them or who land from them. But any person may insist, before being searched, on being taken before a magistrate or superior custom-house officer and raise the question whether there is reasonable suspicion that he has smuggled goods about him.

Sea-robin, a common American name for fishes of the genus *Prionotus*, which represents in America the European gurnards (*Trigla*).

Sea-scorpion. See FATHER-LASHER.

Sea-serpent, the name given to gigantic animals, presumably of serpentine form, which have been frequently described by sailors and others, and which are believed by many naturalists to exist in the sea-depths, especially in tropical oceans. The question of the existence of a sea-serpent has long formed one of the knotty problems of zoological science. But it seems reasonable to conclude that there exists a certain basis for the supposition that huge undescribed marine forms do exist in the sea-depths, and that the most reliable tales of sea-serpents take origin from appearances of such animals. Of such tales possessing a warrantable basis of fact, and emanating from authoritative sources, that of Captain M'Quhae is one of the best known. This account was published in 1848. Captain M'Quhae commanded H.M.S. *Dædalus*, and encountered the serpentine form in 24° 44' S. lat. and 9° 20' E. long., and therefore in the South Atlantic Ocean, near the Tropic of Capricorn, and not very far from the coast of Africa. It was not, as in other cases, in bright and fine weather, but in dark and cloudy weather, and with a long ocean swell. The animal was swimming rapidly, and with its head and neck above water. Captain M'Quhae in his report to the Admiralty describes it with confidence as 'an enormous serpent, with head and shoulders kept about 4 feet constantly above the surface of the sea;' and he adds: 'As nearly as we could approximate by comparing it with the length of what our maintopsail-yard would show in the water, there was at the very least 60 feet of the animal *à fleur d'eau*, no portion of which was, to our perception, used in propelling it through the water, either by vertical or horizontal undulation. It passed rapidly, but so close under our lee-quarter that had it been a man of my acquaintance I should have easily recognised his features with the naked eye; and it did not, either in approaching the ship or after it had passed our wake, deviate in the slightest degree from its course to the south-west, which it held on at the pace of from 12 to 15 miles per hour, apparently on some determined purpose. The diameter of the serpent was about 15 or 16 inches behind the head, which was without any doubt that of a snake; and it was never during the twenty minutes that it continued in sight of our glasses once below the surface of the water; its colour a dark brown, with yellowish white about the throat. It had no fins, but something like the mane of a horse, or rather a bunch of seaweed, washed about its back.' Regret has been very naturally expressed that Captain M'Quhae did not bestow a shot on it. Figures prepared from a sketch by him were published in the *Illustrated London News* of 28th October 1848. About the

same time the testimony of another witness, Lieutenant Drummond, appeared, and was found to differ in some important points from the account of the animal given by Captain M'Quhae and the figures published with his approbation, particularly in ascribing a more elongated form to the head, in the mention of a back-fin, whereas Captain M'Quhae expressly says that no fins were seen, and in a lower estimate of the length of the portion of the animal visible. Lieutenant Drummond's words are: 'The appearance of its head, which with the back-fin was the only portion of the animal visible, was long, pointed, and flattened at the top, perhaps 10 feet in length; the upper jaw projecting considerably; the fin was perhaps 20 feet in the rear of the head, and visible occasionally; the captain also asserted that he saw the tail, or another fin about the same distance behind it; the upper part of the head and shoulders appeared of a dark-brown colour, and beneath the under jaw a brownish white. It pursued a steady and undeviating course, keeping its head horizontal with the water, and in rather a raised position, disappearing occasionally beneath a wave for a very brief interval, and not apparently for the purposes of respiration. It was going at the rate of perhaps from 12 to 14 miles an hour, and when nearest was perhaps 100 yards distant. In fact, it gave one quite the idea of a large snake or eel.' Lieutenant Drummond's account is the more worthy of regard, as it is derived from his log-book, and so gives the exact impressions of the hour, whilst Captain M'Quhae's was written from memory after his arrival in England. Sir Richard Owen thought the animal was a gigantic seal; a supposition, however, which does not at all agree with the description given.

In 1875 a battle between a sea-serpent and a whale was viewed from the deck of the *Pauline* of London, Captain Drevar, when proceeding with a cargo of coals from Shields to Zanzibar. When the *Pauline* reached the region of the trade-winds and equatorial currents she was carried out of her course, and after a severe storm found herself off Cape San Roque, where several sperm-whales were seen playing about her. While the crew were watching them they suddenly beheld a sight that filled every man on board with terror. Starting straight from the bosom of the deep, a gigantic serpent rose and wound itself twice in two mighty coils round the largest of the whales, which it proceeded to crush in genuine boa-constrictor fashion. In vain did the hapless whale struggle, lash the water into foam, and even bellow, for all its efforts were as nothing against the supernatural powers of its dreadful adversary; whose strength may be further imagined from the fact that the ribs of the ill-fated cetacean were distinctly heard cracking one after the other with a report like that of a small cannon.

Of no less a ship than H.M. yacht *Osborne* the captain and officers in June 1877 forwarded an official report to the Admiralty containing an account of a sea-serpent's appearance off the coast of Sicily on the 2d of that month. 'The time was five o'clock in the afternoon. The sea was exceptionally smooth, and the officers were provided with good telescopes. The monster had a smooth skin, devoid of scales, a bullet-shaped head, and a face like an alligator. It was of immense length, and along the back was a ridge of fins about fifteen feet in length and six feet apart. It moved slowly, and was seen by all the ship's officers.' This account was further supplemented by a sketch from the pencil of Lieutenant W. P. Hynes of the *Osborne*, who to the above description adds that the fins were of irregular height, and about 40 feet in extent; but, 'as we were passing through

the water at 10½ knots, I could only get a view of it "end on." It was about 15 or 20 feet broad at the shoulders, with flappers or fins that seemed to have a semi-revolving motion. 'From the top of the head to the part of the back where it became immersed I should consider about 50 feet, and that seemed about a third of the whole length. All this part was smooth, resembling a seal.' These instances are but examples of the many cases in which narratives of the most circumstantial character have been recorded regarding the appearance of serpentine animals, usually in tropical seas.

As will readily be admitted, the chief point at issue is that of the zoological determination of the forms reported to have been seen. Gigantic cuttle-fishes, now proved to have a veritable existence, might in many cases imitate an elongated marine form, swimming near the surface of the sea. It is by far the most plausible theory of sea-serpent existence to suppose that most of the animals described are really giant cuttle-fishes of the *Loligo* or squid type. These creatures may attain a length of 40 feet or more inclusive of their tentacles, and as they swim along the surface of the sea backwards the tail-fin might well be mistaken for a serpentine head and its fin or ridge, while the tentacles and wash produced by the animal's movements would impart an exaggerated length to the body. Even the incident already described in the case of the *Pauline* might be explicable on the theory that giant cuttle-fishes attacked the whales, and that the so-called serpents were really the arms or tentacles of the squids. As regards the *Pauline* case, it may be remarked that the latitude in which the incident occurred was one most unlikely for any sea-snakes to be found. Certain fishes, too, such as the Basking Shark (*Selache maxima*), would also under certain circumstances appear as unusual marine forms; and, as Dr Andrew Wilson pointed out, the well-known Tape-fishes (*Gymnetrus banksii*) and other Ribbon-fishes would very accurately reproduce the features of a marine snake, especially when these fishes, as sometimes happens, have grown to an immense size. The marine snakes or Hydrophidæ of the Indian Ocean would also serve to personate the 'great unknown' if unusually large. It seems certain that in the immense development of ordinary marine animals may be found a probable clue to the sea-serpent mystery. P. H. Gosse entertained the notion that it might be possible to explain certain sea-serpent stories on the theory that some of the gigantic marine reptiles with whose fossils we are well acquainted might still be in existence in the sea-depths, and occasionally make their appearance at the surface of the ocean. Cases of mere serpentine appearances assumed by certain animals are not to be confused with cases in which a single animal has presented a serpentine aspect. Flocks of the birds known as shags swimming close to the water's edge might personate a sea-serpent swimming along the top of the water; but a flock of birds would have been readily detected by Captain M'Quhae, and by many other observers who have beheld the unknown form from a relatively near distance.

Apart altogether from these historical or semi-historical examples, the sea-serpent has had continuous existence in folklore everywhere, whether among the Eskimo, Fijians, Japanese, Icelanders, Basques, Red Indians, or Chinese. The notion is natural and easy of belief, and the human desire for wonders is sufficient to account for any belief.

See C. Gould, *Mythical Monsters* (1886); F. S. Bassett, *Legends and Superstitions of the Sea* (Chicago, 1886); J. Gibson, *Monsters of the Sea* (1886); an article in Dr Wilson's *Leisure-time Studies* (1884); and Oudemans, *The Great Sea-Serpent* (1893).

Seashore, or land bordering on the sea, belongs partly to the crown, and the public have certain rights in relation thereto. The soil or property in the foreshore (land between high and low water mark) is vested in the crown, and the limit on the land side is defined to be the medium line of high-water of all the tides in the course of the year, or the height of the medium tides in each quarter of a lunar revolution during the whole year. But though the crown is *primâ facie* the owner of the seashore, the owner of the adjoining manor has sometimes a grant of it, and he may prove this grant by ancient use—such as gathering seaweed, &c. The public have a right to walk on that part of the shore vested in the crown, but they have no right to trespass on the adjacent lands in order to get at the shore, so that it is only where a highway leads to the shore, or the public land from seaward, that the right can be made available. Thus it has been decided that the public have no legal right to trespass on the adjoining lands in order to get to the shore for the purpose of bathing. The public have a right to fish on the seashore if they get legal access to it, and may take all floating fish, but not oysters or mussels which adhere to the rock, if the soil belongs to an individual. The public have no right to gather seaweed or shells, though, as regards the latter, it is of so little consequence that nobody prevents them. Nor have fishermen a right to go on that part of the seashore which is private property to dig sand for ballast, or to dry their nets, or similar purposes, though in a few cases local customs permitting a limited class of persons (e.g. the fishermen of a township) to exercise such rights have been held valid. In Scotland the right to the seashore is also vested in the crown; when a crown grant gives land bounded by the seashore, this is held to give to the grantee the foreshore also.

See BEACHES, DENUDATION, DERELICT, DRIFT, SAND, UPEHAVAL AND SUBSIDENCE.

Sea-sickness is a variety of vomiting deserving of special notice. It is often preceded by premonitory symptoms, which appear almost immediately after a susceptible person is exposed to the motion of rolling water in a vessel or boat, and are as distressing as the vomiting itself. Amongst these symptoms may be mentioned vertigo and headache, with a peculiar feeling of sinking and distress about the pit of the stomach. Vomiting, however, in general, soon comes on, accompanied with convulsive heaving of the stomach, and such an indescribable feeling of prostration as to render the patient utterly regardless of what is going on around him, and almost indifferent to life. Moreover, pallor and cold sweat are commonly present, with disturbance of the action of the bowels, usually constipation, but occasionally diarrhœa. The susceptibility to this troublesome affection varies extremely in different persons. Some never suffer from it, others only on their first voyage, and others, again, like Nelson, in every fresh voyage they take; with some it continues but a few hours, while others suffer almost continuously throughout a long voyage. In the great majority of cases the sickness disappears in a few days, unless the weather be very boisterous. It almost always ceases on landing, although more or less giddiness may prevail for some hours. Though a very distressing malady it is rarely serious, but sometimes is so severe and prolonged as to prove fatal. Infants and aged persons are supposed to possess a comparative immunity from sea-sickness, while as a general rule women suffer more than men. According to one writer on the subject, persons with a strong heart and a slow pulse suffer little from sea-sickness, while irritable people, with a quick pulse and a tendency to palpitation, are more

liable to be affected; and he thus accounts for different liability of different nations to this affection; 'for, as a rule, the French and Italians being of a more irritable temper suffer most from the disorder, the Germans less, and the English least.'

The primary cause (or rather condition) of sea-sickness is the motion of the ship; and the *pitching* of a vessel, or alternate rising and falling of the bow and stern, is especially apt to produce it. It is less felt in large and heavily ballasted vessels, because the movements referred to are least perceptible in them. Other more or less regularly repeated oscillatory movements produce a precisely similar condition in some people; the motion of a swing or a toboggan in particular. Some suffer in a railway journey, especially when sitting with the back to the engine; while a few individuals are so intensely susceptible that even a short drive in a carriage or omnibus is enough to induce nausea and vomiting.

The mode in which such causes produce sea-sickness has been much discussed; but it is now generally believed to be by a reflex disturbance of the nervous system, induced by the unusual and violent stimulation of the sensory organs concerned in the maintenance of the equilibrium of the body, particularly the semicircular canals (see EAR) and the eyes, and also of the viscera, particularly the stomach. This is not inconsistent with the view of Dr Chapman, who gave much attention to the subject, and held that the motions of the vessel cause the accumulation of an undue amount of 'blood in the nervous centres along the back, and especially in those segments of the spinal cord related to the stomach, and the muscles concerned in vomiting.' He accordingly believed that the only scientific and really effective remedy for this disorder must be one which has the power of lessening the amount of blood in the whole of the nervous centres along the back, and this can be done by lowering the temperature of the spinal region by the local application of ice. For a description of Dr Chapman's 'spinal ice-bags' and for the method of applying them, we must refer to his work *On Sea-sickness* (1864). They have undoubtedly proved of great value in many cases. Another method of treatment which is less difficult to employ and sometimes gives good results in tiding over the tendency to sickness on a short but rough voyage, is to make the sufferer breathe deeply and regularly, timing the respirations by the watch at about fifteen to the minute.

Those who are susceptible to this distressing affection and have not the opportunity of trying the ice-bags, may, at all events, diminish the severity of the vomiting by assuming, and as long as possible retaining, the horizontal position as nearly as possible in the centre of the ship's movement, and keeping the eyes closed. Compression of the abdomen by means of a broad tight belt sometimes gives relief. Fresh air and light diet are undoubtedly of great importance. A little arrow-root, flavoured with brandy or sherry, is usually a kind of food that will most easily remain on the stomach, when the severity of the symptoms is abating. Aerated water or sparkling wine, e.g. champagne, is also soothing to the stomach. The maintenance of the surface temperature, by warm blankets and hot bottles, and the application of a mustard poultice to the epigastrium are often useful. Sucking small lumps of ice also tends to diminish the tendency to vomiting. As soon as possible the sufferer should go on deck, and try to move about; if this can be done the nervous system undoubtedly becomes more quickly accustomed to the unwonted conditions under which it is placed.

With regard to drugs, no specific has been discovered, nor is it likely that there ever will be. But something can often be done by medication both before and during a voyage. First in importance are purgatives. The bowels should be freely relieved the day before the voyage begins, and should never be allowed to become constipated. The administration of a bitter tonic, together with avoidance of food either in great quantity or of irritating nature for a few days before starting, is also useful; and regular doses of the bromides, commenced just before going on board, sometimes diminish the intensity of the malady. When it has set in, chloroform (a few drops on a piece of sugar), opium, chloral may do good; and cocaine, nitrite of amyl, nitroglycerine, phenacetin, or antipyrin have all been strongly recommended. But with all such remedies disappointment is only too common.

See Dr T. Dutton, *Sea-sickness* (2d ed. 1891); and a small monograph by Rosenbach (Berlin, 1891).

Seaside Grape (*Coccoloba uvifera*), a small tree of the family *Polygonaceæ*, a native of the West Indies. It grows on the seacoasts, and receives its name from the bunches of its violet-coloured fleshy calyx enveloping the nuts or seeds. The fleshy part is pleasantly acid, and is eaten with or without sugar; it is esteemed astringent and antidiysenteric; is used in making refreshing drinks. The extract of the wood is extremely astringent, and is sometimes called Jamaica Kino. The wood itself is heavy, hard, durable, beautifully veined, and capable of taking a fine polish.

Sea Slug. See *HOLOTHURIANS*.

Sea-snakes (*Hydrophidæ*), very venomous marine snakes, inhabiting the tropical parts of the Indian and Pacific Oceans, especially about the East Indian Archipelago, and between China and Australia. The body is compressed behind, and the tail is often markedly paddle-shaped; the ventral scales are very slightly if at all specialised; the nostrils are valved, and lie on the tip of the snout; the eyes are small, and most of the sea-snakes are very blind and helpless when taken out of the water; the fangs are like those of cobras, and the venom is very virulent. The sea-snakes feed on fishes, which they kill almost instantly with their poison and swallow head foremost. They are themselves preyed upon by sharks and rays. They not unfrequently attain a length of eight feet, but are not large enough to be mistaken for 'sea-serpents.' All are viviparous, and some bring forth their young among the shore rocks. Among the common forms are species of *Hydrophis* and the yellow-bellied *Pelamys bicolor*, while the genus *Platurus* is in several ways half-way between the typical *Hydrophidæ* and the terrestrial *Elapidæ*.

Seasons. In the article *EARTH* the motions of the earth on which the changes of the seasons ultimately depend are explained. The chief cause of the greater heat of summer and cold of winter is that the rays of the sun fall more obliquely on the earth's surface in the latter season than in the former (see *CLIMATE*). Another concurrent cause is the greater length of the day in summer, and of the night in winter. Within the tropics the sun's rays have at no time so much obliquity as to make one part of the year very sensibly colder than another. But the zone of equatorial calms in which rainfall is practically continuous is shifted northward when the sun moves northward in the northern summer, and is similarly shifted southward in the southern summer. As the wet-zone swings to and fro, following the sun, the regions it traverses experience alternate wet and dry seasons. Those regions lying near the mean position of the wet-zone have thus two wet and two dry seasons in the

year, the regions near its extreme positions having one wet and one dry season. Wet and dry seasons are also produced by the Monsoons (q.v.), themselves due to the relative seasonal change of temperature between land and sea (see also *RAIN*). In the temperate regions of the globe the year is naturally divided into four seasons—*Spring, Summer, Autumn, and Winter*. In the arctic and antarctic regions spring and autumn are very brief, and the natural division of the year is simply into summer and winter, the winter being long, and the summer short; and this is very much the case also in regions of the temperate zones lying near the arctic and antarctic circles. In subtropical regions the distinction of four seasons is, in like manner, very imperfectly marked. Conventionally (as in almanacs) it is assumed that each season commences at the equinox or solstice—e.g. that in the northern hemisphere spring commences at the vernal equinox about March 20, and summer at the summer solstice on June 21, although this is popularly spoken of as 'Midsummer Day'; and the 'summer months' in common English parlance include May, June, and July, winter being November, December, and January, and spring and autumn accordingly. Practically our division of the seasons depends more on seedtime and harvest than on the extremes of annual heat and cold. The greatest heat of summer is reached a considerable time after the summer solstice, the period when the sun's rays are most nearly vertical, and the day is longest. The greatest cold of winter in like manner occurs after the winter solstice—the period when the day is shortest, and the sun's rays are most oblique. The reason in the former case is that as summer advances the earth itself becomes more heated by the continued action of the sun's rays; in the latter, that it retains a portion of the heat which it has imbibed during summer, just as the warmest part of the day is somewhat after mid-day, and the coldest part of the night is towards morning. The four seasons of temperate regions are distinguished by the phenomena of plant-life, such as the budding, blossoming, fruit-bearing, and leafless repose of deciduous trees. Associated with these annual changes there are modifications of structure and function adapted to the seasonal variation of climate in different localities. Similar habits of Hibernation (q.v.) or of change in the thickness and colour of fur or feathers are found in the animals of regions where the seasons are sharply contrasted in climate. The intellectual superiority of the races inhabiting temperate regions is in part traceable to the constant necessity for forethought in providing for the regularly recurring season of winter when natural resources cease to be available.

Sea-spider. See *PYCNOGONIDA*; and for the Spider-crab, see *CRAB*.

Sea-squirt, a popular name for any of the *Ascidians* (q.v.); also called *Sea-pear*, &c.

Sea-surgeons (*Aconuridæ*), a family of spiny-rayed Teleostean fishes, living in tropical seas, especially near coral-reefs. The name refers especially to the members of the genus *Acanthurus*—characterised by a lancet-like spine which lies ensheathed on each side of the tail, but can be erected as a formidable weapon.

Sea-swallow. See *TERN*.

Seathwaite, a valley and hamlet at the head of Borrowdale (q.v.) in Cumberland, remarkable for its heavy rainfall. See *RAIN*.

Sea-trout, a popular name for various species of the genus *Salmo*, but especially for the common *Salmo trutta* (see *SALMON*).

Seattle (pron. *Se-at'tel*), capital of King county, Washington, and the largest city in the state, is on Elliott Bay, an arm of Puget Sound, 18 miles by rail N. of Tacoma. It has a fine situation; the residence streets run up the slope of a hill, with the business portion built on the level ground at the foot, stretching along the excellent harbour, with its many wharves. There are important shipping connections with Asia and Alaska. Seattle owes its prodigious growth to the huge development of the state lumber trade, of which it is the chief seat, and to the abundance of cheap water-power. It now takes a leading place, too, as a grain port, from which the wheat of Washington, Idaho, and Montana is shipped. Shipbuilding and fisheries are also carried on, and there are manufactories of iron and steel. There is a large Sound trade, especially in fish and coal. Seattle is the seat of Washington University (1861). In 1889 a terrible fire destroyed most of the business portion of the city. Pop. (1880) 3533; (1890) 42,837; (1900) 80,671; (1910) 237,194; (1920) 315,312.

Sea-unicorn. See NARWHAL.

Sea-urchins (*Echinoidea*), a class of Echinoderms. In the more typical genera, such as *Echinus*, the body is symmetrical and nearly globular; others, such as *Spatangus*, are heart-shaped; and others, such as *Clypeaster*, are shield-shaped and flattened. In all cases the body is walled in by continuous plates of lime, which, though capable of independent growth, are rigidly connected, except in *Echinothuridae*, which have plastic shells, as the extinct *Palæo-echinoidea* seem also to have had.

In a typical sea-urchin, such as *Echinus esculentus* or *Strongylocentrotus lividus*, the body is a

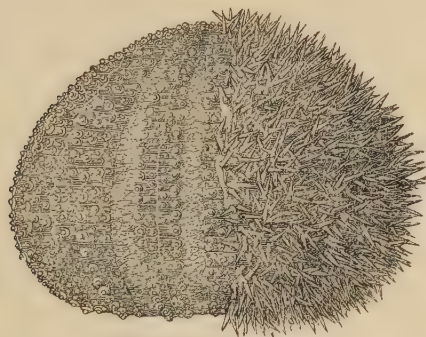


Fig. 1.—Common Sea-urchin (*Echinus esculentus*), one-half with spines removed.

slightly flattened sphere, covered with movable spines. The food-canal begins in the middle of the lower surface, and ends at the opposite pole in the middle of an 'apical disc,' which consists of a central plate surrounded by five 'ocular' and five 'genital' plates. Through each 'ocular' a sensitive 'tube-foot' projects; the 'genitals' bear the openings of the genital ducts, but one of the five is modified as a madreporic plate through which fluid enters and leaves the water-vascular system. From pole to pole extend ten meridians—each a double row of calcareous plates which fit one another firmly. Five of these meridians—in line with the ocular plates—are known as ambulacral areas, for through holes in their plates the locomotor tube-feet are extruded; the other five meridians, alternating with the former and in line with the genital plates, are called inter-ambulacral areas, and bear spines, not tube-feet. The bases of the spines fit over ball-like knobs, on which they are moved by muscles. There are also two peculiarly

modified forms of spines—the minute pedicellariæ, with three snapping-blades mounted on a soft stalk, and small globular sphaeridia which seem to be of use in balancing or equilibration. The pedicellariæ have been seen removing pieces of seaweed and the like from the surface of the shell. In front of the mouth project the tips of five teeth which work against one another, grasping and grinding small particles. They are fixed in five large sockets, and along with fifteen other pieces form 'Aristotle's lantern,' a complex, somewhat lantern-like masticating mill, of which Aristotle took notice. The lantern also helps greatly in locomotion and in the mechanism of respiration.

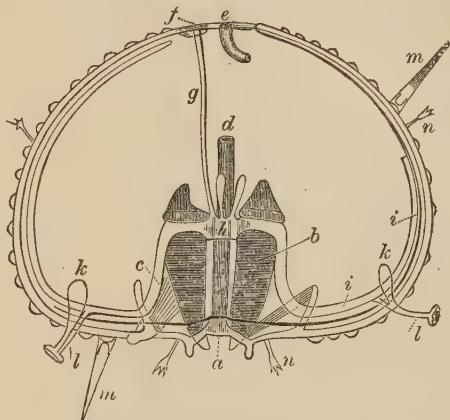


Fig. 2.—Diagram showing the Anatomy of Sea-urchin (after Huxley):

a, mouth; b, teeth of Aristotle's lantern; c, muscles which work the lantern; d, food-canal; e, end of food-canal; f, madreporic plate; g, stone-canal; h, circular water-vessel; i, radial water-vessel; k, ampulla; l, tube-foot; m, spine; n, pedicellaria.

The limy skeleton is formed in the mesoderm, and outside of it there is a delicate ciliated ectoderm with a network of nerve-fibres and some ganglion cells. Inside the shell, lining the spacious body-cavity, there is again ciliated epithelium.

The nervous system consists of a ring around the mouth, with a radial branch up each ambulacral area, and of the superficial network. The alimentary canal passes through Aristotle's lantern, coils round the inside of the shell, and ends in the apical disc. The body-cavity contains a fluid with floating brown cells apparently of some significance in respiration.

The water-vascular system is of use in locomotion, and perhaps also in excretion. From the apical madreporic plate a 'stone-canal' extends through the body to a circular vessel round the upper end of the lantern; this circular vessel gives off five radial vessels, from which the tube-feet are supplied. When filled with fluid the tube-feet become tense and are pressed against the surface of the rock; when the fluid flows back they adhere firmly, and the sea-urchin drags itself towards the attachment. There is a blood-vascular system, but it is difficult to trace. Respiration seems to be discharged in part by the body-cavity fluid, in part by ten hollow outgrowths on the area round about the mouth.

The sexes are separate and resemble one another. The reproductive organs are five spongy masses lying beneath the apical disc. The eggs are fertilised externally by spermatozoa wafted from another sea-urchin; and the free-swimming larva out of which the adult develops, as in other Echinoderms, by a remarkable indirect metamorphosis, is called a Pluteus, and has a quaint form, a little suggestive of a many-legged painter's easel.

A few sea-urchins—e.g. *Hemiaster*—carry their young about with them among their spines.

Most sea-urchins live off rocky coasts; not a few shelter themselves in holes in the rocks; many deep-sea forms are known. Most are very sluggish, moving slowly by means of their tube-feet, in some cases slightly helped by their spines, in other cases perhaps hindered. They feed in part on seaweeds, mostly on organisms and organic matter found in mud and other deposits. Many look as if they were falling victims to their constitutional tendency towards the deposition of lime, for there is hardly any part of the body which may not become limy, and in some of the flattened forms the body-cavity is much restricted by cross beams of lime.

ARTIFICIAL PARTHENOGENESIS. The ova of sea-urchins (as well as those of starfishes, some worms and molluscs, frogs, &c.) have been much used by Loeb, Delage, and others in experiments on artificial parthenogenesis. It is found that development may be induced without any fertilisation by a spermatozoon. Thus if the eggs of the sea-urchin be placed in sea-water to which has been added a little formic, acetic, or butyric acid, and after a few minutes be transferred to ordinary sea-water, they develop normally and form free-swimming larvæ. In some other animals this aspermic development has been induced by many chemical reagents as well as by mechanical, electrical, and other stimuli. Thus frog's eggs will develop into tadpoles after being pricked in a platinum needle, especially if the needle has been previously dipped in frog's blood. (See Loeb, *Artificial Parthenogenesis and Fertilisation*, Chicago, 1913.)

The Echinoids include three main orders—(1) the Endocyclia or Regular Urchins, (2) the flattened Clypeastroidea or Cake-Urchins, and (3) the more or less oval Spatangoida or Heart-Urchins.

The ovaries of *Echinus esculentus* are sometimes eaten, but otherwise the sea-urchins hardly come into touch with human life. See MacBride in *The Cambridge Natural History*, vol. i. (1906).

Seaweeds, a general and popular term applied to a vast collection of lower plant-forms growing on the seacoast from high-water mark (or a little above that limit) to a depth of from 50 to 100 fathoms (rarely deeper), and all belonging to the sub-class of the Thallophyta, to which the name *Algae* has been given (see *ALGÆ*). Any detailed treatment of the organisms included under the term would be impossible within the limits of a short article like the present. It must suffice, on the one hand, to indicate the chief variations in structure and life-history of typical representatives, and on the other to refer briefly to the more important points in the distribution and classification of the group. The short bibliography appended will supply a guide to the very extensive literature of the subject.

An examination of an average shore-belt exposed at ebb-tide reveals the fact that this area may be roughly divided into four regions: (a) a zone at and above high-water mark, characterised by the predominance of filamentous and encrusting, often inconspicuous, forms, exhibiting a bluish-green colour when examined under the microscope; (b) a zone from near high-water mark to half-tide level, occupied chiefly by *algæ* of a bright grass-green tint; (c) from half-tide level to low-tide mark, where the majority of the plants are olive-brown in colour; and finally (d) from near low-water mark to depths never exposed by the lowest ebb, where the preponderance of forms are of a distinctly red colour. Although not a few shores exhibit these zones fairly clearly, it must be remembered that, owing to the nature of the shore, the character of the tides, and the absence or presence of large

influxes of fresh water, the zoning is not always clearly defined. For instance, the uppermost zone of blue-green forms is most likely to be met with on low-lying coast-lines where the seashore proper merges gradually into brackish marshes and muddy pools, such as, for example, the estuaries of the Dee and Mersey, or of the Clyde near Dumbarton. Grass-green forms are most plentiful on shelving rocky shores; whilst on such steep rocky shores as those of the fjords of the west coast of Scotland olive-brown seaweeds form the prevailing vegetation right up to high-water mark. It must be also borne in mind that certain species of *algæ* are invariably found in regions of the littoral area not characteristically occupied by the majority of forms of a similar hue. Thus the common dwarf species, *Pelvetia canaliculata*, closely allied to the familiar bladder-wrack (*Fucus vesiculosus*), belongs to the olive division of seaweeds, and yet is invariably found at or even above high-water mark. Tangle (*Laminaria digitata*), also an olive seaweed, is, on the other hand, a deep-water form only exposed at low tides, whilst the genus *Struvea*, one of the pure-green *algæ*, may be dredged from 30 fathoms. Very many red *algæ* are found under cover of the olive forms between tide marks, whilst some have their habitat at or above high-water mark. For example, two species of the genus *Rhodochorton* form a crimson velvety pile on rocks from half-tide level to far above high-water mark, and another small dark purple form, *Catenella opuntia*, grows on the lee side of rocks which are seldom touched by the flood-tide.

It is worthy of note that the classification of seaweeds into four groups according to colour is strikingly supported by the morphology and life-history of the forms so brought together. This fact becomes all the more remarkable when it is remembered that colour among higher plants is in very few cases of even specific value in classification. The blue-green *algæ* are known as Cyanophyceæ, the pure-green as Chlorophyceæ, the olive as Phæophyceæ, and the red as Rhodophyceæ. (By some authors the lower members of the first two groups are classed together under the name of Protophyceæ; by others the Cyanophyceæ are excluded entirely from *Algæ* and regarded as more closely related to the Schizomycetes or Bacteria.) All possess the green colouring matter chlorophyll, but in the blue, olive, and red forms additional colouring matters (phycoerythrin, phycocyanin, phycophæin, and phycoerythrin) are present to a greater or less extent, masking the pure-green tint so well seen in the Chlorophyceæ. It is impossible in the present state of our knowledge to dogmatise on the precise value of these additional pigments, but we cannot be far wrong in saying that they are associated with the modification of the intensity or quality of sunlight, and aid or protect the chlorophyll in the peculiar and vitally important duties which it performs in the nutrition of the plant organism (see *CHLOROPHYLL*). It has been ascertained that certain rays of the solar spectrum are more efficient than others in the work of carbon assimilation or photosynthesis, and it is worthy of note that these rays are precisely those which are first intercepted in the passage of sunlight into sea-water. Our ignorance of the important physiological problems involved may be estimated when we place against this explanation the fact that Kjellman in his exploration of the flora of the Arctic Sea found that *algæ* grew and reproduced at a mean temperature of -1°C . and during the long and dark arctic night of three months' duration.

Turning from the bathymetric distribution of seaweeds to their surface distribution, we find here also many interesting and difficult problems.

In the first place the medium in which seaweeds live is of a more uniform temperature than that to which land plants are exposed, although against this we must place the fact that seaweeds are more susceptible to fluctuations of temperature. Whilst ocean currents are undoubtedly the chief agents in the transport of the marine flora, long tracts of deep ocean must prove serious barriers to the migration of littoral species. It is scarcely necessary to point out that continental areas, hotter and colder regions of the sea, and long stretches of sandy shore must also act as barriers to possible migration. The effects of such barriers are well seen in comparing the floras of the tropical Atlantic and of the Indian Ocean, the north and south temperate Atlantic, and the eastern and western shores of the same great ocean.

The structure, life-history, and classification of the lower algæ (both fresh-water and marine) having been dealt with in the article *Algæ* (q.v.), there are left for treatment the two higher groups—viz. *Phæophyceæ* and *Rhodophyceæ*. It will be most in accordance with the aim of the present article to sketch very briefly the main lines of classification, and to select a few typical examples for more detailed notice.

The *Phæophyceæ* include all the olive-brown seaweeds found on our shores, and are subdivided according to their methods of reproduction into three chief series—viz. (a) the *Phæosporeæ*, represented by such forms as *Ectocarpus*, *Cutleria*, *Sphacelaria*, and the giants among seaweeds, *Laminaria*, *Macrocytis*, and *Lessonia*; (b) the *Fucaceæ*—e.g. *Fucus*, *Ascophyllum*, *Pelvetia*, &c.; and (c) the *Dictyotaceæ*—e.g. *Dictyota* and *Padina*. The members of the *Phæosporeæ* have a most

contains elongated branched tubular cells which show a marked resemblance to the sieve tubes of *Phanerogams*, whilst the small cortical cells exhibit that intercommunication of protoplasm which is of so great physiological importance in the higher plants.

Both sexual and asexual methods of reproduction are known to occur, though not as yet in all genera. Vegetative propagation by gemmæ is also not uncommon. The asexual reproductive organs are in the form of unilocular gonidangia, the contents of which are transformed into zoo-

gonidia, small motile cells each furnished with two flagella, and capable after a period of activity of longer or shorter duration of settling down and forming new plants. The gonidangia are developed externally on the thallus or are the terminal cells of short branches. They are frequently collected in groups (*sori*), and are accompanied by sterile filaments. The sexual organs are multilocular gametangia

of diverse form, each locus giving rise to a single motile cell somewhat like a gonidium. These cells conjugate in pairs, the product (*zygote*) behaving in a precisely similar manner to the zoogonidium. Although in most of the *Phæosporeæ* the gametes are morphologically indistinguishable, gradations may be observed in some genera where the gametes are differentiated into male and female cells. *Cutleria* is especially interesting in this respect, as the female gametes are much larger than the male gametes, and come to rest before conjugation with the still motile male cell. The *Fucaceæ* are characterised by having distinctly differentiated sexual organs with non-motile ova and motile fertilising sperms. The ova are formed within the swollen cells (*oogonia*) which arise from the wall of flask-shaped cavities (*conceptacles*), and are accompanied by unbranched hairs. The fertilising cells, antherozoids or sperms, are produced in ovoid terminal cells (*antheridia*) of branched hairs, which likewise



Fig. 2. *Laminariaceæ*:

A, *Laminaria digitata*, var. *stenophylla*; B, C, *L. digitata*, var. *cloustoni*; D, young form of B (all much reduced). (After Luerksen.)



Fig. 1.—*Ectocarpus confervoides*:

A portion of the thallus with multilocular gametangia ($\times 10$).

varied vegetative form. Many are filamentous and branched, such as *Ectocarpus* and *Sphacelaria*, some are tubular and unbranched, as *Asperococcus* and *Scytosiphon*, or tubular and branched—*Chordaria*. Others are ribbon-shaped—e.g. *Cutleria*; not a few are membranous and encrusting—e.g. *Ralfsia*; whilst *Laminaria* forms large expanded leathery stalked fronds. In histological differentiation several types may be distinguished. In *Ectocarpus* the fronds consist of branched filaments of cylindrical cells, whilst in other genera the fronds are composed of elongated central cells surrounded by smaller cortical cells. In the *Laminariaceæ* the medullary portion of the thallus



Fig. 3.—*Fucus platycarpus*:

A portion of the thallus showing receptacles ($\times \frac{1}{4}$). (After Tauret.)

The fertilising cells, antherozoids or sperms, are produced in ovoid terminal cells (*antheridia*) of branched hairs, which likewise

arise from the walls of similar conceptacles. In *Fucus platycarpus* both ova and sperms are formed in the same conceptacle; in most Fucaceæ, however, they are formed on different plants. Asexual

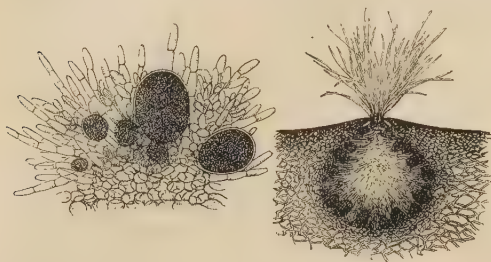


Fig. 4.—*Fucus platycarpus* :

A, vertical section through a conceptacle; B, portion of the wall of a conceptacle, showing oogonia in various stages of development, and antheridia. (A, $\times 20$; B, $\times 150$.) (After Thuret.)

multiplication is unknown. The group includes such well-known genera as *Fucus*, *Ascophyllum*, *Halidrys*, and *Pelvetia*, with branched leathery fronds, the tips of whose branches become transformed into receptacles



Fig. 5.—*Griffithsia setacea* (one-half natural size). (After Thuret.)

for the reproductive organs, and *Himanthalia*, with a button-shaped thallus, from which arise the long strap-shaped reproductive branches characteristic of that genus.

The Dictyotaceæ are an aberrant group of Phæophyceæ with distinct affinities to the Rhodophyceæ. They resemble that group in having non-motile gonidia produced in fours in gonidia which are clustered in sori over the surface of the frond (Dictyota) or along the midrib. The sexual organs are in the form of antheridia and oogonia. The male organs produce non-motile fertilising cells resembling the pollinoids of the Rhodophyceæ, though there is evidence to show that these may be ciliated.



Fig. 6.—*Odonthalia dentata* (one-third natural size).

The oogonia are arranged in sori, each oogonium containing one ovum. In both Fucaceæ and Dictyotaceæ fertilisation is external.

The Rhodophyceæ (Florideæ) form a very large assemblage of most varied vegetative form, and every possible shade of red from a purple black to brilliant pink. The root may be a branched mass, a plate, or a disc attached to mud, other algæ, or rock, whilst the fronds are filamentous, membranous, crustaceous, or calcareous. The asexual organs consist of gonidia whose entire contents in some genera escape as a single non-motile gonidium. In the majority, however, each gonidium contains four non-motile gonidia. The gonidia are solitary or grouped in sori, and often sunk in the tissue of the frond or in special branches. The sexual organs are antheridia and procarpia. The antheridia are generally modified terminal branches or special areas in the thallus (of the more succulent forms), from which are derived short rod-like fertilising cells, here called pollinoids. The female organ is a procarp, whose structure varies in complexity in the different orders of Rhodophyceæ. In the simplest condition it recalls the female organ of Coleochaete, and consists of a rounded cell with a long filamentous apical portion, the trichogyne. In higher members of the series the trichogyne is separated from that portion of the procarp from which the products of fertilisation (carpospores) are derived by one or more intermediate cells, the trichophore, and the basal part itself may become multicellular, all or only some of the cells of which produce the products of fertilisation. Fertilisation is effected by fusion of a pollinoid with the trichogyne, the mediate or intermediate result being the formation of a cluster of cells, the carpospores, derived from



Fig. 7.—*Corallina officinalis*, a calcareous seaweed (natural size).

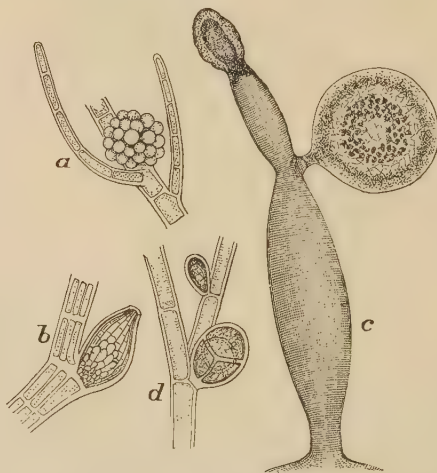


Fig. 8.—Reproductive Organs of the Rhodophyceæ : a, cystocarp of *Spermothamnion turneri*; b, cystocarp of *Polysiphonia urceolata*; c, (lateral) cystocarp and (terminal) antheridium of *Catenella opuntia*; d, gonidia of *Callithamnion tenuissimum*.

the fertile cells of the base. These carpospores may form a naked mulberry-like mass (Nemalion), or may be enclosed by a loose involucre of filaments (Griffithsia), or by an ovoid capsular investment with a terminal pore (Polysiphonia). In others

again the collection of carpospores (*cystocarp*) is completely enclosed within a thick-walled spherical sac (Plocamium), or may be sunk in the tissue of the frond (*Dumontia*). The Rhodophyceæ embrace a large number of orders, the representatives of several of which form well-known objects of interest on the seashore. The best known of these perhaps are Carrageen (*Chondrus crispus*), Dulse (*Rhodymenia palmata*), and Laver (*Porphyra laciniata*). The genera *Callithamnion*, *Delesseria*, *Nitophyllum*, *Plocamium*, and *Odonthalia* are well known to collectors for the beauty of their fronds. It may be of interest to point out that the vast collection of feathery plant-like forms, popularly classed as 'seaweeds' by seaside visitors and sold as such after being fancifully tinted, are in no respect related to the forms we have been considering, but really belong to the zoophyte division (*Hydrozoa*) of the animal kingdom.

For British Seaweeds, see Harvey, *Phycologia Britannica*; Gray, *British Seaweeds*; Landsborough, *Popular History of British Seaweeds*. General and Systematic: Agardh, *Species, Genera, et Ordines Algarum*; Thuret, *Études Phycologiques*; Bornet et Thuret, *Notes Algologiques*; Hauck, *Die Meeresalgen*; Reinke, *Atlas Meeresalgen*; Oltmanns, *Morphologie und Biologie der Algen*; Lotsy, *Botanische Stammesgeschichte*, vol. i.

Sea-wolf. See WOLF-FISH.

Sebaceous Glands. See SKIN.

Sebastian, king of Portugal (q.v.), a grandson of the Emperor Charles V., perished at the fight of Alcazar in Morocco, warring against the Moors, on 4th August 1578. Soon after the battle doubt was thrown upon his death, and impostors began to crop up—first (in 1584) an adventurer, the son of a poor Portuguese potter, who was nicknamed, half in derision, half in railery, the King of Penamacor; then came Matheus Alvares, a sort of brigand-insurgent; then in 1594 a Spanish cook of Madrigal in Castile. None of these people were taken seriously. A fourth impostor found more credence, one Marco Tullio Catizzone, a Calabrian, who first made his pretensions known at Venice in 1598. He was hanged at Sanlúcar in Spain in September 1603. The strongest support of these successive impostors was the undying belief of the common people of Portugal that their popular hero, Sebastian, would some day reappear. The belief grew particularly strong in 1807–8 during the French occupation of Portugal. And even so late as 1838 it was used as a rallying-cry by a party of insurrectionists amongst the Portuguese Brazilians. See M. D'Antas, *Les faux Don Sébastien* (1866).

Sebastian, St., a martyr of the early church, was a native of Narbonne. Under Diocletian he became a captain of the prætorian guard, and secretly a Christian. It coming to the ears of Diocletian how Sebastian personally encouraged those who were being led out to death for being Christians, the emperor had his captain tied to a stake to be shot to death by archers. But they did not wholly kill him; a pious woman, Irene by name, took him away, and tended his wounds. As soon as he was recovered Sebastian boldly faced the tyrant, and upbraided him for his cruelty. Diocletian then ordered him to be beaten to death (288) with rods. He is a protector against plague and pestilence, and is specially honoured on 20th January. His first martyrdom—a young and handsome soldier bristling with arrows—was a favourite subject for the Italian religious painters, as Mantegna, Veronese, and Domenichino.

Sébastiani, FRANÇOIS HORACE BASTIEN, COUNT, marshal of France, was born November 10, 1772, at Porta d'Ampugnano, a village near Bastia, in Corsica. Entering the French army in 1789, he became one of Napoleon's most devoted partisans,

and advanced rapidly. He fought at Marengo, executed some important diplomatic service in Turkey in 1802–3, after which he became general of brigade, and was wounded at Austerlitz. In 1806 he was again deputed to Turkey, this time to break the alliance of the Porte with Russia and England. His mission was successful, and Turkey declared war upon the allies. Thereupon the English fleet forced a passage through the Dardanelles, and cast anchor before Constantinople. Sébastiani, however, speedily put the coast batteries in a state fit for action, and got several small gunboats afloat. But the deposition of the sultan and the treaty of Tilsit put an end to the French intrigues in Turkey, and Sébastiani was recalled (June 1807). He subsequently commanded the fourth French army corps in Spain, and distinguished himself in the Russian campaign of 1812 and at Leipzig. On the exile of Napoleon to Elba he gave in his adherence to the Bourbon government, but joined his old master on his return. After the revolution of 1830 he held for brief periods the portfolios of naval and foreign affairs, and the embassies to Naples and London, but was more distinguished for his elegance and graceful demeanour in the Parisian salons than as a politician or administrator. He was made a marshal of France in 1840, and died at Paris, July 20, 1851.

Sébastiani, a tropical, mostly New World, genus of Euphorbiaceæ, trees, shrubs, and herbs, some of which, especially the Mexican *S. Palmieri*, show the strange phenomenon of the jumping seed. The seeds have two flat sides and a round keeled back. Laid on a flat side they move quickly to the other; from the round side they move more slowly. Often they jerk a little forward. The movement is caused by the larva of a small butterfly, *Carpocapra salitans*, within the seed.

Sebastiano del Piombo, Italian painter, whose family name was LUCIANI, and who got his nickname 'Of the Seal' (*Piombo*) because at the accession of his patron, Giulio de' Medici, as pope (Clement VII.) in 1523 he was given the office of sealer of papal briefs. He was born at Venice in 1485, and learned the art of painting from Giovanni Bellini and Giorgione. After painting a St Chrysostom for the church of that saint in Venice, Sebastiano was taken to Rome by Agostino Chigi (q.v.) about 1512. He helped to decorate Chigi's palace of Farnesina with frescoes illustrating classical mythology, and by his excellence as a colourist won the esteem and friendship of Michelangelo. The two seem then to have worked in conjunction, Sebastiano carrying out in colour designs and drawings made by Michelangelo. Amongst the fruits of this artistic partnership three pictures at least are of the highest rank—viz. 'The Raising of Lazarus' (in the London National Gallery), and a couple of scenes from the last days of Christ (in the church of St Peter in Montorio at Rome). Sebastiano, who possessed no great powers of invention, excelled also as a portrait-painter. An indolent man and a dilatory, Sebastiano did little painting after his appointment as papal seal-keeper; yet he invented a method of painting on slate and stone. He died at Rome in 1547.

Sebastopol, or SEVASTOPOL, a Russian seaport and fortress, is situated near the south-west extremity of the Crimea, on the southern side of one of the finest natural harbours in the world, 4½ miles long from east to west and ½ mile across. The place is celebrated for the long siege of the allies during the Crimean war of 1854–55. The town and harbour were defended by several forts and batteries. The forts were of immense strength, on which artillery was found to make but little impression. On the land side, with the exception of a slight loop-

holed wall extending partially round the western side, the town, previous to the siege, was entirely undefended; but the earthworks and fortifications then successively extemporised by the genius of General Todleben kept the armies of France and England at bay for eleven months, from October 1854 to September 1855. The place sustained repeated bombardments until the capture of the Malakoff and Redan works, on September 8, 1855, at length forced the Russians to evacuate the lines and retire to the north side. The town was completely ruined; the docks and forts still standing were blown up by French and English engineers, and by the treaty of Paris (1856) were not to be restored; but the restrictions were removed by the abrogation of the neutrality of the Black Sea, by the Conference of London (1871). The town was in great part rebuilt, but at first grew slowly. After 1885 the Russian government restored the fortifications and reconstructed the docks, and Sebastopol became again the naval port for the Black Sea fleet; in 1899 the commercial port was transferred to Feodosia or Kaffa (q.v.). Under the Soviet régime, Sebastopol was only used as a naval port and a radio station, the name being changed to Akhiar. There are two cathedrals. Pop. 73,000. Sebastopol was founded on the site of a Tatar village immediately after the Russian conquest of the Crimea in 1783, under the orders of the Empress Catharine II. The promontory on which it stands was originally colonised by Greeks from Heraclea, in Asia Minor, and became known as the Heracleotic Chersonese.

See CRIMEAN WAR; Kinglake's *Invasion of the Crimea*, Hamley's *War in the Crimea* (1891), Todleben's *Vertheidigung von Sebastopol* (4 vols. Berlin, 1864-72), and Leo Tolstoy's vivid description of the siege in *Sebastopol* (Eng. trans. 1890).

Sebenico (Slav. *Sibenik*), a picturesque town of Yugoslavia, in Dalmatia, stands on a land-locked bay of the Adriatic, 43 miles by a branch-railway NW. of Spalato. The chief ornament of the place is its cathedral, built all of stone, in 1430-1555. The style is Italian Gothic. Three forts and walls on the land side defend the city. Fishing is carried on, and there is some trade in wine and olive-oil. Pop. 10,000. It was a favourite place of residence of the kings of Croatia, was made the seat of a bishopric in 1298, and repulsed a siege by the Turks in 1647.

Sébillot, PAUL (1846-1918), an eminent French folklorist, was born at Mantignon, in the department of Côtes-du-Nord. After his studies at the communal college of Dinan, and a course of law at Rennes, he came to Paris to become a notary, but soon abandoned the pen for the pencil. The pursuit of his art carried him to Saint-Brieuc and Pont-Aven, and many an out-of-the-way corner of Brittany, and opened up to him stores of old-world lore in which he was to find the main interest of his life. From 1870 to 1883 he exhibited in the Salon as many as twenty pictures, but he gradually abandoned art for folklore, and made his name widely known by a long series of admirable books. He succeeded to Henri Martin's seat in the Commission for Megalithic Monuments, became *chef du cabinet* at the ministry of Public Works, and was nominated Chevalier of the Legion of Honour in 1889. He edited the *Revue des Traditions Populaires* from its foundation (1885).

Secale. See RYE.

Secant. See TRIGONOMETRY.

Secchi, ANGELO, astronomer, was born at Reggio, 29th June 1818, and trained as a Jesuit, became professor of Physics at Washington, United States, and in 1850 at the Collegio Romano, and director of the Roman observatory, where he

laboured till his death, 26th February 1878. His chief discoveries were in the region of spectrum analysis and solar physics; and, besides some 300 papers, he published in French *Le Soleil* (1870), and in Italian *L'Unità delle Forze Fisiche* (1869) and *Le Stelle* (1877).

Secession. See UNITED PRESBYTERIANS; also UNITED STATES.

Seckendorff, VEIT LUDWIG VON, statesman and theologian (1626-92), studied at Strasburg, and served successively the princes of Saxony and Brandenburg, being chancellor of the university of Halle at his death. He is best known for a Latin compendium of church history (1664), and a work, *De Lutheranism* (1688), in reply to Maimbourg.—His nephew, FRIEDRICH HEINRICH (1673-1763), was distinguished as a field-marshal and diplomatist in the Austrian service, and was made a Count of the Empire.

Secker, THOMAS, Archbishop of Canterbury (1758-68), was born at Sibthorpe, Nottinghamshire, in 1693, the son of a Dissenter of independent means, who wished him to enter the ministry of his own communion. In 1716, however, the son turned to medicine, which he studied at London and Paris, ultimately taking his doctorate in physic at Leyden in 1721. Meanwhile, urged by his old schoolfellow, Joseph Butler, he had decided to take Anglican orders; in 1722 he graduated B.A. at Oxford, and in that and the following year he was ordained deacon and priest. His preferments were Houghton-le-Spring (1724), Ryton and a prebend at Durham (1727), chaplain to the king (1732), St James's, London (1733), Bishop of Bristol (1735), of Oxford (1737), Dean of St Paul's, for which he resigned the living of St James's (1750), and the primacy (1758). He was a wise, kindly, hard-working bishop, and a notable preacher in his day. He died 3d August 1768. See the *Review of his Life*, by Beilby Porteous (5th ed. 1797; originally prefixed to a posthumous edition of his sermons, &c. 1770).

Second is the sixtieth part of a minute, whether of time or of angular magnitude; formerly seconds having been distinguished as *minute secundæ*, from minutes or *minute primæ*. See CIRCLE, DEGREE, DAY.

Second Advent. See ADVENTISTS, MILLENNIUM.

Secondary, in Geology. See PETROGRAPHY, MESOZOIC.

Second'ing is an arrangement by which officers of the British army, when extra-regimentally employed, become supernumeraries in their regiments, and have their places filled by others, so that the service may not suffer. Thus, a captain appointed adjutant of yeomanry, special reserve, or volunteers is placed upon the seconded list for the five years during which his appointment lasts. His place in the regiment is filled up, but his name (in italics) remains in its usual place in the *Army List*, his promotion goes on, and he is brought back at the end of his employment as soon as a vacancy occurs in his proper rank.

Second-sight, a gift of prophetic vision, long supposed in the Scottish Highlands and elsewhere to belong to particular persons. The most common form it took was to see the *wraith*, *fetch*, or shadowy second self of some person soon to die, often wrapped in a shroud, or attended with some other of the special circumstances of death or burial. Of course the prophetic character may easily enough have been a mere additional assumption, the time of occurrence of distant events being apt to be confused with the time of hearing of them. In the popular mind everywhere the mystery of death, and

the instinctive human longing to believe in a continuity of conscious spiritual life and sympathy, have generated a belief in the probability of an appearance coinciding with, or soon succeeding, the death of an individual; and from this the step is easy to a belief in the possibility of similar appearances before death, in order to foreshadow or forewarn. For, if the appearance be admitted as a probability, it is not difficult to take a further step and attribute to it the function. For what more natural than to suppose that, just as the affection for a dead friend survives the separation of the grave, so the affections of the disembodied spirit or apparitional ghost-soul should continue to cling to the persons loved on earth, and that he should seek by every possible means to give them forewarnings of things soon to happen? And what agents more natural than those gifted souls that stand between the living and the dead, who have attained clearness of spiritual vision by rising above the bondage of sense, through lonely meditation and inner communion with things unseen? Such are the seers to whom the gift of second-sight was once attributed in the Highlands; and we find, as was to be expected, that most often they were reputed men of severe and virtuous life, who would gladly have lost their faculty if they could, and indeed were often sorely troubled in their minds as to whether it was not something that had come from the devil and not from God. In Aubrey's account we read of one who besought the presbytery to pray for him that he should be relieved from this burden, and how after special supplication and confession it was taken from him. Among the Covenanters too the gift of special foresight and prophecy was one vouchsafed to men like Peden, eminent for holiness and spiritual elevation. The gift seems not to have descended by succession, although this is stated to have been the case in Skye before the gospel reached it, and there was long a persistent belief that it belonged to the seventh son of a seventh son; according to some it appears in special cases to have been capable of being communicated from one person to another. Martin in his *Description of the Western Isles of Scotland* (1703) gives a full account of the second-sight, with a classification of the special visions usually seen, which is conveniently summarised in the seventh chapter of Defoe's well-known *Life and Adventures of Duncan Campbell* (c. 1680-1730), the deaf and dumb soothsayer, who inherited the faculty from his Lapland mother. With regard to the difficult question of the determination of the time between the sight and the fulfilment, we read here that if an object was seen early in the morning the event would be accomplished a few hours afterwards; if at noon, the same day; and if at night, the accomplishment would take place weeks, months, and sometimes years afterwards, according to the time of night the vision was beheld. The appearance of a shroud was an infallible prognostic of death, and the nearness or remoteness of the event was judged by the amount of the body that was covered by the ghastly sheet; if it was not seen above the middle, a delay of a twelvemonth might be hoped for; but if it ascended high towards the head, the mortal hour was close at hand. The reader will remember the splendid artistic use made of an analogous notion to this by Rossetti in *The King's Tragedy*. The vision makes such a lively impression upon the seers, continues Martin, that they neither see nor think of anything else except the vision, as long as it continues; the eyelids of the seer are rigidly fixed, and the eyes continue staring until the object vanishes. Sir Walter Scott has put the second-sight to fine use in *Waverley*, *The Legend of Montrose*, and elsewhere.

The gradation of symbolical appearances we have mentioned strikes the imagination and gives something like a system to the supernatural phenomena. But if we turn to the cases related we find no such regular order and exactness. The evidence is vague and confused, and the incidents are often of the most trivial character, the revelations, apparently mere subjective hallucinations, commonly made to poor illiterate men, predisposed from their conditions of life to melancholy and superstition. Moreover, one standing weakness is that such predictions may force their own fulfilment, and the indefiniteness of the time provides a convenient loophole of escape for the conscience. As we see in the popular notions about dreams, there is a besetting snare of a tendency unconsciously to antedate the later impression and to read back details into the dream. Even contradictory dreams are forced to the required interpretation on principles of implied symbolism or even of mere conventional and completely irrational explanation; and similarly we find unrecognised apparitions capable of symbolic explanation, as a black dog appearing before a death, phantasmal lights, and the like, as well as weeping, the screech of the *banshee*, &c., in the region of sounds. Again, coincidences, really due to pure accident, account for much; and still more the invariable leaning of the primitive mind to false analogies and to confound the *post hoc* with the *propter hoc*. The savage and the enthusiast alike think in the same vicious circle; what he believes he therefore sees, and what he sees he therefore believes.

Stories of second-sight meet us also in the actual world of history. We find it in the story of Wallace and Bruce; again in the famous vision that Thomas the Rhymer had of the death of Alexander III. at Kinghorn; associated with the tragic fate of James I.; and in the unheeded warning given to the Scottish nobles before going to find their fate at Flodden. A Scottish seer is said to have foretold the unhappy career of Charles I., and another the violent death of Villiers, Duke of Buckingham. In 1652 Sir George Mackenzie, afterwards Lord Tarbat, wrote a minute account of its manifestations, addressed to the celebrated Robert Boyle, which is published in the correspondence of Samuel Pepys. Aubrey throughout life had strong interest in the superstition, and has recorded not a few examples. Next came Martin's copious description, then the Rev. John Fraser's *Authentic Instances* (1707), and in 1763 the ambitious but poor and credulous *Treatise on the Second Sight* by Theophilus Insulanus. A fresh revival of interest in the subject took place after the publication of Dr Johnson's memorable *Journey to the Hebrides* (1775). Johnson was naturally superstitious, and would willingly have believed in the possibility of messages from the other world. But his love of truth was too strong to be satisfied with the evidence, and he confessed that he never could 'advance his curiosity to conviction, but came away at last only willing to believe.' On one occasion Boswell tells us he laid down a sound canon for such questions, incapable to be shaken: 'We could have no certainty of the truth of supernatural appearances unless something was told us which we could not know by ordinary means, or something done which could not be done but by supernatural power; that Pharaoh, in reason and justice, required such evidence from Moses; nay, that our Saviour said: "If I had not done among them the works which none other man did, they had not had sin."' As we have seen, spectral sights may be caused by dreams, and every night so many are dreamed that some must come true; morbid conditions of mind or body may account for many more; not to speak of accidental optical illusions, or the workings of

an abnormally vivid imagination. And again, from the other side, we may say that it is hardly a compliment to the idea of a divine providence to suppose that special miracles are wrought to announce the marriage or death of a Highland peasant, the wreck of a boat, the winner of a race, or the arrival of a stranger in a remote island of the Hebrides. Nothing wiser on this question generally has been written than Mrs Henry Sidgwick's paper, 'On the Evidence for Premonitions,' in the *Proceedings of the Society for Psychical Research* for December 1888. She defines premonitions as predictions, foreshadowings, or warnings of coming events, which afford, if believed, a knowledge of the future greater than that which human beings could obtain by exercising their faculties on the facts before them; and her conclusion is that the evidence at present collected does not seem sufficient to warrant a conclusion in favour of these. The whole of the first-hand cases up till that time before the Psychical Society amounted to 240, about 66 per cent. of these being dreams, thus falling far short both in quantity and quality of the evidence for *telepathy*. Setting aside the two-thirds dreams, she classifies the remaining third as follows: (1) Visual hallucinations—persons or objects seen when nothing was really there; (2) auditory hallucinations—voices or other sounds heard when, according to the belief of the percipient, there was no real natural sound; (3) verbal predictions, as by fortune-tellers; (4) non-externalised impressions of various kinds—namely, ideas of more or less definiteness, mental visions, mental voices, and motor impulses. See APPARITIONS, DIVINATION.

Secret, DISCIPLINE OF THE. See DISCIPLINA ARCANI.

Secretary-bird (*Serpentarius*), an aberrant and in some respects primitive genus allied to the birds of prey, but apparently requiring an order to itself. There are two African species, *S. serpentarius* in the south and east, and *S. gambiensis* from Senegambia to S. Abyssinia. The legs are very long, the toes are partially webbed, the region below the ankle is protected by large scales. The bird stands about three feet high; it has a long neck and a long tail, and bluish gray plumage. It



Secretary-bird (*Serpentarius serpentarius*).

has an occipital crest of feathers without barbs at the base, which can be raised or depressed at pleasure, and the name 'Secretary' was given to it by the colonists at the Cape of Good Hope because of the resemblance of the crest feathers to pens stuck behind the ear. It feeds chiefly on reptiles of all kinds, which it devours in great

numbers, and is so highly valued on account of the constant war which it wages against serpents that a fine is inflicted at the Cape for shooting it. It fearlessly attacks the most venomous serpents, stunning them with blows of its wing, or seizing and carrying them into the air to such a height that they are killed by the fall. It uses its feet also to overpower its prey, striking violent blows with them. Small serpents are swallowed entire; the larger ones are torn to pieces. The secretary-bird is most frequently seen in pairs, or solitary. It is tamed as a protector of poultry-yards, but if not sufficiently fed is apt to help itself to a chicken or duckling. An attempt has been made to introduce this bird into Martinique in order to reduce the number of venomous serpents in that island.

Secretary of State, an ancient and important office in the government of England. The oldest record of its existence is in the reign of Henry III., when John Maunsell is described as 'secretarius noster.' Prior to the Restoration the holder of this office was generally styled the 'king's chief (or 'principal') secretary'; he had the custody of the king's signet, and discharged his duties with the assistance of four clerks. Two secretaries are said to have been first appointed towards the close of the reign of Henry VIII. The office, always one of influence, gradually grew in importance. On the Union of 1707 Anne added a third secretary of state for Scotland, which office, however, was soon done away with. In the reign of George III. there were at first but two secretaries; for a time there was a third for America, but his office was abolished by statute in 1782. While the secretaries were two in number both equally directed home affairs; to the one were committed the foreign affairs of the northern, to the other of the southern department. Irish affairs belonged to the province of the elder secretary.

There are now seven principal secretaries of state, who are respectively appointed for home affairs, foreign affairs, war, the colonies, India, air, and Scotland. They are all appointed by the sovereign by delivery of the seals of office, followed by the issue of a patent under the great seal, and they are always members of the Privy-council and of the cabinet. Though each has his own department, he is considered capable of discharging the duties of the others; a member of the House of Commons if removed from one secretaryship to another does not thereby vacate his seat. Not more than six (since 1926) secretaries or under-secretaries of state may sit at one time in the House of Commons.

To the Secretary of State for the Home Department are entrusted the home affairs of England and Wales, as well as of the Channel Islands and the Isle of Man, except those, such as education, health, and agriculture, which are administered by other and newer departments. He has the charge of the maintenance of the internal peace of the whole country, the security of the laws, and the administration of justice so far as the royal prerogative is involved in it. He provides for the suppression of riots. He has the ultimate supervision of all that relates to prisons and criminals; and numerous statutory powers have been given him regarding police, sanitary matters, the regulation of labour, &c. He is responsible for the exercise of the prerogative of mercy; application for pardon or commutation of sentence forms no small part of the work imposed on the Home Secretary. All patents, licences, dispensations, charters of incorporation, commissions of the peace and of inquiry pass through his office. He is empowered to grant certificates of Naturalisation (q.v.) to foreigners. He also represents Northern Ireland in the British cabinet. His patronage is very considerable, including the nomination to a large

number of judicial offices. Among his powers is that of examining and committing for trial persons charged with offences against the state, a function which, though its legality has been called in question, has often been exercised.

The functions of the Home Office are now mainly confined to England and Wales, with the Channel Islands and the Isle of Man, but almost all of them formerly extended, and some of them still extend, to Scotland. Up to 1885 the Home Secretary took charge of Scottish affairs, and was assisted in their administration by the Lord Advocate. By an act of that session, supplemented by another in 1887, a Secretary for Scotland was appointed, and the Scottish Office was constituted. The Secretary for Scotland, in addition to functions previously belonging to the Local Government Board and the Scottish Education Department, had transferred to him 'all the powers and duties vested in and imposed on the Secretary of State by Act of Parliament or by custom so far as such powers and duties relate to Scotland,' with certain exceptions. Included in the transferred powers were the prerogative of mercy and the responsibility for the maintenance of order. There are certain powers of a universal nature which could not be regarded as related to any one part of Great Britain, particularly naturalisation and extradition, which the Home Secretary still retains; and in order to ensure uniform administration in the two countries in question relating to factories, explosives, vivisection, the control of aliens and the control of dangerous drugs, the powers of the Home Secretary are made to extend to the whole of Great Britain. By an act of 1926, the status of the Secretary of Scotland was raised to that of a Principal Secretary of State, and all the powers and duties of the Secretary of Scotland were transferred to the Secretary of State for Scotland.

The Secretary of State for Foreign Affairs is the responsible adviser of the crown in all communications between the government and foreign powers. He negotiates treaties, either directly with the foreign ministers resident in the country, or through the British ministers abroad. It is his duty to inquire into the complaints of British subjects residing in foreign countries, to afford them protection, and to demand redress for their grievances. The Foreign Secretary recommends to the sovereign all ambassadors, ministers, and consuls to represent this country abroad. He grants Passports (q.v.) to British subjects travelling abroad.

The Secretary for the Colonial Department has the supervision of the laws and customs of the colonies and dependencies (except India), watches over their interests, apportions the imperial troops necessary for their defence or police, appoints governors, and sanctions or disallows laws reserved for his consideration by colonial governors. The responsibilities of the colonial office in regard to the greater colonies have been much decreased by the extension of responsible government (see COLONY).

Each of these secretaries of state is assisted by two under-secretaries of state—one permanent, while the other is a political officer dependent on the administration in power.

The Secretary of State for India, whose office dates from the abolition in 1858 of the double government of India by the Court of East India Directors and Board of Control, has the same control over the government of India which was formerly exercised by these bodies, and countersigns all warrants and orders under the sign-manual relating to India. He is assisted by an under-secretary, who is also a member of the legislature and loses office with the cabinet, and by a permanent under-secretary and assistant-secretary, as also

by a council of not more than fourteen members, over whom he presides. The procedure for the sending of orders and communications to India, and in general for correspondence between the Secretary of State and the Governor-general in Council or any local government, is now prescribed by the Secretary of State in Council. All despatches from governments and presidencies in India must be addressed to the secretary.

The Secretary of State for War administers the military forces of the crown along with the other members of the army council. He is responsible to the crown and parliament for all the proceedings of the council, but the council is vested in most of the powers formerly exercised by the Secretary of State. He prepares for the royal signature and countersigns commissions in the army, and recommends to the sovereign for the order of Knighthood of the Bath. Down to the Crimean war there was also a Secretary-at-war, a high officer of the ministry, who had the control of the financial arrangements of the army, and was the responsible medium for parliamentary supervision in military affairs. He was quite independent of the Secretary of State and of the military authorities.

By the Air Force (Constitution) Act of 1917 an additional Secretary of State, for Air, was created.

For a full account of the secretarial departments, see Todd's *Parliamentary Government in England* (new ed. by Spencer Walpole, 1892), and the Whitehall Series containing Sir Edward Troup's *The Home Office* (1925), &c.

In the cabinet of the United States there is one Secretary of State, who is specially charged with foreign affairs.

Secretary of the Navy, now called the Secretary to the Admiralty, is the permanent secretary, generally selected from the principal clerks, though instances have occurred of a naval officer holding the post, e.g. Captain Robert Hall. The Secretary attends board-meetings, signs all orders issued, and is responsible for the discipline of the Admiralty Office. This appointment is of long standing, and was once held by Samuel Pepys. —The Financial Secretary is a ministerial supporter in the House of Commons; he is mainly responsible for the financial administration of the service. He changes, of course, with the ministry, of which he is a subordinate member.

Secret Chambers were mostly of post-Reformation construction, designed as 'priest's holes,' or hiding-places for 'trafficking mass-priests,' in the days when to say mass was either high-treason or felony. They might also, of course, conceal Jacobite or other conspirators; and that of Danby Hall, the seat of the Scropes, was found, on its rediscovery about 1800, to contain arms and saddlery for forty or fifty troopers, stored up, it would seem, against some intended rising. Brother Nicholas Owen, S.J., *alias* 'Little John,' who with Father Garnet (q.v.) was arrested at Hindlip Hall, and who is termed 'that useful cunning joiner of those times,' was a chief contriver of these secret chambers, and after his capture 'was divers times hung upon a Topcliff rack in the Tower of London to compel him to betray the hiding-places he had made up and down the land.' They were oftenest formed in the thickness of a wall, and the entrance to them might be through a panel, behind a hinged picture, beneath a hearth-stone, up a chimney, &c. About a century since at Irnham Hall, Lincolnshire, it was noticed that one of the chimneys of a cluster was unblackened, and it proved to be really a shaft to give light and air to a priest's hole, the entrance to which was gained by removing a single step between two servants' bedrooms. You then come to a panel,

with a very small iron tube let into it, through which any message could be conveyed to the occupant. This panel removed, a ladder of four steps leads down to the secret chamber, which is 8 feet long, 5 broad, and just high enough to stand upright in. Another at Ingatstone Hall, the old seat of the Petres, is 14 feet long and 10 high, but only 2 wide; this contains an old chest for vestments. How cunningly these chambers were contrived may be seen in the fact that at Hindlip the minutest search was made ten whole days in vain, till Garnet came forth himself, forced by want of fresh air, not of food, for marmalade and other sweetmeats were lying by him, and 'broths and warm drinks had been passed to him by a reed through a little hole in a chimney that backed another chimney into a gentlewoman's chamber.' Smugglers during the 18th century had sometimes secret chambers of a sort, for the storage of 'run' goods, at farm-houses a few miles inland; nay, so late as 1860 one such was used for illicit malting in a Suffolk village, till the excise officer detected its whereabouts by pouring water over the floor above. But for the last *historical* instance of their use we must look abroad, to Nantes, where in 1832 the Duchess de Berri (q.v.), a corpulent lady, was, with two gentlemen, roasted out of a secret chamber at the back of a fireplace, after sixteen hours' patient endurance.

The following is a list of some of the best-known secret chambers, arranged under counties in alphabetical order, with the date sometimes of the erection of the mansion (not necessarily, of course, of the priest's hole) or of its demolition, and with the names of traditional occupants: *Berkshire*, Lyford; Milton, near Abingdon; Watcomb, Bucks, Dinton (regicide Mayne). *Berwick*, Bemersyde. *Cambridge*, Sawton. *Cheshire*, Bollington; Lyme Hall, near Disley. *Cornwall*, Bochym. *Cumberland*, Netherhall, near Maryport. *Derby*, Bradshaw Hall, near Chapel-en-le-Frith; Hallam. *Durham*, Bishop Middleham (in which a 'teetotaller drank himself to death with brandy,' Southey's *Commonplace Book*, 4th series, 354). *Essex*, Ingatstone (temp. Henry VIII.). *Forfar*, Glamis Castle (the Toad-headed Monster). *Gloucester*, Bourton-on-the-Water (demolished 1834). *Hants*, Hinton-Ampner; Mapledurham, Moyles Court (Lady Lisle's house); Titchborne. *Hereford*, Treago. *Herts*, Knebworth (1553, demolished 1811). *Lancashire*, Ashes, at Goosnargh; Borwick; Lowstock Hall, in Bolton parish (demolished 1816); Lydiate; Mains Hall, in Kirkham parish (Cardinal Allen); Speke Hall; Widnes House, near Warrington; Stonyhurst (in great tower). *Leicester*, Long Clawson. *Lincoln*, Irnham Hall (c. 1500); Kingerby Hall; Upton. *Middlesex*, Canonbury Tower, Islington; Cromwell House, Highgate; White Welles House. *Monmouth*, Raglan Castle. *Norfolk*, Oxburgh House. *Northants*, Burghley House; Harrowden. *Northumberland*, Netherwitton (Lord Lovat?); Wallington Hall. *Notts*, Workop Manor (burned 1761). *Oxford*, Broughton Castle; Chastleton; Minster Lovel (Lord Lovel, Simnel's adherent, starved to death here, 1487, and skeleton found in 18th century?). *Pembroke*, Carew Castle (temp. Henry I.). *Shropshire*, Boscobel (Charles II.); Pitchford; Plowden; White Ladies (Charles II.). *Somerset*, Trent Manor House (Charles II.). *Stafford*, Moseley Hall (Charles II.). *Suffolk*, 'Ancient House,' Ipswich (1567; Charles II.?); Coldham Hall; Melford Hall. *Surrey*, Benton; Ham House, at Weybridge (1610, hiding-places shown to Evelyn by Duke of Norfolk); Sanderstead Court; Sutton Place, near Guildford (temp. Henry VIII.). *Sussex*, Ashbourne Place (Bishop Juxon); Cowdray (Lord Montague); Parham; Pax Hill, near Cuckfield (built by Andrew Boorde, q.v.); Slindon; Street Place; West Grinstead. *Warwick*, Coughton Court; Compton-Wyniates (c. 1520). *Wilts*, Heale House, near Amesbury (Charles II.; visited by Dr Johnson, 1783). *Worcester*, Armscott Manor House, near Shipston-on-Stour (George Fox the Quaker); Birtsmorton Court (14th century; Sir John Oldcastle); Harborough Hall; Harvington; Hindlip Hall (eleven hiding-places, now demolished; see above); Little Malvern Court. *Yorkshire*, Abbey House, Whitby; Danby Hall,

near Bedale; Dinsdale; the Grove, Leyburn; the 'New Building,' near Kirkby Knowle; Red House (Henry Slingsby). See *Notes and Queries* for 1855-56 and 1879-85; *Chambers's Book of Days* (1869); *Chambers's Journal* for 1883 and 1886; and Allan Fea's *Secret Chambers and Hiding Places* (1901).

Secretion is a vital process in which certain cells of the body form within themselves definite products, which accumulate and are usually discharged. The cells specialised for secreting are called glandular, and many are often united to form a gland. The definite products formed by the activity of the glandular cells are called secretions, this term being applied both to process and products. All the digestive juices, the silk of silkworms, the webs of spiders, the wax of bees, the nectar of flowers, and the like, are secretions. They are formed by the activity of the living matter from materials derived from the blood, or, when there is no blood, from the supplies of food which otherwise reach the glandular cells. They are discharged sometimes by a slow outpouring comparable to filtration through the free surface of the cell, sometimes by the more or less complete rupture of the cell. The process of secretion is usually periodic, intervals of quiescence alternating with those of activity. See GLANDS, PHYSIOLOGY, DIGESTION. For the secretion of plants, see PHYSIOLOGY (VEGETABLE).

Secret Service Moneys, in the widest sense of the term, include all funds placed at the disposal of ministers of state, to be expended at their discretion without giving an account. In the 18th century large sums were paid for secret service out of the king's civil list; these moneys were used chiefly for the purpose of bribing members of parliament. In 1782 Burke carried his scheme of financial reform; the amount to be paid from the civil list was limited to £10,000, and ministers expending secret service money were required to make a declaration that they had done so in accordance with the intentions of parliament. In 1886 the matter was further considered, and an act was passed under which the payment authorised by the law relating to the civil list was discontinued. All moneys required for secret service are now included in the estimates. The declarations required by Burke's Act are sufficiently stringent to prevent abuse. Almost all governments have some fund of which no public account is given; and all secret expenditure is naturally viewed with suspicion by the representatives of the taxpayers. See SPY.

Secret Society. Under this name are embraced voluntary associations which are found in many different types of human society; no general definition can be given, for the simple reason that the secrecy to which the name refers may imply no more than the existence of a password known to all members of a secret society, whose rites, &c., may be otherwise universally known. On the other hand, the secret element may be the names of members, often because the objects of the society, though generally known, are illegal; or the rites may be shrouded in mystery, because they are deemed to be too valuable to divulge to any but those who enter the confraternity; finally, the objects of the society may be secret, and this is often due to the knowledge that the feeling of mystery thus engendered will add to the influence of the society.

Among civilised peoples the secret society is often political in its objects; the Ku Klux Klan is a typical case; it was founded in the Southern states after their defeat by the North in order to redress the balance against the whites due to pro-negro legislation. Other American political societies, like

Tammany, were originally established as patriotic organisations on aboriginal models, but have now become political institutions. On the other hand, societies which originally had ulterior objects, such as the Freemasons, may become purely social in their functions.

Among non-civilised peoples secret societies often take a more prominent place than among ourselves, partly because they may fulfil judicial and other functions which with us appertain to professions or to the state, partly because in the absence of any competing organisation any body of men is able to impose its will on the unorganised mass. Secret societies of various kinds are found in Australia, Oceania, North and South America, and Africa; as the history and meaning of them seems to differ each area has to be treated independently; but this does not mean that with the progress of knowledge it may not be possible to trace all forms ultimately to a common origin.

In Australia, and perhaps in Africa, if we take the term secret society in its strictest sense, the society of adult men, which initiates youths into tribal secrets, often by means of painful rites, may be termed a secret society, because the esoteric knowledge is kept not only from the uninitiated but also from the women. As, however, all adult males are normally initiated we can hardly speak of them as forming a voluntary association; they are in many respects analogous to the age grades of other areas.

In Melanesia, especially the southern part, the secret society is found among less advanced peoples, though there are exceptions, such as the Banks Islands, and it is associated with matrilineal descent. In typical cases there are two societies, the Sukwe in the village, only partially secret, which has the men's club-house as its centre, and the Tamate, or ghost society, which is really secret and meets in the bush; an important point is that in the latter society are various grades, some open to men who do not belong to the Sukwe, others to none but members of the Sukwe. One of the features of initiation into Tamate is the pretended death of the novice, an element widely found in other secret society areas. Rivers accounted for these societies by the theory that they are due to interaction between the aborigines of the islands and a body or bodies of immigrants, each party having its own cults and rites, which they tended to keep secret from strangers; it is not impossible that the animal masks of the Tamate derive their origin from totemic clans which used the masks representing their totems in annual rites.

In Polynesia we hear most of societies associated with warriors and young men or with the higher ranks (e.g. Kaioi of the Marquesas, the Areoi of Tahiti); no systematic study of them has yet appeared; when they came to the knowledge of civilised observers they were mainly social in their functions, often notoriously licentious. But it is quite possible that they are ultimately one with the secret society of Melanesia, though their development has been different owing to the difference in the relations between aboriginal and immigrant elements of the population.

In North America some secret societies were or are connected with religious mysteries, with the keeping of records, with the dramatisation of myths, &c., while others were devoted to leechcraft, war, &c. Formal initiation into the tribe was probably rare, but the secret society was often associated with progress in clan status; it also served to create ties analogous to those of kinship. From one point of view we may classify these societies into social and esoteric, with the former being sometimes associated age grades, which are a natural element in military tribes; while the

latter were organised mainly in connection with a religious mystery, though they might have other functions; not infrequently such a society had a drama which might be publicly performed. A singular feature of the secret society among the Kwakiutl is that the year is divided into two portions, sacred and profane, each with its own social organisation. Among them the secret societies are in some respects very near to totemic clans, and may have been modelled on them. Membership may be acquired, however, by marriage or by killing a person and securing his paraphernalia. Among the Hopi, on the other hand, the secret society seems to have developed from the local group, which maintained its own ritual.

We know little of the secret societies of South America; a prominent feature of the rites seems to be the use of ordeals intended to test the courage of candidates.

In Africa there are three main areas of secret societies: (a) the extreme west beyond Liberia, (b) Nigeria and Kamerun, and (c) the Congo; societies are found elsewhere but not in such numbers; certain areas, like the Gold Coast, are for some obscure reason practically without societies of the ordinary African type, though there are religious confraternities which make use of masks. African secret societies can from one point of view be classified into initiation societies (Labi of Baya tribe), societies connected with the cult of the dead (Oro, &c., of Yoruba), or religious rites (Imandwa of Ruanda), age grades (Masai), and so on; but for practical purposes such a grouping is of little value; for it is clear that the Yoruba societies, which began by practising a cult of the dead, developed into organisations with police and judicial functions. It is therefore necessary to draw a sharp distinction between the original meaning of a society and its later developments.

The societies with political functions are confined, so far as can be seen, to the coastal area from Sierra Leone to Kamerun; three may be singled out as of special importance, the Poro of the Mendi, Timne, &c., the Ogboni of the Yoruba, and the Egbo of Calabar. The Poro society, which may be of great antiquity, though it is not supreme, yet holds in check the chief who rules the area in which there is a branch of the society; in the Yoruba country, on the other hand, the Ogboni was the actual sovereign power; it was composed of the heads of important families, and even they were accepted for membership only if they were of proved capacity and reliability. Other societies were subordinate to it, such as the Zangbeto of Porto Novo, with police duties; the Oro society was, especially among the Egba, the executive force of the Ogboni. A striking feature of Egbo rule in Calabar was the regulation that it exercised its judicial functions only at the instance of a member; thus a non-member had to purchase the protection of a member before his case could be heard. Outside Africa the secret society seems to be confined to males in almost every case; but in Africa not only are women admitted, exceptionally, to male societies like Poro, but some societies are composed of both sexes, while others, like Bundu in Sierra Leone, are confined to women; these latter are usually for the purpose of initiating young girls; among the Mpongwe, however, the women have a powerful society, whose main object in practice is to protect women against ill-usage by men.

Some of the African societies, e.g. Poro and Egbo, protect property by a mark, such as a miniature broom near a field in which a crop is growing; this brings us near the practice of Tabu (q.v.), and finds its counterpart in Melanesia.

There are also in use in Africa secret languages for use among the members of a society; this has not been recorded elsewhere. Another feature of special importance in Africa is the belief in the existence of a tutelary spirit of a society, which is believed to kill the novice. But a complete survey of the subject is impossible in a short space, and for further details the reader is referred to works and articles cited below. Generally speaking, the rites of secret societies, and of initiation generally, are to be explained as, firstly, the removal of the candidate from the profane world for, secondly, a period of instruction prior to admission to the ranks of the adults or of the initiates; and, thirdly, a ceremony or series of ceremonies to remove him from the world in which he has lived as a candidate, and to readmit him to the profane world.

For a more extended account see *Hastings's E.R.E.*, and the authors cited in the footnotes and bibliography; to these may be added (for Africa) D. Westermann, *Die Kpelle*; (for Oceania) W. H. R. Rivers, *History of Melanesian Society*; (for America) papers by Boas, Fewkes, Cuhing, Mrs Stevenson, and others in the *Reports of the Bureau of American Ethnology*.

Secret Writing. See CRYPTOGRAPHY, INK.

Secrole. See BENARES.

Sector, in Geometry, is a portion of a circle included between two radii and the intercepted arc of the circumference. The area of a sector is equal to that of a triangle whose base is equal in length to the intercepted arc, and whose perpendicular height is equal to the length of the radius.

Secularism is the term applied to a system of ethical principles advocated from about 1846 by J. G. Holyoake (q.v.). It is a new form of Free Thought seeking human improvement by the instrumentality of material means; and it aims to substitute the piety of usefulness for the usefulness of piety, and to treat error as a defect of knowledge rather than a defect of right intention. It takes as its axiom that what is best for humanity will command the approval of the author of humanity; what is 'best for humanity' being determinable by reason, tested in this life by the experience of this life. Experience teaches that science is the providence of man. Science teaches that improvement and progress can be surely attained by the wise use of material agencies. Material agencies act by causation—the law alike of nature and mind. Causation in will shows that, if men can be induced to pursue that conduct which is most useful, habit will render it the most agreeable. Causation in opinion implies that error can only be eradicated by the eradication of its cause. False ideas can only be extirpated by true ideas. Hence the social aim of Secularism is to establish those material conditions in which, as far as forethought can compass them, it shall be impossible for a man to be depraved or poor. Morality of conduct—the main thing in this life—is determined by its conduciveness to the welfare of others as well as ourselves. This utilitarian rule has this advantage, that, while the strongest faith may co-exist with the greatest ignorance, utilitarian morality can only begin with intelligence, and the morality will be on the whole the greater the wider intelligence becomes.

Since the Secularist's profession is that mankind can be largely improved by well-devised material means, it belongs to him to inculcate a sense of responsibility for the condition of the world, so far as his exertions or influence can extend. The theological mind cares mainly for the souls and little for the social welfare of others. The Secularist holds that Truth and solicitude for the social welfare of others are the proper concern of a soul worth saving. Only minds with goodness in them have

the merit of future existence in them; minds without veracity and generosity die; the element of death is in them already. The majority of people conduct life by believing what they wish, not by conforming to what they know—an easy, loose, pleasant kind of faith which commands many followers; belief without inquiry and action without the sense of social responsibility are always popular. He who undertakes the duty of selecting his principles protects himself from hereditary error. Every step towards reasoned truth implies thought, investigation, patience, courage, and accountability.

But to acquire truth thought must be free, un-intimidated by any threat or penalty, legal, spiritual, or social; if inquiry must end in a prescribed conclusion or the inquirer perish everlastingly, no one but a fool would inquire at all. Unless men regard truth as higher than consequence thought must be sterile. Even inquiry, with whatever courage conducted, would be sterile without the right of free publicity of the results; the publication of new truth is the duty of the thinker, and his silence or supineness is a social crime. The free search, the free publicity, the free criticism, and free action of opinion are necessary secular conditions—conditions which have never been insisted upon as necessary to spiritual life. Though these conditions are used by science they are not claimed by it, being outside its province. Secular-minded thinkers alone have formulated and vindicated these conditions.

A main object of Secularism is to establish morality on grounds independent of Christianity, for so long as morality is supposed to have but that foundation it will not be influential on those who reject or do not accept Christianity. There is unquestionably a vast outlying class in every European country, and still more in India, who are without the pale of Christianity. Secularism is intended for these, and for all who deem theology indefinite, inadequate, undesirable, or unreliable. The object of Secularism is to afford these classes a knowledge of principles addressed to their common reason and intelligence, by an appeal to principles of a secular nature, common to humanity in every state and clime. The reality of Deity and a future state, being indeterminable by the experience of this life, are not secular questions; Atheism and Theism are alike without the means of demonstrating their own truth, and, though they may be subjects of personal belief, cannot be secular tenets—provable by experience. What is incapable of proof is usually decided by desire, and is without the conditions of uniformity or certitude. Morality, which fulfils the conditions of the highest religion, is attainable irrespective of belief in things outside this world. The uses of the universe are no more dependent upon the knowledge of its origin than the uses of a habitation are dependent on the knowledge of its architect.

Secularism does not ask to be esteemed a Christian system as Christianity is commonly accepted, but an ethical system. So far as Christianity is moral Secularism has common ground with it; but its reasons for being moral are not Christian reasons, but human considerations alone. Christianity attaches salvation to belief; Secularism seeks it in conduct. Christianity holds that inquiry must end in faith. Secularism teaches that regardless of consequences it should end in truth, and maintains intelligent sincerity to be sinless—not errorless, but without guilt. The doctrines of eternal perdition for honest dissent, of the natural depravity of man, of the wilfulness of an uncaused will, and of deliverance by prayers are immoral, discouraging, and traitorous; and

secular controversy on the moral tendencies of these tenets is alone useful as advancing and vindicating secular ideas. Upon questions of miracles, prophecy, genuineness or inspiration of Scripture Secularism troubles itself little. If miracles are good it is a pity they have ceased; morality needs no inspiration. Precepts have no force unless corroborated by experience, and it is ill with men when they take authority for truth, instead of truth for authority.

Secularism does not say there is no light or guidance elsewhere, but maintains that there is light and guidance in secular truth, whose conditions and sanctions exist independently, and act independently. Secular knowledge is that kind of knowledge which is founded in this life, which relates to the conduct of this life, conduces to the welfare of this life, and is capable of being tested by the experience of this life. Mathematics, botany, chemistry, political economy are secular subjects of instruction; Secularism includes the education of the conscience. If a sum in arithmetic is wrong it can be proved by a new way of working it; if a medical recipe is wrong the effect is discoverable on the health; if a political law is wrong this is sooner or later apparent in the disaster it brings with it; but if a theological belief is wrong we must die to find it out.

Secularism is separateness and does not confuse together distinct things. By repute there are two worlds—the unknown and known. The interpreter of the unknown is theology; the interpreter of the known is experience, which teaches the uses of this world. Since mankind would perish if all were called upon to agree upon the authorship of the world before using it for the purposes of life, the Secularist forbids no opinion and gives none on a matter beyond his knowledge. He does not undertake to say whether nature is the outcome of intellect, or intellect the outcome of nature. He believes that there is no religion higher than truth, and that the reverence of that which is honest, and just, and compassionate exalts humanity; that manliness is self-helping and not mendicant, and vexes not the ears of the All-Wise with capricious supplications. Secularism seeks to create independent thinkers in all parties, and its adherents are content when their advocacy induces others in religious, social, and political movements to follow in the path of reason, experience, and material improvement.

See Holyoake's *Principles of Secularism* (1855), *Secular Review* (1876), *Present Day* (1886), *Trial of Theism* (1868), and *Reminiscences* (1905), McCabe's *Life and Letters of Holyoake* (1908), and G. J. Holyoake (1922). See also AGNOSTICISM, BRADLAUGH.

Seculars. See CLERGY.

Secunderabad. See HYDERABAD.

Securite, the name of a safety explosive similar to roborite. It consists of a mixture of ammonium nitrate (74 parts) and meta-dinitro-benzene (26 parts). A variety known as flameless securite contains in addition oxalate of ammonium.

Security, in legal language, means a right conferred on a creditor which makes him secure or certain to recover what is due to him. Security may be given by setting aside some part of the debtor's property to answer the creditor's claim; for the modes in which this may be done, see PAWN-BROKING and MORTGAGE. 'Securities for money' is a very wide term, including the shares, stocks, and debentures of public companies, &c. See Cavanagh's *Law of Money Securities* (2d ed. 1885) for a compendious account of the English law relating to the subject. And see the articles CAUTION, GUARANTY.

Sedalia, capital of Pettis county, Missouri, 188 miles by rail W. of St Louis. It has large railway-shops, flour-mills, manufactories of woollens and machinery, and is the centre of an agricultural district. Pop. 21,000.

Sedan, a town and frontier fortress of France, dept. of Ardennes, stands on the Meuse, 64 miles by rail NE. of Reims. Colbert founded here cloth-factories, the fabrics of which have a European reputation. Various branches of metal-working are carried on, and there is an active trade in wool. Pop. 17,500. The fortress, or rather the citadel, capitulated to the Germans in 1815; but Sedan is chiefly noted for the surrender (2d September 1870) of Napoleon III. and an army of 83,000 men, with all their accoutrements and baggage, to the Germans in the Franco-German war. The fortress was dismantled after 1875. Marshals Turenne and Macdonald were born here. Previous to its incorporation with France (1642) it was the capital of an independent principality (that of the Comtes de la Marck and later dukes of Bouillon) and a Protestant stronghold. Its industrial prosperity was largely due to the influx of Huguenots; and at its theological seminary, famous until the revocation of the Edict of Nantes, notable Scotsmen such as Andrew Melville taught.

Sedan Chair, a portable covered vehicle for carrying a single person, borne on two poles by two men. The name is derived from the town of Sedan, where this species of conveyance is said to have been invented. The Duke of Buckingham used one in the reign of James I., a proceeding which gave general offence, it being made matter of public remark that this royal favourite used his fellow-countrymen to do the work of beasts. In September 1634 Sir Sanders Duncombe got a letter patent, granting him the sole right and privilege for fourteen years to use and let for hire within London and Westminster 'covered chairs' to prevent the unnecessary use of coaches; according to Evelyn he got the notion from Naples. Sedan chairs were largely used during the greater part of the 18th century, being found very well adapted for transporting persons, in full dress, to public and private entertainments. Not only were there numerous public conveyances of this kind in London and all considerable towns, but the owner of every large mansion had his private sedan handsomely fitted up. In Edinburgh at the close of the 18th century sedan chairs were far more numerous than hackney coaches, and were almost all in the hands of Highlanders. They were in use in London so late at least as 1830, at Winchester as 1851, at Peterborough and Edinburgh as 1860, at Genoa as 1882, at Newcastle as 1885, and at Bury St Edmunds as 1890. Sedan chairs have also been employed as ambulances for conveying sick persons to hospitals.

Sedatives are substances or measures which exert a depressing or soothing effect on any part of the body. They are called pulmonary, nervous, gastric, cardiac, &c. sedatives according to the special part of the organism on which they exert their effects. They are employed to relieve pain, and to reduce over-activity and hyper-excitability of any organ or system. They embrace a very large number of commonly used medicines.

Sedbergh, a small town in the West Riding of Yorkshire, on the Rawthey, 45 miles by rail NW. of Skipton. It has a Norman church and a grammar-school (1551) of high repute, where Sedgwick was educated and Hartley Coleridge was a master.

Sederunt. See ACTS OF SEDERUNT.

Sedge. See CAREX.

Sedgefield, a town of Durham, 9 miles NW. of Stockton, with a cruciform Early English church and a grammar-school.

Sedgemoor, a marshy district in the middle of Somersetshire, 5 miles SE. of Bridgwater, was the scene of the fight between 4000 soldiers of King James II. and 8000 of the undisciplined followers of the Duke of Monmouth, on 6th July 1685; the latter were defeated, with the loss of a thousand slain on the battlefield and several hundreds more in the subsequent pursuit and in the executions that followed. The account of the fight in Macaulay's *History* should be read, and also the description in Blackmore's *Lorna Doone*.

Sedgley, a town of Staffordshire, 3 miles S. of Wolverhampton, with coal-pits and ironworks. Pop. 17,300.

Sedgwick, ADAM, for more than fifty years Woodward professor of Geology at Cambridge, was born at Dent in Yorkshire in 1785, graduated from Trinity College, Cambridge, in 1808, and for the next ten years lectured as a Fellow of his college. He was then elected professor of Geology (1818); and in the following year, on the foundation of the Cambridge Philosophical Society, he was chosen one of its secretaries. For many years he took an active part in the discussions of the Geological Society of London, of which he was president in the years 1829 to 1831. Most of his writings were couched in the form of papers contributed to the *Transactions* of these two societies. His best and most successful labour was expended upon the investigation of the paleozoic and crystalline rocks; and his longest work was a dissertation on *British Palæozoic Rocks and Fossils* (Lond. 1851-52). Along with Murchison (q.v.) he made a systematic study of the geology of the Alps, and of the Devonian system in England. Although he did admirable service in establishing geology on a thoroughly scientific basis, Sedgwick was in other regards firmly rooted in distinctively conservative ideas: he made a trenchant attack upon *The Vestiges of Creation* in the *Edinburgh Review*, and put himself in strong opposition to Darwin's *Origin of Species*. He was canon of Norwich Cathedral from 1834, and for some years held the office of vice-master of his college. His death occurred at Cambridge, on 25th January 1873. In 1890 appeared 2 vols. of his *Life and Letters*. The Sedgwick Memorial Geological Museum at Cambridge (by T. G. Jackson) was opened in 1904.

Sedimentary Rocks. See GEOLOGY (p. 154), PETROGRAPHY.

Sedition, a general name given to such offences against the state as fall short of treason. In the law of England it is not a strictly technical word. Writing, publishing, or uttering words tending to excite subjects to insurrection, though not urging them to rebellion or total subversion of the government, come under the denomination of seditious libel, and seditious meetings or assemblies are punishable as misdemeanours. The crime consists in the intention to excite disaffection against the sovereign, the government, or the administration of justice, or to excite the sovereign's subjects to attempt, *otherwise than by lawful means*, the alteration of any matter in church or state by law established, or to promote ill-will and hostility between different classes of such subjects.

In Scotland sedition is distinguished from Leasing-making (q.v.), in so far as the object of the latter is to disparage the private character of the sovereign, while the former crime is directed against the order and tranquillity of the state. The punishment of sedition, formerly arbitrary, is now restricted to fine and imprisonment. See Lord Cockburn's *Trials for Sedition in Scotland* (2 vols. 1888).

Sedley, SIR CHARLES, courtier and poet, was born almost certainly in London, and not at his father's seat at Aylesford, Kent, in 1639, a maternal grandson of the famous Sir Henry Savile. He was educated at Wadham College, Oxford, repaired to court at the Restoration, and soon became notorious at once for debauchery and wit. Later he sat in parliament for New Romney, retired from court, and joined the party of Mary at the Revolution, out of *gratitude* to James, who had seduced his daughter, and made her Countess of Dorchester. 'Since his majesty has made my daughter a countess,' said he, 'it is fit I should do all I can to make his daughter a queen.' Johnson's line, 'And Sedley cursed the form that pleased a king,' has kept alive the memory of this sordid amour, but it is worth noticing that the daughter, speaking of what attracted the king, decries her own beauty with something of her father's wit: 'It cannot be my beauty, for he must see that I have none; and it cannot be my wit, for he has not enough to know that I have any.' Sedley survived till 1701. He left five authentic plays, among them *The Mulberry Garden* and *Bellamira*, but what little fame remains to him now rests solely on a few songs and *vers de société*. Even his licentiousness does not wear the open grossness of the age.

Seduction, in English law, means the act of decoying away a servant or member of a family from his or her duty; in a narrower sense it includes offences against the chastity of women, where the offender accomplishes his purpose by persuasion, not by force. It is not a criminal offence unless the facts are such as will support a charge of Rape (q.v.) or Abduction (q.v.). No action can be maintained by a woman who is seduced, however basely or deceitfully the seducer may have acted; but a master or mistress may sue in respect of loss of service caused by the seduction. If a father or mother can make out loss of service, damages can thus indirectly be recovered for the seduction of a daughter; and it is the inveterate practice of juries to give 'exemplary damages' in such cases, if the conduct of the defendant has been heartless or dishonourable. The rule of law is most irrational: a rich man, whose daughter occasionally makes his tea, can recover damages if she is seduced; a poor man, whose daughter is in a situation away from home, cannot. In Scotland the woman can sue in her own name if deceit has been used; but the difficulty of showing that the deceit was the only cause of the injury prevents such actions from being common. Redress is sometimes obtained by an action for breach of promise of marriage or (in Scotland) by an action of declarator of marriage; and the father of an illegitimate child can be compelled to maintain it.

See Smith's *Law of Master and Servant*, 7th ed. (1922); Walton on *Husband and Wife*, 2d ed. (1922).

Sedulius. See HYMN.

Sedum, a genus of plants of the family Crassulaceæ, having the calyx in four to eight (usually five) deep segments, which often resemble the leaves, the same number of spreading petals, twice as many stamens, and four to eight (usually five) ovaries, each with a nectariferous scale at the base. The species are numerous, with succulent, often roundish leaves, and pretty, star-like flowers. Many of them grow on rocks, whence the English name Stone-crop. They are natives of the temperate and cold parts of the northern hemisphere; some are British. Among the British species are *S. Telephium*, popularly called Orpine, and *S. acre*, the most common, whose brilliant yellow flowers adorn the tops of old walls, the debris around quar-

ries, &c. Many of the dwarf-growing species are employed in the style of flower-gardening called 'carpet-bedding.'

Seed. In the higher plants, which are called Spermatophytes or 'seed-plants,' the egg-cell lies within an Ovule (q.v.), and after fertilisation grows into an embryo plant, with one or two primary leaves—all before separation from the parent plant. What is separated, to begin in favourable conditions a new and independent life, is a seed, which may be defined as a ripe ovule containing an embryo plant.

From the article OVULE the reader will understand how the seed is formed, how a mass of tissue—the nucellus—borne by the carpellary leaf contains a female spore or 'embryo-sac,' whose nucleus divides into a female nucleus or oosphere, and a number of other nuclei of minor importance. The fertilised oosphere, within the embryo-sac, imbedded in the nucellus, and surrounded by the coats of the ovule, develops into an embryo plant, and the whole structure is called a seed.

Structure of the Seed considered in relation to the Growth and Germination of the Embryo.—The segmented egg-cell within the embryo-sac gives rise to the embryo and to a 'suspensor' which moors it. The figure shows somewhat diagrammatically the embryo moored to the top of the embryo-sac by the suspensor; the base of the embryo next the suspensor is the region from which the radicle or young root will spring; the depressed apex at the opposite pole of the embryo is the region from which the plumule or young stem will shoot forth; the two sides form the young cotyledons or seed-leaves.

The embryo is the essential part of the seed; the other structures are subsidiary to its nurture, protection, and germination. The stored food material is of great importance, for after separation from the

the embryo. It may lie in the cells of the nucellus, around but not within the embryo-sac, as in the seeds of bananas and ginger; then we call it perisperm. Or it may lie in more intimate relation to the embryo, within the embryo-sac, formed from the secondary nucleus (see OVULE), as in the seeds of wheat and castor-oil; then we call it endosperm. Sometimes there may be both endosperm and perisperm, as in water-lilies. But in many cases there is neither endosperm nor perisperm, all the food material being stored within the embryo itself—in its cotyledons—as in the pea and wallflower, apple and almond. Such seeds are somewhat confusedly called ex-albuminous.

The food materials, which are so often and by no means happily summed up in the term albumen, vary in different kinds of seeds, but in a general way we may say that they consist of starch, fatty, and protein substances in varying proportions.

Structure of the Seed considered in relation to the Protection of the Embryo.—As the embryo plant is a delicate structure, and as its separation from the parent plant is attended with vicissitudes, for the seed may be blown or carried into unfavourable conditions, and as most of the seeds which are liberated are not at once ready to germinate, it is important that the life of the embryo should be protected. This necessary protection is supplied in various ways. Around the ovule a double investment usually grows, and part of this investment is modified as the husk of the seed. The modification becomes marked as the seed grows ripe, as it begins to be ready for separation from the parent, as its supply of water begins to fail, as its vitality becomes more dormant; in fact the modification, which is a most useful one, is in part a necessary result of the physiological conditions of seed-ripening. In the modified husk it is generally possible to distinguish a thin, relatively unimportant internal tegmen from an outer, thicker, resistant testa. This testa may be leathery or woody, fleshy or gelatinous, smooth or hairy; it is variously adapted for the protection of the enclosed embryo. We may compare it to the shell or case which often surrounds the animal embryo. There is usually some relation between the nature of the seed-coat and that of the pericarp which surrounds the whole fruit; for in indehiscent fruits with tough walls (as in achenes and nuts) the seed-coat remains thin, while in dehiscent fruits the seed-coat is usually thick and hard. See GEOGRAPHICAL DISTRIBUTION.

Apart from the husk, the ripe seed is sometimes marked by a growth from its base or stalk. This is called the aril, and may be hairy as in willows and poplars, fleshy as in *Euonymus*, peculiarly shredded as in the mace of *Myristica fragrans* or nutmeg. When the growth from the base or from the funiculus of the seed is all on one side, it is called a caruncle, as in *Chelidonium majus*, *Viola tricolor*, and *Ricinus communis*. The outer surface of a liberated seed may also bear a mark at the place (hilum) where it separated from the funiculus; this is well seen in the common bean. Sometimes also a small opening or depression (*cicatricula*) persists as a remnant of the micropyle or aperture by which the pollen-tube passed between the coats of the ovule. In many cases the region marked by an external scar, corresponding to hilum or to micropyle or to both, is of special importance, the tissue of the seed-coat being modified so as to act as a sponge through which water soaks in to the embryo within. Many of the hard coats of seeds have, instead of this special sponge, numerous minute canals perforating their dense substance.

Structure of the Seed considered in relation to

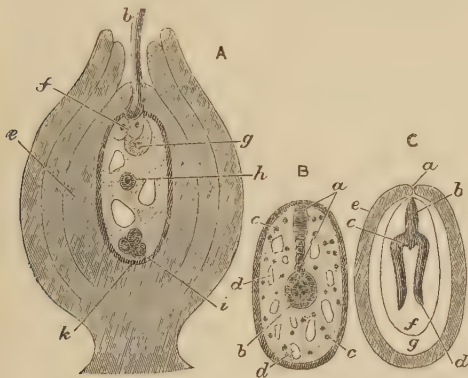


Diagram showing general structure of Seed (from Parker's *Elementary Biology*):

- A, section of ovule: b, pollen-tube; n, nucellus; f, accessory cells or synergids; g, ovum or egg-cell; h, central nucleus of embryo-sac; i, antipodal cells of embryo-sac; k, embryo-sac.
 B, embryo-sac, showing a, suspensor; b, embryo or segmented ovum; c, nuclei; d, vacuoles.
 C, section of a seed, showing a, the micropyle; b, embryo with embryonic root; c, embryonic stem; d, cotyledons; e, external seed-coat; f, endosperm; g, perisperm.

parent the embryo grows and sends out its rootlet, and pushes up its stem and expands its delicate leaves, in great part on the strength of what nutritive material the seed contains. This nutritive material, or 'albumen' as it is often called, out of which the first new parts of the young plant will be in great part built up, is formed in Angiosperms and in Gnetum after fertilisation, in Gymnosperms except Gnetum before fertilisation; and is disposed within the seed in three different ways in relation to

Seed-scattering.—Already in the article FRUIT reference has been made to adaptations which secure the dispersion of the seeds. Oftenest the dispersion depends upon the fruit, which may burst violently so that the seeds are scattered, or may be juicy and palatable so that it is eaten by birds and other animals, the indigestible seeds being in this way carried far and wide. Sometimes the fruit and the seed are virtually though not technically the same, as is the case in thistle-down, in which each little winged fruit borne about by the wind contains a single seed. Sometimes, however, the seeds themselves are borne about by the wind, as in willows and poplars, willow-herbs (*Epilobium*), cinchona, *Asclepias syriaca*, &c. The hairs which serve as parachutes to the seeds of poplars, willows, and the like are accessory growths outside the seed; a similar rich growth of cottony hair is characteristic of *Gossypium* and *Eriodendron*. It should also be noted that in many cases the seed is adapted to anchor itself, for the surface is often ridged or peaked, as in *Hyoscyamus*, *Papaver*, *Nigella*, or becomes glutinous in moist places, as in flax and some species of *Plantago*.

For further details as to the structure of seeds, consult morphological works such as Sachs's *Text-book of Botany*; for further details as to seed-scattering and the like, see Kerner's *Natural History of Plants*; for hints as to the practical study of seeds, see Strasburger's *Practical Botany*.

Vitality of Seeds.—Although the seed is a complex structure, it is usually able to remain for weeks, months, or even years in a state of dormant life hardly distinguishable from death except in its power of reawakening. We usually say that a seed is ripe at its separation from the parent plant, but this ripeness is not coincident with readiness to germinate. Sometimes indeed, as in the sheaves of corn in a wet season, the seeds may germinate before they leave the parent plant; so do those of the mangroves; those of ephemeral plants usually germinate as soon as they are scattered. In most cases, however, seeds are not ready to germinate until after they have remained for some time dormant. The seed of the mistletoe is ripe in autumn, but it does not germinate until April or May of the following year; that of *Draba verna* requires ten or eleven months of quiescence; that of *Euphorbia Cyparissias* remains under ground from four to seven years; that of *Euphorbia exigua* is said to lie dormant for nine years. In some cases the reason of the prolonged postponement of germination is to be found in the hardness and thickness of the husks which surround the seeds, and in the slowness with which water seems able to penetrate into the dense cells; and it is likely that time is also required for ferments which the seeds contain to do their work of preparing the reserve food material for use in germination.

Seeds vary greatly in their powers of retaining their life. Those of the willows and poplars are peculiarly short-lived; unless they land in moist places they usually die in a few days. 'Seeds rich in ferment quickly lose their power of germinating. Ripe acorns will not germinate after a year, nor coffee-beans after six months. Nor do those which are rich in oil survive nearly so long as those whose reserve-products consist mainly of starch.' There is no doubt that carelessly-made experiments have given rise to a much exaggerated estimate of the powers of retaining vitality which seeds possess. Thus, we often hear of mummy wheat which has germinated after many centuries; but this assertion rests on a deception. Indeed, modern experiments with the seeds of cereals show that they lose their vitality after ten years at most, and usually much sooner. Those of some leguminous plants may, however, survive for several decennia (whin and

melilot for fifty years). The vitality of seeds is also illustrated by the fact that some dry seeds can survive very high and very low (100° C. and -250° C.) temperatures.

Uses of Seeds.—As seeds are often rich in starchy, fatty, and protein substances, their importance as food is very great. Those of cereals and leguminous plants are especially valuable; and the seeds of hazel, chestnut, coconut, *Chenopodium Quinoa*, *Bertholletia*, *Pinus Cembra*, and many others are also edible. Others, such as mustard and nutmeg, furnish spices; many others, such as linseed, almonds, coconut, castor-oil plant, yield oil; cotton-wool surrounds the seeds of *Gossypium*, &c.; vegetable ivory is the dense endosperm of *Phytalephas*. Some seeds are rich in stimulants, as in coffee and kola plants; many, such as *Strychnos Nux vomica* and *Physostigma*, yield drugs.

Seedling Forms, or JUVENILE FORMS. See RETINOSPORA.

Seeland (Dan. *Sjælland*). See ZEALAND.

Seeley, SIR JOHN ROBERT, K.C.M.G. (knighted in 1894), was born in London in 1834, the third son of the publisher, Robert B. Seeley (1798-1886). He was educated at the City of London School, and at Christ's College, Cambridge, and graduated in 1857 first (equal with three others) in the first class in the classical tripos. Next year he became a Fellow of his college, later a lecturer there, then at his old school, but in 1863 was professor of Latin in University College, London, in 1869 of Modern History at Cambridge, with a fellowship at Christ's in 1882. *Ecce Homo* appeared anonymously in 1865, and excited an extraordinary commotion in the religious world in England, which was startled almost as much by its consummate literary excellence and its spiritual reverence as by the absence of the supernatural element. As a study of the human character of Jesus it still stands unrivalled. It was followed in 1882 by *Natural Religion*, a work hardly less valuable, though less known. He died 14th January 1895.

Other, and acknowledged, works of Seeley's are *English Lessons for English Readers*, in collaboration with Dr E. A. Abbott (1869); *Lectures and Essays* (1870); an edition of *Livy*, Book I. (1871); *Life and Times of Stein: or Germany and Prussia in the Napoleonic Age*, a work that has satisfied even German scholars (3 vols. 1879); *The Expansion of England* (1883); *A Short Life of Napoleon the First* (1885); and *Growth of British Policy* (with Life by Prothero, 1895); *Introduction to Political Science* (1896)—besides many important contributions to magazines.

Segantini, GIOVANNI (1858-99), painter, was born of humble parents in Arco on the Lake of Garda, for a time lived as herdboys on the mountains, and then was sent to study at the School of Art in Milan, but was largely self-taught. He was most successful in realistic interpretations of nature and mountain scenery, and his work, decorative in scheme, is characterised by vivid design coupled with harmony of colour.

Segesta, or EGESTA, an ancient city of the Elymi, in the north-west of Sicily, 8 miles WSW. of the town of Alcamo. The Athenian expedition of 415 B.C. was ostensibly in aid of Segesta against Selinus. After this it became a dependent ally of Carthage. In 307 it was sacked by Agathocles of Syracuse. In 206 it became Roman, and soon received Latin rights. It suffered much from the attacks of the Saracens, and there is now little to be seen there but the fine ruins of a theatre and of a great Doric temple, hexastyle peripteral, with 36 columns, measuring 200 by 86 feet. It was never finished; the cella was never built, the columns have been left unfluted and the metopes flat. There are hot springs five miles to the north.

Segesvár (Ger. *Schässburg*, Rum. *Seghisoara*), a town of Transylvania, on the Great Kokel, 60 miles by rail NE. of Hermannstadt, consists of an upper and a lower town. Pop. 12,000, who weave cotton and linen. Here on 31st July 1849 the Hungarians were defeated by the Russians; Petöfi is believed to have been amongst the slain.

Segovia, an old city of Spain, stands at the northern foot of the Sierra de Guadarrama, 32 miles NNW. of Madrid. It occupies a rocky eminence 3300 feet above sea-level, is surrounded by ruinous walls with round towers, and consists of narrow uneven streets, with old, quaint, and stately houses, and numerous parish churches and convents. The fortress or castle is perched on the west extremity of the rocky height, and was originally Moorish, but has been gradually restored since its destruction by fire in 1862; its towers and windows command magnificent views. The cathedral (1521-77) is one of the finest specimens of Late Gothic in Spain. The grand aqueduct, built in the time of Trajan, is a very fine example of Roman architectural work. It consists of two rows of arches, the one resting upon the other, some 2600 feet long and 102 feet high. Wool-scouring and the manufacture of paper, pottery, and cloth are languidly carried on. Pop. 16,000. Segovia was a place of importance during the time of the Romans, and was frequently the residence of the kings of Castile and Leon. Charles I. of England lodged at the castle, 13th September 1623, and supped on 'certaine trouts of extraordinary greatness.' The unresisting town was sacked in 1808 by the French.—The province has an area of 2635 sq. m. and a pop. of 167,000.

Segu, or **SEGU-SIKORO**, an important trading town of western Africa, stands on the Niger (here called the Joliba), 400 miles SW. of Timbuktu. It was formerly the capital of a large native state, which has lost power under the successive conquests of the Toucouleurs, the Bambarra, and the French (1890). The traders are chiefly Arabs. Pop. 36,000.

Ségur, the name of a French family, originally of Guienne, distinguished both in arms and letters, as well as for its sufferings in the Huguenot cause. Its most famous members were the following: HENRI FRANÇOIS, Comte de Ségur (1689-1751), an able French general in the war of the Austrian succession. His son, PHILIPPE HENRI, Marquis de Ségur-Ponchat (1724-1801), fought in the Seven Years' War, became marshal in 1783, and outlived in his retirement the stormy scenes of the Revolution. The eldest son of this Philippe Henri was LOUIS PHILIPPE, Comte de Ségur d'Aguesseau (1753-1830), for five years ambassador at the court of St Petersburg, and a great favourite with Catharine II. He served in the American war of independence, hailed the great Revolution with delight, and, stranger still, retained in extreme old age that love of liberty that marked his early years—the last act of his life was a eulogium on the revolution of July. As a writer Ségur exhibits in fine perfection the national graces of style and spirit. Among his numerous writings are: *La Politique de tous les Cabinets de l'Europe* (1793); *Histoire de Frédéric-Guillaume II.* (1800); *Histoire Universelle* (1817); *Galerie Morale et Politique* (1817-23), a delightful work; *Mémoires* (1825-26). He left two sons, OCTAVE and PHILIPPE PAUL, the latter of whom (1780-1873) was a general of the first empire, took part in the fatal expedition to Russia in 1812, and wrote the story of the campaign (1824), as also on Peter the Great and Charles VIII. See the Life of him by Taillandier.

Seiche, a tide-like phenomenon first observed on the Lake of Geneva (q.v.), but now recognised

in many lakes, rivers, and land-locked arms of the sea, which have been credited to differences of barometric pressure, to the effect of winds, or to earth tremors. In longitudinal seiches the water is higher at one end of the lake, but there are binodal (when low-water occurs simultaneously at both ends) and multinodal seiches. See Dr Forel's *Le Léman* (3 vols. 1892-1905), Sir G. Darwin, *Tides*.

Seidlitz Powders (so named from the village of Seidlitz or Sedlitz in northern Bohemia, where there is a spring of natural aperient mineral-water with similar constituents) are composed of 120 grains of tartrate of soda and potash and 40 grains of bicarbonate of soda reduced to powder, mixed and enclosed in a blue paper, and 38 grains of powdered tartaric acid in a white paper. The contents of the blue paper are dissolved in from half a tumbler to a tumbler of water, and those of the white paper are then stirred in. The mixture should be taken while the effervescence from the liberation of the carbonic acid is still going on. These powders act as an agreeable and mild cooling aperient. If a stronger dose is required, either an increased quantity of the powder may be used, or a little sulphate of magnesia (about a drachm) may be added.

Seine, one of the four chief rivers of France, rises on the slope of the plateau of Langres, north-west of Dijon, and flows north-westward, with many windings, past Troyes, Fontainebleau, Melun, Paris, St Denis, St Germain, Mantes, Elbeuf, and Rouen, through a total course of 482 miles, and pours its waters into a wide estuary of the English Channel, on which stand the ports of Harfleur, Havre, and Honfleur. It is navigable for boats from Marcilly, 350 miles from its mouth, and since 1890 the canalisation of the Seine has been one of two projects (the other a ship-canal) for connecting Paris with the Atlantic (see PARIS). The Seine drains an area of 30,000 sq. m.; receives the Aube, Marne, and Oise from the right, and the Yonne, Loing, Essonne, and Eure from the left; and is connected by canals with the Somme, Scheldt, Meuse, Rhine, Saône, and Loire. Works for keeping open a navigable channel through the estuary, which is liable to silt up, were commenced as far back as 1848, and were continued for more than twenty years. In consequence of these engineering works 28,000 acres of land were reclaimed, and vessels of 2000 tons, drawing 20 feet of water, can get up to Rouen. Moreover, a canal has been constructed to give Havre connection with the Seine at Tancarville, so that vessels can avoid the uncertainties of the deeper estuary.

See the beautiful engravings in *The Seine and Loire* (from Turner's *Rivers of France*; 1886); and Sir Edward Thorpe's *The Seine from Havre to Paris* (1913).

Seine, the metropolitan dept. of France, completely enclosed by the dept. of Seine-et-Oise, is a portion of the former province of Île-de-France, and derives its name from its principal river, the Seine. One-sixth of its area is covered by the city of Paris (q.v.), and the rest is quickly studded with the suburban villages of the capital—Boulogne, Puteaux, Clichy, Montreuil, &c. It is at once the smallest and most populous dept. in the republic: its area is 185 sq. m.; its pop. in 1876 was 2,410,841; in 1921, 4,411,691; in 1926, 4,204,853. From south-east to north-west it is traversed for 37 miles by the windings of the Seine, which receives the navigable Marne at Charenton and the Bièvre at Paris. The surface is marked by undulations and low hills, the highest, Mont Valérien and Mont Bicêtre, reaching 650 feet. The scenery—of which the woods of Verrières, Meudon, and Saint-Cloud, together with those of Vincennes and Boulogne, transformed into parks, and watered by artificial

ivers and lakes, are perhaps the most striking features—is wonderfully charming. A network of canals and railways, the latter converging in the capital, afford easy means of transit in any direction. The soil is not naturally fertile, but, owing to the skill of the farmers and gardeners, who obtain abundant supplies of manures from the metropolis, the country around Paris and its suburbs has been rendered remarkably productive. The culture of vegetables and fruits for the markets of Paris is one of the most important branches of husbandry. Enormous quantities of mushrooms are cultivated in the ancient quarries of Paris near Montrouge, and in the catacombs beneath the city. Quarries of gypsum and freestone abound, and are productive. Manufacturing industry is very active and extensive, but is principally concentrated in Paris and its suburbs. The arrondissements are Paris, St Denis, and Sceaux.

Seine-et-Marne, a dept. in the north of France, is bounded on the W. by the dept. of Seine-et-Oise, and forms a portion of that wide basin in the middle of which stands Paris. Area, 2275 sq. m.; pop. (1921) 349,234. The dept. is drained by the Seine and its tributaries (Yonne and Loing) and the Marne and its tributaries (Ourcq, Petit Morin, and Grand Morin). The surface is broken into a series of plateaus separated by valleys. Timber is grown in every part; and among the forests is that of Fontainebleau. The soil is generally fertile. Wheat, oats, potatoes, beet-root, and fodder crops are the chief productions. Building-stone, gypsum, clay, sand, and peat are extracted in large quantities. The manufactures are very varied, and embrace paper, sugar, porcelain and glass, spirits, flour, tiles, &c. The cheeses of Brie are well known, and so are the roses of Provins. The white grapes of Fontainebleau have a European reputation. The capital is Melun, and the arrondissements are Melun, Coulommiers, Fontainebleau, Meaux, and Provins.

Seine-et-Oise, a dept. in the north of France, encloses the metropolitan dept. of Seine. Area, 2184 sq. m.; pop. (1921) 921,673; (1926) 1,053,584. The principal rivers are the Seine and its tributaries the Oise, Marne, Essonne, Bièvre, Epte, &c. The surface is pretty level on the whole, but the country is charmingly diversified by picturesque valleys and great forests. Vast quantities of wheat, oats, potatoes, beet-root, and fodder crops are produced; and there are several fine varieties of stone and clay. There are numerous branches of manufacture, the most important being porcelain (at Sèvres), paper, cotton and woollen stuffs, iron goods, sugar, spirits, bricks, chemicals, laces, soap, and motor-cars. The dept. is divided into the arrondissements of Versailles, Corbeil, Étampes, Mantes, Pontoise, and Rambouillet, and the capital is Versailles.

Seine-Inférieure, a maritime dept. of north-east France, formed out of the old province of Normandy, and bounded on the N. and W. by the English Channel. Area, 2448 sq. m.; pop. (1921) 880,671. The Seine flows through the southern districts; but a number of important though small streams flow north-west across the dept. and fall into the Channel. The hills of Caux extend from east to west, and to the south of them are rich pasture-lands, watered by the Seine and its affluents. The coasts are formed of chalk-cliffs, varying in height from 200 to 400 feet. This dept. is one of the most flourishing in all France, having many manufacturing establishments (cotton and woollen mills, dyeworks, shipyards, foundries, sugar-refineries, tobacco factories, chemical works, &c.), a large trade from Havre, Rouen, and Dieppe, and much prosperous farming (cheese, butter, cattle,

wool). Cider is extensively made. The coast-fisheries are valuable. On its coast are the favourite seaside resorts of the Parisians—Fécamp, St Valéry, Tréport, Dieppe, and others. The arrondissements are Dieppe, Le Havre, Rouen, Neufchâtel-en-Bray, and Yvetot. The capital is Rouen.

Seine-net. See FISHERIES.

Seir, MOUNT. See EDM.

Seisin, or SASINE. See FEOFFMENT, INFEEFMENT.

Seismometer is an instrument for measuring shakings, tremors, and tiltings of the earth (see EARTHQUAKE). In its earlier and ruder forms it was merely a seismoscope or seismograph, and its indications or records could not be interpreted quantitatively. Such, for example, is Babbage's bowl of treacle, in which the liquid, tending by inertia to remain steady as the bowl moves with the ground, leaves a high tidal mark as an evidence of the earthquake. Probably, but by no means certainly, such an instrument would indicate the direction of the largest motion occurring in an earthquake. It could not, however, record the succession of oscillations that make up the shock, or give really comparative records of different earthquakes. Similar limitations exist in all forms of liquid seismoscopes, such as Mallet's and Palmieri's, in which mercury moving in glass tubes forms the 'steady body.' A complete seismometer must, indeed, be capable of recording the entire earthquake motion in time, so that the amounts and rates of motions in all directions can be readily estimated from the records. The practical realisation of such an instrument we owe to the labours of Ewing, Gray, and Milne, who, working simultaneously and more or less in concert, brought to bear upon the problem of Japanese earthquakes a rare combination of scientific knowledge and mechanical skill. Gray and Milne's Seismometer (see *Philosophical Magazine*, 1887) is perhaps the most complete of its kind, and is identical in principle with Ewing's Bracket Seismometer, which was the earliest instrument constructed for recording on the same sheet both the horizontal and vertical motions of small earthquakes. In these instruments there are three weights suspended by brackets, so that each has somewhere within it a 'steady point' with reference to one of the three directions, N. and S., E. and W., up and down. To these weights suitable levers are attached, which trace out on a smoked surface any desired magnifications of the relative motions of the earth and the corresponding steady points. Thus we obtain records of the three components of an earthquake motion; and from these the whole motion can be reconstructed and a model made of the complex motion of an earth particle, as was done by Professor Sekiya of Japan. When the vertical motion is large, so that the earth's surface is thrown into distinct waves, these bracket seismometers fail to act as such. The precise meaning of a 'steady point' may be best obtained from consideration of a long pendulum with a heavy bob. We may suppose a pencil fixed to the bob and bearing lightly upon a sheet of paper resting on the ground. In an earthquake the ground moves, and with it the pendulum support. But the pendulum bob, because of its inertia, remains steady during the first motion, of which, consequently, we get a tracing on the paper. The subsequent tracing is a combination of the real earthquake motion and the slow swing of the pendulum itself. To get a perfectly steady point we should have to use an infinitely long pendulum. By a combination of an inverted unstable pendulum with an ordinary stable pendulum of convenient size, the stability may be reduced to neutrality,

and a very satisfactory steady point obtained. This plan, first suggested by Principal Forbes, is very effectively realised in Ewing's Duplex Pendulum Seismometer. The record is a superposition of the whole horizontal motion, and gives definitely little more than the maximum displacement in direction and magnitude. For earth tremors and earth tiltings much more delicate instruments are needed than have been described. Of these Bertelli's Tromometer is the best known. For large and disastrous earthquakes the havoc wrought is the only seismoscope that can be depended upon.

Seistan, or HAMUN-I-HELMAND, a large, irregularly-shaped, shallow lake or swamp in the west of Afghanistan, close to the frontier of the Persian province of Khorasan, a division of which province (mainly steppe) is named Seistan after it. The lake is not a single expanse of water, but is divided into three depressions. Great part of the area is generally dry; but, as the basin has no outlet, when the Helmund (q.v.) is in flood the lake overflows and fertilises large tracts of country.

Sejanus. See TIBERIUS.

Selachoides. See CARTILAGINOUS FISHES.

Selaginella, a genus of heterosporous Pteridophytes, closely allied to the so-called Club-moss (see LYCOPODIACEÆ), many of the species cultivated in conservatories. The sole genus of the family Selaginellaceæ, *Selaginella* chiefly inhabits regions between the equator and 35° N. lat. One species, *S. selaginoides*, is found in Britain.

Selan'gor, one of the Federated Malay States, has been since 1874 under British protection. It lies between Malacca and Perak, has an area of 3156 sq. m. and a pop. (1921) of 401,000, including many Chinese; contains rich deposits of tin, is well forested, and grows tapioca, rubber, rice, and sugar. The capital is Kwaia Lampur (with 80,000 inhabitants), which is connected by rail (27 miles) with Klang and Port Swettenham, the principal ports of the state, on the Klang River. See MALAY STATES.

Selborne, a pleasant Hampshire parish of 12 sq. m., 5 miles SSE. of Alton station and 20 E. of Winchester. Gilbert White (q.v., 1720-93) has made it for ever famous by his *Natural History of Selborne* (1789). 'The Wakes,' the ivied house where he lived and died, still stands, though added to; the church, where he lies, was restored in 1877. Nothing remains of an Augustinian priory (1232).

Selborne, ROUNDELL PALMER, EARL OF, was born at Mixbury Rectory, Oxfordshire, November 27, 1812, and had his education at Rugby and Winchester and at Trinity College, Oxford. His course was exceptionally brilliant; he carried off the Chancellor's prize for Latin verse (1831), the Newdigate (1832), the Ireland scholarship (1832), took a classical first-class in 1834, was elected to a Magdalen fellowship, and took both the Chancellor's prize for the Latin essay (1835) and the Eldon Law scholarship. He was called to the bar at Lincoln's Inn in 1837, and became a Q.C. in 1849; sat for Plymouth in the House of Commons from 1847 till 1852, and again from 1853 till 1857; became Solicitor-general in 1861 under Palmerston, being at the same time knighted and returned for Richmond; and was Attorney-general from 1863 till the fall of the Russell government in 1866. His inability to accept Mr Gladstone's whole Irish Church policy prevented his accepting the Chancellorship in 1868, but he succeeded Lord Hatherley in 1872, and was created Baron Selborne. The year before he had represented the government as counsel before the Arbitration Court at Geneva. Selborne was ever active as a reformer in legal procedure, and his reign will

remain memorable from the fusion of law and equity effected by his Judicature Act (1873). He fell with his party in February 1874, but returned to the woolsack in May 1880, and sat till the dissolution of 1885. He was raised to the rank of Earl of Selborne in 1882. He found himself unable to accept Mr Gladstone's Irish policy, and therefore in February 1886 declined a third term of office. Chairman of the Oxford University Commission, he was made D.C.L. (1863), and was Lord Rector of St Andrews University in 1877. His *Book of Praise* (1863; 9th ed. 1892) is an admirable collection of hymns. Other books are *Notes on some Passages in the Liturgical History of the Reformed English Church* (1878), *A Defence of the Church of England against Disestablishment* (1886), and *Ancient Facts and Fictions as to Churches and Tithes* (1888). He died 4th May 1895. See his *Memorials* (4 vols. 1896-98).

Selby, a market-town in the West Riding of Yorkshire, on the right bank of the Ouse, 15 miles S. of York and 20 E. of Leeds. The great cruciform parish church, measuring 283 by 59 feet, was the church of a mitred Benedictine abbey, founded in the 12th century by Hugh, sheriff of Yorkshire. It exhibits every style from Norman to Perpendicular; lost its south transept by the fall in 1690 of the central tower (meanly rebuilt twelve years later); and was completely gutted by fire in October 1906, but the repairing of the fabric, happily not destroyed, was at once undertaken and completed in 1909. The river is navigable for small vessels up to 400 tons. Selby has manufactures of flax, ropes, leather, beer, &c., besides shipbuilding and the making of bricks, oil-cake, sauces, flour. It is the traditional birthplace of Henry I. (1068), and in the Great Rebellion was recaptured from the royalists by Fairfax (1644). Pop. 10,000. See W. W. Morrell's *History of Selby* (1867).

Selden, JOHN, an illustrious English scholar and jurist, was born at Salvington near Worthing in Sussex, 16th December 1584, studied at Hart Hall, Oxford, for three years, and then removed, first to Clifford's Inn, London, and afterwards to the Inner Temple, to study law. It was here that his great learning began to attract attention, and won for him the friendship of Camden, Usher, Sir Robert Cotton, and Sir Henry Spelman. As a conveyancer and chamber-counsel he acquired wealth, yet found time for studies at once profound and wide in range. Selden wrote his first treatise, relating to the civil government of Britain previous to the Norman Conquest, and entitled *Analecton Anglo-Britannicon* (pub. 1615), when twenty-two years of age. In 1610 appeared his *Jani Anglorum Facies Altera* (Eng. trans. 1683), giving an account of the common and statute law of English Brittany to the death of Henry II., and also *The Duello, or Single Combat*, a history of trial by battle; and in 1614 was published his *Titles of Honour*, still an authority. Three years later appeared his erudite work on the Syrian gods, especially in their connection with the Old Testament, entitled *De Diis Syriis Syntagmata Duo*. His *History of Tithes* (1618) demolished their *divine right*, and brought down upon his head the fulminations of the clergy, much more noisy than convincing. Fortunately for his assailants the Privy-council suppressed the book and forbade him to reply. In 1621 Selden suffered a brief imprisonment for advising the parliament to repudiate King James's doctrine that their privileges were originally royal grants; in 1623 he was elected member for Lancaster, in 1626 for Great Bedwin, and in 1628 for Ludgershall, both in Wilts, and henceforward till his death he took a considerable part in public affairs.

He was sincerely attached to the cause of the

parliament, and as sincerely opposed to the views of the court party and the king, but he was above all things a constitutional lawyer, and derived his ideas of the rights of the subject from the history of the nation, and not from religious fanaticism or metaphysical considerations. Still he 'loved his ease,' as Clarendon says, and so let things be done without protest of which he did not approve. In 1628 he hoped to draw up the Petition of Right, and the year after he was committed to the Tower with Eliot, Holles, and the rest. After eight months' rigorous imprisonment he was transferred to the Marshalsea, but soon after was released through the favour of the Earl of Arundel, and retired to Wrest in Bedfordshire, the seat of the Earl of Kent. In 1640 he was chosen member of the Long Parliament for the university of Oxford; and now, when the struggle between the king and the nation began to point towards the fatal rupture, he was suspected of not being zealous enough by such as were themselves perhaps over-zealous. Already in 1635 he had dedicated to the king his *Mare Clausum* (an answer to the *Mare Liberum* of Grotius and the Dutch claims to fish off the British coasts), and there is evidence that Charles personally looked on him with favour. Selden was one of the committee of twenty-four appointed to draw up a remonstrance, and at this point his path first diverged from that of Hyde, yet without their friendship being impaired. He opposed vigorously the policy that led to the expulsion of the bishops from the House of Lords, and finally to the abolition of Episcopacy. Yet he adhered in the main to the cause of the parliament, driven by the complete arbitrariness of the king's later measures. He took no direct part in the impeachment of Strafford and voted against the Attainder Bill, and, though he furnished precedents for the measures taken against Laud, had no share in his prosecution.

He sat as a lay-member in the Assembly of Divines at Westminster (1643), and perplexed his clerical colleagues sadly with his irony and his learning. Soon after he was appointed keeper of the rolls and records in the Tower. In 1644 he was appointed one of the twelve commissioners of the Admiralty, and elected master of Trinity Hall at Cambridge, which office he declined. In 1646 he subscribed the Covenant, and the year after the sum of £5000 was voted to him by parliament in consideration of his services and sufferings. In 1647 he was appointed one of the university visitors, and always used his influence to moderate the tyranny of his fanatical colleagues. One of his last public acts was to join in the last effort for a reconciliation between the king and the parliament. After the execution of Charles, of which it is certain he strongly disapproved as both unlawful and inexpedient, he took little share in public matters; and when requested by Cromwell to answer the *Eikon Basilike*, he refused. His death occurred at Whitefriars, November 30, 1654, and he was buried in the Temple Church, London. His last years he had spent in the house of Elizabeth, dowager-countess of Kent, with whom, between her husband's death in 1639 and her own in 1651, the intimacy had been so great as to colour Aubrey's statement that they were privately married. He left about £40,000; his 8000 books were given by his executors to the Bodleian. The principal writings of Selden, besides those already mentioned, are: *Marmora Arundeliana* (1624); *De Successionibus in Bona Defuncti secundum Leges Ebraeorum* (1634); *De Jure Naturali et Gentium, juxta Disciplinam Ebraeorum* (1640), a work more learned than critical, like most of Selden's biblical productions, who thought far too much of the

opinions of the Rabbins; *Uxor Ebraica*; and *De Synedriis et Praefecturis Juridicis Ebraeorum* (1650 et seq.); besides a great variety of posthumous tracts and treatises, of which the most famous, and also the most valuable, is his *Table-talk*, recorded and published by his amanuensis, Richard Milward, in 1689 (ed. by Singer, 1847, and by Reynolds, 1892). Of this Coleridge says, with some exaggeration, however: 'There is more weighty bullion sense in this book than I can find in the same number of pages of any uninspired writer.' Selden's best character stands in the gallery of Clarendon, who adds excellently: 'His style in all his writings seems harsh, and sometimes obscure; which is not wholly to be imputed to the abstract subjects of which he commonly treated, out of the paths trod by other men, but to a little undervaluing the beauty of a style, and too much propensity to the language of antiquity; but in his conversation he was the most clear discusser, and had the best faculty in making hard things easy and present to the understanding, of any man that hath been known.' Selden's works were collected and published at London in three folio vols. (1726).

See Singer's Biographical Preface, Dr John Aikin's *Lives of Selden and Usher* (1811), and G. W. Johnson's *Memoir* (1835). The Selden Society was founded in 1887 for promoting the study of English legal history.

Selection. See DARWINIAN THEORY, SEXUAL SELECTION.

Selectmen. See MASSACHUSETTS.

Selene, the Greek moon-goddess, a daughter of Hyperion and Theia, and sister of Helios (the Sun) and Eos (the Dawn). As sister of Helios or *Phoibos* ('shining') she had the name of *Phoibe*, and latterly was identified with Artemis, though the identification was never quite exact, as Artemis always retained her reputation for chastity, while Selene had fifty daughters by her lover Endymion and several by Zeus. She is represented by the poets as a lovely woman with long wings and a golden diadem, riding across the heavens in a chariot drawn by two white horses, cows, or mules. See *Ueber Selene und Verwandtes*, by W. H. Roscher (1890-5).

Selenga, a river (740 miles) of Mongolia and Siberia, flowing by three arms into Lake Baikal. It is navigable from May till October for 200 miles from the Chinese frontier, and steamers and lighters ply on it.

Selenite (Gr. *Selenē*, 'the moon'). This name is given to the transparent variety of Gypsum (q.v.). It occurs in distinct crystals belonging to the oblique or monoclinic system, or in folia. It is usually white (colourless), but sometimes it is tinged with red, yellow, green, gray, &c. Selenite is soft, easily cut, and capable of being split into very thin plates. These are much used in polarising apparatus (see POLARISATION). Selenite is a comparatively common mineral, although it rarely occurs in large quantities. Finely crystallised specimens are found at Bex in Switzerland, in Sicily, and at different places in the United States. There is a magnificent group of crystals of this mineral in the British Museum from Reinhardtsbrunn in Gotha. In Nova Scotia, where, in the vicinity of Oxford, near River Philip, there are vast deposits of gypsum (large quantities of which are sent to the United States), selenite is found abundantly. At Petitcodiac, New Brunswick, where extensive deposits of gypsum also occur, there is a vein of nearly pure selenite one mile long and eight feet wide. Selenite, being a pure form of gypsum, is used for making the finest kind of plaster of Paris. Plates of selenite are said to have been used by the ancients for some of the purposes for which we use glass.

Selenium (sym. Se; at. number, 34; at. weight, 79.2) is an element having two forms. In the *vitreous* form, at ordinary temperatures, it is a solid of a dark-brown colour, and when broken presents a conchoidal vitreous fracture; thin splinters of it are, however, of a dark-red tint when seen by transmitted light. It is tasteless and inodorous, a non-conductor of electricity. Its specific gravity is 4.28; its melting-point is 217° C., and its boiling-point 700° C. When selenium is very slowly cooled from the fused condition its appearance is quite different; the structure being *granular* or *crystalline* (sometimes called 'metallic'). Crystalline selenium is of a dull leaden colour; it is very opaque to light even in thin films; its specific gravity is 4.8, its melting-point 200° C., and its boiling-point 680° C. It is a conductor of electricity at ordinary temperatures. Crystalline selenium varies in electrical conductivity with its state of aggregation and the time during which a current has been passing through it; and up to 270° C., which is above the melting-point, it acts unlike a metal in respect that its conductivity increases with the temperature. When crystalline selenium is acted upon by light (especially the yellow and the red), and to a less extent when acted upon by dark rays, it increases in conductivity; in the case of very bright sunlight this increase being sometimes even tenfold. Light of variable intensity produces corresponding and rapidly-responding variations in the conductivity of the crystalline selenium upon which it may fall—a circumstance utilised in 1880 in the Photophone (q.v.), and since then in numerous practical applications. The vapour of selenium is inodorous and deep yellow; it is 164 times as heavy as hydrogen at 1400° C.; this corresponds nearly to the molecular formula Se_2 . When heated in the air selenium does not very readily take fire; but it is combustible, and burns with a blue flame, and gives off an irritating and malodorous vapour, while a portion of it is volatilised in red fumes. The product of combustion is oxide of selenium, SeO_2 .

Selenium is of rare occurrence in nature; it is chiefly found as a selenide in combination with lead, silver, copper, or iron; but it has also been discovered in sulphur, and in certain sulphides of iron. It forms with oxygen a suboxide and a binoxide (SeO_2 , selenious anhydride); and as it forms also a selenic acid, $\text{H}_2\text{SeO}_4 + x \text{ aq.}$, the existence of a selenic anhydride SeO_3 is inferred, though it has not been isolated. With hydrogen selenium forms seleniuretted hydrogen, or hydroselenic acid, H_2Se . Selenium was discovered in 1817 by Berzelius, in the refuse of a sulphuric-acid manufactory. He named it selenium (Gr. *selênê*, 'the moon'), because in many respects it resembled tellurium (from Lat. *tellus*, 'the earth').

Seleucia, the name of several ancient cities in Syria, Pisidia, Pamphylia, Cilicia, Caria, and Mesopotamia, founded during the earlier existence of the dynasty of the Seleucidæ (q.v.). Of these two were especially distinguished. (1) **SELEUCIA PIERIA**, founded by Seleucus Nicator, a few miles north of the mouth of the Orontes in Syria, was the seaport of Antioch, and became of great importance during the wars between the Seleucidæ and the Ptolemies for the possession of Syria. It rapidly declined under the Roman dominion. The ruins have been fully explored and described in modern times by Pococke (*Observations on Syria*) and Chesney (*Royal Geographical Society's Journal*, vol. viii.). The remarkable tunnel of 1088 yards in length, which was excavated out of the solid rock and formed the only communication between the city and the sea, and the remains of its triple line of walls, citadel, temples, amphitheatre,

necropolis, &c. attest the former importance and splendour of the city. (2) **SELEUCIA ON THE TIGRIS** was also built by Seleucus Nicator, on the west bank of the Tigris, 40 miles (according to Strabo 33) north-east of Babylon, which was despoiled to supply materials for the construction of the new city. Situated in a district of great fertility, and commanding the chief trading routes of Assyria, Babylonia, and western Persia, it rapidly rose to wealth and splendour, supplanted Babylon as the capital of the eastern portion of the Seleucid monarchy, and when in the acme of its greatness contained a population of more than 600,000. When the Seleucid empire fell before the Romans the fate of Seleucia was sealed. It was partly burned by Trajan (116 A.D.), and in 165 was completely destroyed by Avidius Cassius.

Seleucidæ, the dynasty of kings to whom fell that portion of Alexander the Great's Asiatic conquests which included Syria, a large portion of Asia Minor, and the whole of the eastern provinces (Persia, Bactria, &c.). The founder of the dynasty was **SELEUCUS I.**, surnamed Nicator, who in the second partition of Alexander the Great's empire obtained Babylonia, to which, with the aid of Antigonus, he subsequently added Susiana; but a quarrel having arisen with that powerful chief, Seleucus took refuge in Egypt (316 B.C.). The course of events, however, allowed him to return to his satrapy in 312; his re-entry into Babylon marked the beginning of the *era of the Seleucidæ*. Having recovered Susiana, he conquered Media, and extended his power to the Oxus and Indus. In 306 he assumed the regal title; and four years afterwards he joined the confederacy of Ptolemy, Lysimachus, and Cassander against Antigonus, and obtained the largest share in the conquered territories of that ruler, a great part of Asia Minor and the whole of Syria falling to him. Towards the close of his reign he gained by war the rest of Asia Minor, but was assassinated (280) by one of his own officers. Seleucus cherished the ambition of building up a second empire equal in extent to Alexander's, and he pursued with great zeal the plan of 'Hellenising' the East, by founding numerous Greek and Macedonian colonies in various parts of his dominions; he also built numerous cities, several of which—as Antioch in Syria and Seleucia on the Tigris—rose to be among the most populous and wealthy in the world. In the reign of his feeble grandson, **ANTIOCHUS II.** (260–246), Bactria was lost and the foundations were laid of the kingdom of Parthia. His son, **SELEUCUS II.** (246–226), surnamed Callinicus, was greatly beset by Ptolemy of Egypt, by his own brother, and by the Parthian prince, but managed to hold his own with some difficulty. The glories of Seleucus I. were revived in the second son of Seleucus II., **ANTIOCHUS III.** (q.v.), 'the Great,' who was the first of the Eastern 'great kings' of Iran to come into collision with the Romans. His second successor was his own able son, **ANTIOCHUS IV.** (q.v.), Epiphanes (I.; 'the Illustrious'), who conquered Coele-Syria and Palestine from the Egyptians, but withheld his hand from Egypt at the bidding of the Romans. He practised atrocious cruelties on the Jews, whose religion he endeavoured to root out in favour of the Greek religion; but the heroic resistance of the Maccabees (q.v.) completely foiled his project. He died in a state of raving madness, which was attributed by his subjects to his sacrilegious crimes, and so they in derision converted his surname into Epimanes ('the Madman').—The succeeding rulers were for the most part a set of feeble and incompetent sceptre-holders, none of whom was able to delay the gradual disintegration of the empire. Babylonia, the original centre of their power, was conquered by the Parthians in

the reign of Demetrius II. (146-125). From that time the Seleucids were restricted to Syria, until that region was taken from them by Pompey and converted into a Roman province (65 B.C.).

Self-defence. See ASSAULT, MANSLAUGHTER. **Self-denying Ordinance,** a measure carried through parliament in 1645 by the influence of Cromwell and the Independents, by means of which generals who were either less efficient or but half-hearted in the cause were removed from the command of the army. After Manchester's lack of energy at the second battle of Newbury (October 27, 1645) Cromwell had determined upon a change of tactics, and attacked Manchester in parliament, but he soon found the more sweeping measure a better means towards his ends. The Lords threw out the measure, whereupon the Commons proceeded to form a New Model Army under Sir Thomas Fairfax as general-in-chief. The Lords now passed the measure with some alterations and called on all existing officers to resign. Thus Essex, Waller, and Manchester were got rid of, while Cromwell was specially reappointed to the command of the cavalry as lieutenant-general.—For a similar measure, but one suicidal to good government, in the history of the French Revolution, see MIRABEAU, and ROBESPIERRE.

Selim I., Sultan of Turkey, son of Bajazet II., was born in 1467, and dethroned his father by the aid of the Janizaries, 25th April 1512. Then he caused his father, brothers, and nephews to be put to death. This gives the key to his character—warlike, energetic, unscrupulous, and fanatical. In 1514, after massacring 40,000 Shiites, he declared war against Shah Ismail of Persia, whom he defeated at Chaldiran in the neighbourhood of Tabriz; but a spirit of disaffection breaking out in his army, he was compelled to content himself with this success, which gave him possession of the provinces of Diarbekir and Kurdistan. In 1517 he conquered the Mameluke rulers of Egypt, and annexed that country, Syria, and the Hejaz. Moreover he won from the Abbaside khalif, then living as a spiritual prince at Cairo, the headship of the Mohammedan world, the title of imam, and the standard of the Prophet, and gained possession of the sacred cities of Mecca and Medina. He also laid the foundation of a regular marine, constructed the arsenal of Pera, chastised the insolence of the Janizaries with savage severity, and laboured to ameliorate, by improved institutions, the condition of the various peoples he had conquered. He died 22d September 1520, while planning an expedition against Rhodes. Strange to say, this savage fanatic was a lover of literature, and even himself cultivated the poetic art. He was succeeded by his son, Solymán (q.v.) the Magnificent. For other sultans named Selim, see TURKEY.

Selinus, an ancient Greek colony in the western end of Sicily, now represented by ruins close to the modern Castelvetro. It was founded by Dorians about 628 B.C., conquered by the Carthaginians in 409, and utterly destroyed by them in 249, the inhabitants being deported. The most notable ruins still extant are seven great Doric temples.

Seljuks, a division of the Gluzz confederacy of the Turkish tribes, who were settled on the Jaxartes and in Transoxiana in the 11th century, when they became converts to Islam. Toghrul Beg, grandson of a chief named Seljuk (whence the name of the several successive dynasties), severely crippled the empire of Ghazni (1040), and then turning westwards conquered all Persia. Ten years later he marched upon Bagdad, to the assistance of the Abbaside Khalif (q.v.), a mere *fainéant* sovereign, who existed by the favour and protection of a powerful family of the Shiite faith.

The head of this family (the Bowides) was, however, the master rather than the protector of the khalif. Him Toghrul seized and supplanted; and, being of the orthodox Sunnite faith, he was nominated by the khalif 'Commander of the Faithful.' Dying in 1063, Toghrul was succeeded by his nephew Alp-Arslan. This sovereign wrested Syria and Palestine from the rival Fatimite khalif of Egypt, and in 1071 defeated the Byzantine emperor Romanus Diogenes, and captured him. The price of his release was a heavy ransom and the cession of great part of Anatolia or Asia Minor to the Seljuk. Alp-Arslan was stabbed by a captive enemy in distant Turkestan (1072), and was succeeded by his distinguished son Malik Shah. His reign is chiefly remarkable for the enlightened rule of his grand-vizier, Nizam-ul-Mulk, the school-fellow of Omar Khayyam (q.v.), and of Hassan ibn Sabbah, founder of the Assassins (q.v.). This statesman founded a university at Bagdad, an observatory, and numerous schools and mosques, and with the help of his old friend Omar Khayyam revised the astronomical tables and introduced a new era, the Jelalian. After the death of Malik (1092) the extensive empire began to break up into smaller kingdoms. But already during his lifetime, and even that of his predecessors, powerful tributary princes had ruled over separate provinces in Syria (see NUR ED DIN MAHMUD and SALADIN), in Kerman (beside the Persian Gulf), and in Asia Minor. During the first half of the 12th century the most powerful of these provincial rulers was Sinjar, who governed Khorasan, with Merv for his capital. He spent his life fighting against the Ghaznevids, against the Turkestan chiefs, and latterly against the Mongols. But a stronger and more immediate interest attaches to the province of Syria and that of Asia Minor, or Rum, as the Seljuks preferred to call it. It was the rulers of these two provinces or kingdoms who persecuted the Christian pilgrims and so provoked the Crusades (q.v.), and it was the rulers of the same two kingdoms against whom the crusaders of Europe principally fought. The capital of Rum was fixed at Iconium (Konieh) in the first half of the 12th century. This dynasty reached the acme of its power under Kaikavus (1211-34), who ruled over nearly the whole of Asia Minor and extensive territories in Mesopotamia and northern Persia. During the reign of his son Kaikhosran II. the poet Jelal-ed-Din Rumi flourished and the various orders of dervishes arose; and at the same time the Mongols began to threaten the eastern borders of the state. Indeed from about 1253 the real sovereign power of that part of Asia was in the hands of the Mongol chiefs, Hulagu and his successors, until the rise of the Ottoman princes. These last, Turks like the Seljuks, had retreated westwards before the all-conquering Mongols about the middle of the 13th century, and at the end of it they entered the service of the Seljuk ruler of Asia Minor. After that the name Osmanli or Ottoman soon superseded that of Seljuk as the appellation of the Turkish rulers and ruling classes in Asia Minor. And out of the Ottoman supremacy grew the empire of Turkey (q.v.). The Seljuks, however, had centuries before, whilst they were still settled in Transoxiana, lost a good many of their peculiarly Turkish characteristics and had become 'Turkomans,' i.e. 'Like the Turks,' and with their conversion to Islam they also adopted the Perso-Arabian civilisation and customs, though still retaining their own language as well as using those of the peoples they had conquered.

See De Guignes, *Histoire des Huns*, &c. (4 vols. 1756-58), the German translation (by Vulfers, 1838) of Mirkhond's *Persian History of the Seljuks*, and Laurent, *Byzance et les Turcs Seldjoucides dans l'Asie occid.* (1913).

Selkirk, a Scottish royal burgh, the county town of Selkirkshire, on an eminence 400 to 619 feet high, that flanks the right bank of Ettrick Water, 6 miles S. by W. of Galashiels by a branch-railway (1856) and 39 SSE. of Edinburgh. The county buildings (1870), the town-hall (1803), with a spire 110 feet high, and the statues of Scott (1839) and Mungo Park (1859) are the chief features of the place, with the beautiful grounds of the Haining. The 'souters of Selkirk' were long famous for their 'single-soled shoon;' but to-day the staple manufacture is that of tweeds, which dates from 1835. With Hawick and Galashiels, Selkirk returned one member to parliament from 1868 to 1918. Pop. (1831) 1880; (1861) 3695; (1911) 5946; (1921) 5775. About 1113 Earl David founded at *Schelechyrrh* ('kirk of the shiels') a Tironensian abbey, which as David I. he removed about 1126 to Kelso (q.v.). The story of the eighty Selkirk men who marched to Flodden (1513), but of whom one only returned, bringing a captured pennon, dates, according to Mr Craig-Brown, only from 1722. Andrew Lang was a native.

Selkirk, ALEXANDER. See JUAN FERNÁNDEZ.

Selkirk, EARL OF. See DOUGLAS, MANITOBA.

Selkirk Mountains, an outlying range of the Rocky Mountains, in British Columbia, extending southwards from about 52° N. lat. to near the United States frontier. The range contains enormous glaciers, and is the home of bears, big-horn sheep, the Rocky Mountain sheep, &c. One pass-valley (Rogers') has been reserved as a national park. The Canadian Pacific Railway climbs over the mountains at a point 4300 feet above the sea.

Selkirkshire, an inland county in the south of Scotland, bounded by Peebles, Edinburgh, Roxburgh, and Dumfries shires. Measuring 28 miles by 17, it has a land area of 267 sq. m. or 170,793 acres, of which barely one-tenth is under crops. Silurian in formation, and drained by Ettrick and Yarrow Waters to the Tweed, it is a pastoral region of grassy rounded hills—Minchmoor (1856 feet), Dun Rig (2433, the highest), Ettrick Pen (2269), and eight others exceeding 2000 feet above sea-level. Sheep-farming (over 170,000 head) is an important industry; and the manufactures are confined to the two towns of Selkirk and Galashiels. Since 1918 Selkirkshire has united with Roxburghshire to return one member to parliament. Pop. (1801) 5388; (1851) 9809; (1871) 14,005; (1911) 24,601; (1921) 22,607, of whom 7068 were in Selkirk, and 12,846 in Galashiels. Smaller than Middlesex, and than all but seven of the thirty-three Scottish counties, Selkirkshire yet contains within its narrow bounds almost all the old Forest of Ettrick; St Mary's Loch; the whole course of the Yarrow; the vale of Ettrick, where the 'Shepherd' was born and lies buried; the birth-places, too, of Laidlaw and Mungo Park, of the 'Flower of Yarrow' and Alison Cockburn; Ashiesteel, where Scott wrote *Marmion*; the scenes of the ballads of 'The Douglas Tragedy,' 'The Dowie Dens,' 'The Outlaw Murray,' and 'Young Tam-lane;' the battlefield of Philiphaugh; and the ruins or sites of the castles and peel-towers of Newark, Dryhope, Tushielaw, Oakwood, and Buccleuch. See the articles ETTRICK WATER, YARROW, PHILIPHAUGH; and T. Craig-Brown's county history (2 vols. 1886), and Sir G. Douglas's (1899).

Sellar, WILLIAM YOUNG, was born at Morvich near Golspie in Sutherland, 22d February 1825, and educated at Edinburgh Academy, of which at fourteen he was head-boy. He next went to Glasgow University, from which he passed at seventeen, a Snell Exhibitioner, to Balliol College, Oxford.

He graduated with a classical first-class, in 1850 was elected to a fellowship at Oriel, next acted as assistant-professor at Durham, Glasgow (1851-53), and St Andrews (1853-59), filled for four years the Greek chair at St Andrews, and was elected in 1863 to the Latin chair at Edinburgh, which he retained till his death near Dalry in Galloway, 12th October 1890. He made his name widely known by his learned and brilliant books, *The Roman Poets of the Republic* (1863; revised and enlarged, 1881), *The Roman Poets of the Augustan Age—Virgil* (1877), and *Horace and the Elegiac Poets* (1892), the latter edited from his papers by his nephew, Andrew Lang, with a brief memoir prefixed. Of the last volume—the completion of his task—the part treating of Ovid alone is unfinished. The whole forms a noble *corpus* of criticism on the greatest poets of Rome, marked by full knowledge, insight at once keen and sympathetic, and a fine dignity of style.

Selma, capital of Dallas county, Alabama, on the Alabama River, and at the intersection of a number of railways, 165 miles by rail NNE. of Mobile. It has a large trade in cotton, and possesses ironworks, cotton-factories, planing-mills, car-works, &c. Pop. 15,600.

Selous, FREDERICK COURTNEY, explorer and big-game hunter, was born in London, 31st December 1851, and educated at Rugby and on the Continent. When only nineteen years old he began a life-long association with South Africa, his love of natural history taking him to South Central Africa, where he carried out much pioneer work. In 1890 he became attached to the British South Africa Company, and conducted work for it in Mashonaland. Later Selous took part in the Matabele wars. He engaged in many big-game hunting expeditions all over the world, and, on the outbreak of the Great War, offered himself for service at the age of 62. He was killed at Beho Beho during the East African campaign on 4th January 1917. See Life by J. G. Millais (1918).

Selsey, or SELSEA, a village on a flat and dreary but fertile peninsula on the Sussex coast, 7 miles S. of Chichester. Here in the middle of the 7th century the cathedral church of the South Saxons was founded by Wilfrid of York; and Selsey was the see of a succession of twenty-two bishops, till in 1079 the seat of the bishopric was transferred to Chichester by Bishop Stigand. The sea has made great encroachments on the peninsula, which ends in Selsey Bill, and the site of the old cathedral is now submerged.

Seltzer Water (Ger. *Selterwasser*) takes its name from the village of Nieder-Selters near Limburg, in the Prussian district of Wiesbaden, where several springs, in one basin, yield 5000 cubic feet an hour of this sparkling and effervescing mineral water. Its chief ingredients are carbonic acid, bicarbonate of sodium, and common salt. It acts as a mild stimulant of the mucous membranes and as a diuretic, and is employed in chronic disorders of the digestive, respiratory, and urinary organs. It is much used as a beverage and as a table-water by those suffering from liver complaint, and in hot climates and seasons, and is widely exported to all quarters of the world. The spring was discovered early in the 16th century, but was at first little prized. Artificial Seltzer Water is extensively manufactured both on a large scale and for domestic use. See AERATED WATERS, MINERAL WATERS.

Selwyn, GEORGE, wit, was born of a good old Gloucestershire family on 11th August 1719, and was educated at Eton and Hertford College, Oxford, whence, after making the grand tour, he was expelled in 1745 for a blasphemous travesty of the Eucharist. He entered parliament for a pocket

borough in 1747, and, siding generally with the court party, was rewarded with several sinecures; in 1751 succeeded his father in the Matson property; and for the best part of half a century led the life of a man about town, dozing in the House, gaming pretty deeply, corresponding much, and haunting executions. He often visited Paris, where he had the *entrée* of the best and the highest society, whilst at home his chief intimates were the Duke of Queensberry, Horace Walpole, 'Gilly' Williams, and Lord Carlisle. Grown at last 'like the waxwork figure of a corpse,' he died 25th January 1791. He left £33,000 to Maria Fagniani ('Mie Mie'), and the residue of his fortune to 'Old Q'—to whom, as to Selwyn himself, was referred by gossip the paternity of that future Marchioness of Hertford.

See Jesse's *George Selwyn and his Contemporaries* (1843), Hayward's *Lord Chesterfield and George Selwyn* (1854), Roscoe's *George Selwyn* (1899), and S. P. Kerr's *Selwyn and the Wits* (1909).

Selwyn, GEORGE AUGUSTUS, bishop, was born 5th April 1809. He was educated at Eton and at Cambridge. He rowed in the first inter-university boat-race (1829), and was a great pedestrian and swimmer. In 1841, while curate of Windsor, he was consecrated first and only bishop of New Zealand and Melanesia—now divided into many sees. On the voyage out he studied Maori and navigation, so that he could preach to the natives in their own tongue on his arrival, and could steer his own vessel on his missionary voyages. He visited every portion of his huge diocese before setting about his great work of organising it. A visit to England in 1854 brought back John Coleridge Patteson, afterwards the martyred bishop of Melanesia, to whose see Bishop Selwyn's second son was consecrated in 1877. In 1867 Bishop Selwyn attended the first Pan-Anglican Synod at Lambeth, and against his own inclinations was appointed Bishop of Lichfield, where upon his initiative the first Diocesan Conference in which the laity were duly represented met in 1868, and where he died 11th April 1878. Possessing in a special degree the gift of organisation, and always regarding himself as 'a man under authority,' he expected the same soldier-like obedience from those under him.

See *Life* by Rev. H. W. Tucker (2 vols. 1879) and the more popular *Life* by Rev. G. H. Curteis (1 vol. 1889). For Selwyn College, see CAMBRIDGE.

Semang, a pigmy people of the Malay Peninsula and Sumatra. See NEGRITOS.

Semaphore (from *sēma*, 'a sign,' and *pherō*, 'I bear') was the name applied to the system of telegraphy in use before the application of the electric current. Semaphores were invented by Richard Lovell Edgeworth in 1767 (cf. p. 91 of his *Memoirs*, ed. 1854), but were first regularly established by the French in 1794 as a plan for conveying intelligence from the capital to the armies on the frontier. In the following year Lord George Murray introduced them in England; and by their means the Board of Admiralty were placed within a few minutes of Deal, Portsmouth, or Plymouth. These semaphores consisted of towers built at intervals of from 5 to 10 miles on commanding sites. On the top of each tower was the telegraph apparatus, which at first comprised six shutters arranged in two frames, by the opening and shutting of which in various combinations sixty-three distinct signals could be formed. In 1816 Sir Home Popham substituted a mast with two arms similar to many of the present railway signals. The arms were worked from within the tower by winches in the lookout room, where a powerful telescope in either direction constantly commanded the mast of the next station.

If a fog set in at any point on the route the message was delayed; otherwise when a sharp lookout was kept the transmission was very rapid. For instance, the hour of one by Greenwich time was always communicated to Portsmouth when the ball fell at Greenwich; the semaphores were ready for the message, and it commonly passed from London to Portsmouth and the acknowledgment back to London within three-quarters of a minute. Each station was in the charge of a naval officer—usually a lieutenant—with one or two men under him. To save the cost of this establishment the Deal and Plymouth lines fell into disuse soon after the peace of 1815; and the superior advantages of the electric telegraph being incontestable, the Portsmouth line sent its last message on the 31st December 1847, and in this capacity the semaphore closed its career of usefulness for ever. Railway signals are, however, a form of semaphore. See RAILWAYS, and, for the semaphore used for communicating with ships, SIGNALLING.

Semecarpus, a genus of Anacardiaceae trees, of which *S. Anacardium* is the Marking-nut Tree of India, a deciduous tree growing in the sub-Himalayan tract. An ink much used in that country for marking cotton cloths is obtained from the acrid juice of the pericarp of the fruit. Lime-water is added to improve the ink. The fleshy cup of the ripe fruit is eaten raw, but it is better roasted. Bird-lime is made of the fruit in its green state. The wood also contains an acrid juice which causes swelling and irritation, in consequence of which the timber is not put to any use.

Semele. See DIONYSUS.

Semendria (Serb. *Smederevo*), a ruined fortress of Serbia, on the right bank of the Danube, 26 miles SE. of Belgrade. Here the Turks defeated the Hungarians in 1411. The place was taken by the Turks in 1459, by Prince Eugene in 1717, by the Germans and Austrians in 1915. Pop. 7000.

Semgallen. See COURLAND.

Semicircular Canals. See EAR.

Seminole, a tribe of American Indians, originally (1750) a vagrant branch of the Creeks, whose name Seminole signifies 'wild' or 'wanderer.' In 1817 they joined with the Creeks and some negroes who had taken refuge with them, ravaged the white settlements in Georgia, plundering plantations, and carrying off slaves, whom they refused to surrender. General Jackson was sent to punish them, and his expedition hastened the negotiations which ended in the cession of Florida to the United States (1819). By a treaty of 1823 the Seminoles, who numbered some 4000, gave up most of their lands for an annuity, and agreed to return fugitive slaves; but in 1832, to satisfy the settlers, the chiefs were deluded into signing a treaty agreeing to the removal of the whole tribe west of the Mississippi. This treaty was repudiated by the tribe at the instigation of Osceola (q.v.), one of their chiefs; and a long and costly war against a handful of savages ensued. In the end the remains of the tribe were removed to Indian Territory, now part of Oklahoma, where (except a few still left in Florida, Texas, and Mexico) all the Seminoles are now settled; they number 3000.

Semipalatinsk, a district of Asiatic Russia, stretching northwards from Lake Balkash, and constituting the eastern corner of the Cossack (Kirghiz) Republic. It embraces outliers of the great Altai and other lofty chains of central Asia, rising to 10,000 feet, and enclosing between them wide stretches of steppe-land. The principal river is the Irtysh, which flows north-westwards to the

Obi. The climate ranges between wide extremes, and the whole region is undergoing desiccation. The people are mostly Kirghiz. The chief town, Semipalatinsk, standing on the right bank of the Irtysh, is an important trading centre for that part of Asia. Pop. 44,000.

Semi-Pelagianism. See PELAGIUS.

Semiramis, wife of Ninus, mythical founder of Nineveh according to Ctesias and the Greek historians. A daughter of Derceto the fish-goddess, she was exposed in infancy, but miraculously fed by doves, then brought up by Simmas a shepherd, whose name she took. Onnes, one of the king's generals, charmed by her beauty, married her, but she won the heart of the king himself by her heroic capture of Bactra, whereupon her husband had the loyalty to make away with himself. Ninus soon died, leaving Semiramis to reign gloriously for forty-two years, conquering in Persia, Libya, Ethiopia, unsuccessful in India alone. At the end of this time she left the throne to her son Ninyas and disappeared, thereafter to be worshipped as a divinity. The historical germ of the story seems to be the three years' regency (B.C. 811-808) of Sammu-ramat, widow of Shamshi-Adad V. and mother of Adad-Nirari III. The name of the mighty queen survived in place-names, and was familiarly attached to the great works of antiquity, as the hanging gardens of Babylon. Many things in her story, and such points of detail as her personal beauty and her voluptuousness, point to an identification with the great Assyrian goddess Ishtar or Astarte (q.v.). See Lenormant, *La Légende de Semiramis* (1873); Frazer, *The Golden Bough*.—The Semiramis of the North was a name not inappropriately applied to Catharine II.

Semiretchinsk, formerly a province of Asiatic Russia, having East Turkestan on the SE., Fergana on the SW., and Lake Balkash on the N. It is a mountainous region, being crossed from east to west by the Ala-tau and Thian-Shan Mountains, whose peaks run up to 16,000 feet. Between them lies the mountain-lake of Issyk-kul. In the north are level-tracts, partly fertile, partly barren sand. The climate is temperate; earthquakes occur—e.g. at Vyernyi (renamed Alma-Ata). The northern part now forms the south-eastern corner of the Cossack (Kirghiz) Republic, and the southern falls into the Kara-kirghiz autonomous territory. The people of the region are mostly engaged in pastoral pursuits, rearing large herds of horses, camels, and sheep.

Semites, the name given to one of the great divisions of mankind occupying south-west Asia, namely, Arabia and its northern extension, the lands lying between the Mediterranean, Asia Minor, and Armenia, Persia, the Persian Gulf, the Red Sea, and Egypt. The inhabitants have always been closely inter-related in language, custom, religion, and physical features; but not only is Arabia geologically and ethnically connected with north-east Africa, the whole area is so exposed that a dividing line can hardly be drawn between the Semitic area and the rest of the Near East. The term itself is derived from Genesis, chap. x., where the world as known to the Hebrews is divided among the 'sons' of Shem. But the classification follows no clear rule, as Canaan, along with Heth (the Hittites), is named with Egypt as 'son' of Ham, although Canaan was part of Palestine, and Egyptians, Canaanites, and Hittites were quite distinct politically and linguistically. Moreover, Shem's 'sons' include Lud or Lydia, in Asia Minor, and Elam to the east of the Tigris; and these, too, linguistically, and especially as regards culture, differ most markedly. On the

other hand, Elam certainly came under the influence of Babylonia and Assyria, and at times the connexion between Lydia and the Semitic area was an intimate one; similarly Canaan, and especially the Phœnician coasts, had close relations with Egypt from an early date; and the Hittites (q.v.) of Asia Minor had offshoots in Syria and Palestine. Accordingly the list in Genesis, chap. x. is so far in harmony with the facts when it maintains the homogeneity of the Semites and their historical and cultural relations with their neighbours; but it is preferable to apply the term 'Semite' to certain languages and the people speaking them in south-west Asia, rather than to any specific type of civilisation.

The SEMITIC LANGUAGES form a well-defined group, the members of which are as nearly related as those of any one of the Indo-European divisions (e.g. the Slavonic or the Romance or the Scandinavian). They may be arranged in four classes: (I.) The *East Semitic*, the practically identical languages of Babylonia and Assyria (q.v.), known as early as the third millennium B.C. As proved by the tablets discovered at Amarna in Egypt, and also elsewhere, the language was the *lingua franca* of the middle of the second millennium, used for diplomatic and official purposes in Egypt, by the Hittites of Asia Minor, and in Palestine and Syria (see TELL EL-AMARNA). In what circumstances the very complex and difficult Cuneiform (q.v.) attained such importance is uncertain, though it was used by a colony in Cappadocia by the 21st century B.C. The script itself—not the language—was later simplified and used in Persia; but the language was already dying out in the Neo-Babylonian period (6th century B.C.), though tablets have been found down to the 1st century B.C.

To the (II.) *West Semitic* belong the languages of early Syria and Palestine, traces of which are found among the 'Amorite' influences in the First Babylonian Dynasty (see BABYLONIA, vol. i. p. 639), in Egyptian references, and more especially in the various 'glosses' in the Amarna tablets, 1400 B.C. These languages, called for convenience Amorite, or better, Canaanite, come before us after the 'Amarna' age in a simple consonantal script from which (or from collateral branches of which) so many alphabets have been directly or indirectly derived (see ALPHABET). They differ only dialectically. Moabite is known from a famous historical inscription (see MOABITES). Phœnician, carried by traders over the Mediterranean, persisted in Carthage in the Christian age (see PHœNICIA, vol. viii. p. 107). Hebrew (q.v.), of which the Old Testament preserves indications of different dialects, was kept alive in the schools, and, assuming a modified form, has been maintained by the Jews for literary purposes. Recent energetic efforts to elaborate the language and utilise it for the most modern requirements of life and learning will be watched with keen interest. See JEWS.

(III.) From an early date both these classes were threatened by the *North Semitic* or Aramæan (see ARAMÆA). Sporadic traces apart, it becomes prominent about the 8th century B.C., primarily in Syria. The extensive conquests of Assyria, her mixed armies, and her policy of transporting whole tribes, led to its spread. At the fall of Assyria, and amid the political and social unrest that mark the middle centuries of the first millennium B.C., Aramaic increased in importance and became the *lingua franca* of the Persian age (5th-4th centuries). Sardis in Lydia, Elephantine in Upper Egypt, and the Indian Taxila testify to its rapid extension. Of its many dialects those of the Jews and other colonists at Elephantine (5th century); and, later, of the Arab Nabatæans (q.v.), and of Tadmor or Palmyra (q.v.), most nearly resemble

the Aramaic portions of the books of Ezra and Daniel. That Aramaic was the language of the people in the Christian age is shown by a few words preserved in the Gospels (*Talitha cumi*, &c.), and by the popular translations and expositions of the Old Testament known as *Targums* (q.v.). Most important of all Aramaic dialects was that of Edessa, the literary language which played so vital a part in the history of eastern Christianity. Syrian missionaries carried their language and script as far as India and China; and while a Syrian community has continued to exist in Travancore, the Syriac alphabet was the source of several strange scripts in Central Asia (see ALPHABET, Vol. I. p. 190). Apart from this literary language a few popular Aramaic dialects were preserved, the most interesting being that of the Mandæans (q.v.).

Meanwhile (IV.) Aramaic itself was being gradually displaced by another *lingua franca*—Arabic—a member of the *South Semitic* class. (a) The earliest representatives of this are found in the Minæan and Sabæan inscriptions of South Arabia, which have a characteristic script of their own (see SABÆANS). Their archaic character has suggested to some scholars a very remote date—the second millennium B.C.; but the Sabæan inscriptions reach down to the 6th century A.D., and the oldest of all may not be earlier than the 10th century B.C. Continued intercourse between Arabia and Egypt, culminating in the latter part of the Sabæan period, led to the rise of Geez or Ethiopic, which has ever since had an independent linguistic history in Africa. But in Arabia proper the dialects used by the Bedouin tribes coalesced by the 6th century A.D. into what is known as (b) *Classical Arabic*. Through Islam this became a fixed literary language, though in course of time various popular dialects can be traced throughout the Mohammedan world. The Arabic script itself, originally derived from an Aramaic alphabet, and in this respect quite distinct from *Old Arabic* (α, above), has had a no less extensive career. See ARABIA.

Although classical Arabic is relatively a recent language, it has many primitive features; and its subsequent vicissitudes so explain the linguistic processes in the other Semitic languages that Arab life and thought have commonly been regarded as typically Semite, and Arabia itself as the original home of the Semites. This is disputed; at all events the Semitic languages have well-marked peculiarities, which, as a whole, sever them from Egyptian (and African) languages on the one side, and the Sumerian of Babylonia on the other. Consonants only are written (so also in Egyptian), with the exception of (1) Babylonian-Assyrian, where, however, similar consonantal sounds are not very carefully distinguished, and the gutturals have been smoothed down; and (2) Ethiopic (originally vowelless). But there was a tendency in Hebrew, more especially in the Aramaic of the Mandæans, to use vowel-letters, and systems of vowel-signs were carefully framed, more elaborate for Syriac and especially for Hebrew, and an exceptionally simple one for Arabic. It is not difficult, however, to read unvocalised Semitic, though of course serious ambiguities often occur. Semitic roots are commonly triconsonantal and the vowel changes regular: *KATABA* 'he wrote,' *AKTABA* 'he taught or caused to write,' *YAKTUBU* 'he will write,' *KĀTĪB* 'a writer,' *KĪTABĀT* 'secretaryship.' The bare roots (e.g. K-T-B) do not exist by themselves, and the inter-relation between the derivatives is often instinctive and suggestive, as *Saddik* 'righteous,' *Sedākah* 'righteousness, alms,' *Asdāk* 'legitimate kin,' *Šadik* 'congruent, as it should be.' Pronouns are expressed by suffixes: *ānī* 'I,' *lī* 'to me,'

ōthī 'me' (accusative), *malikī* 'my king,' *himlikanī* 'he made me king'; adjectives are often expressed by nouns ('idol of silver,' 'prince of peace'), and by a characteristic usage (the 'construct state') two words can be closely united to express a general compound idea: 'The-fear-of-the-king' (which could also mean 'caused-by-the-king'), 'clean-of-hands,' 'grieved-in-spirit,' 'seekers-after-good.' The tense system is undeveloped, but there is great richness of verbal idea, and nouns and verbs overlap. There is co-ordination rather than subordination. In Hebrew, scenes are juxtaposed and each determines the other. Hebrew lacked subordinate particles, and was not adapted for abstract thought and continuous argument. The one exception—the book of Ecclesiastes—differs notably from earlier and 'classical' Hebrew. There is much more flexibility in the later languages, viz. in Syriac (perhaps owing to contact with Greek-speaking people), and in Arabic, which, though linguistically primitive, is well developed as regards forms, vocabulary, and syntax. In general the languages are concrete (rage = nostril, anger = heat), and ideas of 'life,' 'salvation,' 'righteousness' have a more concrete, material significance. They admitted of spiritual interpretation; and spiritual ideas could be, but were not necessarily hidden in such concrete ritual as washing of the body in order to remove the taint of sin. Hebrew constantly represents a more primitive stage of thought, as when the same root expresses two sides of a process (bear or beget, guilt or punishment, act prudently or prosper, work or reward, possess or dispossess, look keenly and recognise or regard as a stranger). In consequence, in translating and interpreting the Old Testament it is often very difficult to do justice to a stage of thought which Western peoples have outgrown. 'Holy' or 'sacred' did not necessarily convey an ethical idea; and what was not normal (ecstasy, madness, enthusiasm) was readily treated as super-normal, if not sacred. The distinction between the order of nature and the social order was not clearly recognised; and offences, whether ethical or merely ceremonial, might not only offend the Deity, but react upon the land and its produce.

The Semitic peoples have a fine physical organisation, and are extremely virile. Though mentally quick and clever, they have not been persistent in progress. Impatient of restraint, they have often been too arbitrary to be good rulers and teachers; and the world has perhaps learnt more from them than ever they could have taught it. With brilliant but often untutored imagination and a keen sense of beauty, their temper has been averse to sustained thought. Their art has been manifested now in Assyrian sculpture, now in Phœnician fabrics and silver-work; but Egypt, Persia, and Greece have been among the models, and not only in art have they been indebted to their neighbours. As middle-men they have played a proud part, leaving their stamp on what they have received—myths from Babylonia, wisdom from Egypt, transmitting, with improvements, the 'Arabic' numerals from India, and in the 'Dark Ages' keeping alive the learning which had come to them through the Syrians, and, in the first instance, the Greeks. Arab travellers and propagandists, Syrian missionaries and traders, the scattered Jews of the 'Diaspora,' and Phœnicians of the Mediterranean are characteristic of the restlessness of the Semite, whose function in spreading elements of civilisation and in making history is but imperfectly known. Thrown back upon himself by desert life or by travel, a nomad trader or a caravaneer, the Semite, self-centred and confident, carried his world and his faith with him. That the three great religions, Judaism, Christianity, and Islam, are of Semitic origin gives the Semites a unique

place in history. Much has been written on Semitic monotheism and its transcendent God. But of polytheism there is no lack of evidence; and intermediaries between man and the Deity abound, as subordinate deities, angels, and saints, a specific intercessor (Marduk, Michael), and as priestly kings and priests. Nor, as Robertson Smith has shown, is Divine Immanence contrary to the Semitic mind. Semitic religion is characterised by a remarkable intimacy, which led to convictions of magical control of processes otherwise associated with the gods, as also to the superb confidence and assurance which characterise the prophets of the Old Testament. Hence the religion is one of astonishing paradoxes: a familiarity that did not always breed awe or reverence, and a fear and trembling before a majestic if not rather arbitrary Deity. The much-discussed Semitic monotheism is essentially a passion, a vehemence: man's nothingness before the Deity alternating with a proud consciousness of this knowledge and the relationship it implied. As in days of old (Isaiah xxix. 13), Allah's name may be commonest in use, but the 'constitutionally irreligious habit of the Arab mind' (Robertson Smith) is as striking as the phases of Semitic life and thought which justify the conviction that religion is the Semites' gift to the world.

The history of Semitic religion goes back to the old Oriental religions of the Near East, to the days of Egyptians and Sumerians, Hittites, and doubtless the Cretans, and other peoples of the Aegean. Even Persia, whose fine ethical religion of Zoroaster (q.v.), subsequently impressed the Jews, had its forerunner about 1400 B.C., when an Iranian influence can be traced in Syria and Palestine. In point of fact, the religion of Israel in the Old Testament is rather a reaction against the civilisations amid which it grew up. Historically it unites an ancient and decaying Oriental world with that of the Greek and Roman age. Christianity arose during an Oriental revival, or rather a reaction against the powerful wave of Hellenism which had swept over the East. In tracing its victories over other Oriental cults of the age, we have to observe that though primarily a Jewish sect it is a remarkable fusion of specifically Jewish and entirely un-Semitic thought. Not unnaturally, it did not take root in the land of its birth, but it underwent its most striking developments at the hands of European rather than Oriental minds. When at length Mohammedanism (q.v.) arose in Arabia (7th cent. A.D.), it was upon the last remains of the old Oriental civilisations. Like the Arabic language itself, Islam both is primitive and shows the influence of its older environment. With its simple theism and most intelligible of promises and threats, it rapidly spread over non-European areas where Greek thought had not permeated. Its development was due to other than Semites (Greek-Syrian, Persian), and its learning actually made a deeper impression upon Jews and Christians than upon Mohammedans, and Islam can hardly be said to have made any further intellectual progress. Semitic religion as a whole is concrete and of 'this world'; even its mysticism is practical. In this way it stands apart from Indian pantheism, pessimism, and the repudiation of 'this world' as 'illusion.' Semitic religion is typically averse to Greek rationalism and anthropomorphism; and it is the influence of the Greek spirit in the larger sense (that is, including western Asia Minor) which both marks the essential difference between western thought and that of India, and has had such varying effects upon the Semitic religions themselves. The religion of the Old Testament owes its uniqueness to the great teachers of ethical monotheism and to the constructive events of about

the 6th and 5th centuries B.C. (see PENTATEUCH). It was indeed followed by a sort of social philosophy (e.g. the book of Proverbs), which took a strangely un-Semitic form under direct Greek influence in Alexandria (in the book of Wisdom). But the most pregnant religious ideas were developed further only in early Greco-Semitic Christianity. The share that the Hebrew Old Testament, as an integral part of the Bible, has had in shaping life and thought in western Christendom is of course incalculable, and cannot but be contrasted with its influence, as the sacred book of the Jews, upon the history of Rabbinical Judaism. Although Judaism has its great and influential creative thinkers (notably Maimonides and Spinoza), it is by no means the simple elemental theism of the later Arabs, which developed its own elaborate though scarcely progressive theology and jurisprudence; nor was it able to avail itself, as Christianity did in order to live, of the fruits of the Greek mind. Thus the Bible both is and is not a Semitic product. The religion of Israel owes its strength to the extreme self-consciousness of a people, its belief in its destiny, and the prophets' teaching of the price of mission. The 'holiness' of a God, Who was in a real sense Israel's own, demanded a 'holy' people; and ideas of 'holiness' and 'righteousness,' divine and human, were hammered out under the stress of hard events. Tragic crises shaped and tested the profoundest religious convictions; internal, political, and social vicissitudes led to the democratisation of a religion which was the religion of a people and not of a class. Inspiring traditions of national origin afforded stability and continuity; and, in the course of relatively few centuries—when compared with the lengthy history of Egypt and Babylonia—Israel saw the rise and fall of one age and the beginning of a new one. So, a reconstructed religion issued in the Old Testament, but was unable to make a further advance when, a few centuries later, Christianity sprang from it, and the line of Israel's prophets came to an end. The religion of the Old Testament, standing apart from the outworn surrounding civilisations, has a certain primitiveness, comprehensiveness, and completeness. Its most effective ideas were developed ('fulfilled') at what proved to be the beginning of a new era; and through this continuity and development the whole Bible itself covers a unique series of creative and progressive movements in history. The Semites have produced some famous historians, and their ideas of history are invariably of great interest. The Bible, covering as it does the greatest epoch-making developments, has stimulated further development; and, extending over so large a field of life and thought, it has implicit in it, as subsequent ages found, a philosophy of history and religion which is far from proving sterile. While the very attractiveness of Jewish theosophy, in the Kabbalah (see CABBALA), awakened Christians of the 15th and 16th centuries to serious Semitic study, continued research has but enhanced the absorbing and fascinating questions which the Semites raise; and a fair estimate must seek to do justice to the Semitic genius, its conspicuous merits, and no less conspicuous defects, and to weigh the achievements of this remarkable people with what progressive humanity has been able to learn from them.

For the Semitic languages in general, see especially Nöldeke's article under that heading in *Ency. Brit.*, and the German work by Brockelmann (Berlin, 1908). For the religion, see W. Robertson Smith, *Religion of the Semites*, and Lagrange, *Études des Rel. Sémitiques* (1905). F. Hommel's *Éthnologie und Geographie des alten Orients* (Munich, 1926) is extraordinarily elaborate. See also *Camb. Anc. Hist.*, vol. i. chap. v. (and the Bibliography).

Semler, JOHANN SALOMO, one of the most influential German theologians of the 18th century, was born 18th December 1725, at Saalfeld in Thuringia, and educated at Halle. After editing for a year the Coburg official *Gazette*, and lecturing on philology and history at Altdorf for six months, he was in 1752 appointed professor of Theology at Halle, where he taught with great success. He died at Halle on 14th March 1791. For many years he enjoyed a wonderful popularity as a teacher, and exercised so wide and profound an influence as pioneer of the historical method that he has been called the 'father of Biblical Criticism.' Yet, of course, he contributed little to the science; his chief merit is to have pointed out the way and indicated the right methods to those who came after. He was distinctively a rationalist, and one of the most influential in emancipating theology from the fetters of tradition. But he sincerely believed in revelation; and he lost favour through his opposition to the *Wolfenbüttel Fragments*, and his adverse criticism of the 'naturalism' or extreme rationalism of Bahrdt. Both friends and enemies found it difficult to reconcile his defence of revelation with his own critical freedom. In insisting on the distinction of the Jewish and Pauline types of Christianity he (possibly influenced by the deists Toland and Morgan) clearly anticipated a main position of the Tübingen school. As a thinker he was deficient in philosophical consistency and breadth of view; and as a writer he possessed no literary skill or grace. He wrote a vast number of books; but none of much value at the present day.

See his own *Lebensbeschreibung* (1871-82); Schmid, *Theologie Semlers* (1858); Tholuck, in his *Vermischte Schriften*; and for the influence of the Deists, an article by David Patrick on 'English Forerunners of the Tübingen School' in the *Theological Review* for 1877.

Semliki, a river of equatorial Africa, flowing north-east into Lake Albert. It was discovered by Stanley in 1888.

Semlin (Serb. *Zemun*; Mag. *Zimony*), formerly a frontier town of Hungary, since 1918 Yugoslav, stands on a tongue of land at the junction of the Save and the Danube, on the right bank of the latter, above Belgrade. It contains the ruined castle of John Hunyady, who died here. Pop. (1921) 18,525, mostly Serbs. See Kingslake's *Eothen*.

Semmering, a mountain on the borders of Styria and Lower Austria, 60 miles SW. of Vienna, and 4577 feet above the sea, over which the Vienna, Gratz, and Trieste Railway has been carried by a series of ingenious engineering contrivances. The railway, built in 1850-53, passes through 15 tunnels and numerous galleries, and crosses 16 viaducts. It extends from Gloggnitz on the north to Mürz-zuschlag on the south, a distance of 25 miles. The greatest elevation is reached at 2940 feet in the Semmering tunnel (4692 feet long). The steepest gradient for any distance is 1 in 40.

Semmes, RAPHAEL (1809-77). See ALABAMA.

Semnopithe'cus, the genus of monkeys to which the Entellus Monkey (q.v.) belongs.

Semolina, an article of food consisting of granules of the floury part of wheat. The name semolina is often applied to the larger sizes of 'middlings' made in the process of flour-milling (see MILL), and these products are sometimes sold under the name semolina in the granular state after thorough cleaning, instead of being ground into flour. Semolina is chiefly used for making puddings and soups.

Semon, RICHARD (1859-1918), German physiologist, born at Berlin, was educated there and at the universities of Jena and Heidelberg. After

graduating in medicine, he did some exploration work in Africa, and was subsequently (1887-97) professor of anatomy at Jena. He committed suicide at Munich shortly after Christmas in 1918. Semon is chiefly known for his elaboration of the thesis of Ewald Hering, Samuel Butler (q.v.), and others, that unconscious memory can be attributed to all substances. By the 'mnemic' principle—'the principle of conservation in the mutability of all organic happenings'—he endeavoured to link up the phenomena of memory, heredity, and habit. In 1904 he published *Die Mneme, als erhaltendes Prinzip im Wechsel des organischen Geschehens*. (Eng. trans. by L. Simon, 1921). A less biological and more psychological treatment was afforded in 1909 in *Die mnemischen Empfindungen in ihren Beziehungen zu den Originalenempfindungen* (translated by Bella Duffy into English as *Mnemic Psychology*, 1923). A posthumous work, *Bewusstseinsvorgang und Gehirnprozess*, appeared in 1920.

Sempach, a small town of Switzerland, 9 miles by rail NW. of Lucerne, on the east shore of the lake of Sempach. Under its walls Leopold, Duke of Austria, with 4000 men, was met on 9th July 1386 by the confederated Swiss to the number of 1500. The nature of the ground being unfitted for the action of cavalry, the horsemen (1400 in number) dismounted, and formed themselves into a solid and compact body, which was at once charged by the Lucerners; but the wall of steel was impenetrable, and not a man of the Austrians was even wounded, while many of the bravest of the Swiss fell. But, as the legend runs, Arnold von Winkelried, a knight of Unterwalden, seized with a noble inspiration, rushed forward, grasped with outstretched arms as many pikes as he could reach, buried them in his bosom, and bore them by his weight to the earth. His companions rushed over his body into the breach thus made, slaughtered the armour-encumbered Austrian knights like sheep, and threw the remainder into the utmost confusion and dismay. The result was a decisive victory for the Swiss, who thus asserted their independence, and finally broke the efforts of the Austrian dukes to subdue them. The anniversary of this great victory is still celebrated by religious solemnities on the field of battle.

Semper, KARL, naturalist, was born at Altona on 6th July 1832, studied at Kiel, Hanover, and Würzburg, and, after travelling in the Philippines and South Sea Islands, became professor of Zoology at Würzburg. He wrote on the Philippines, on several problems of comparative anatomy, and *The Natural Conditions of Existence as they affect Animal Life* (trans. 1880). He died 30th May 1893.

Sempervivum. See HOUSE-LEEK.

Sempringham. See GILBERTINES.

Sen, KESHUB CHUNDER, an Indian religious reformer, was born at the village of Garifa (Gouripore) in Bengal, on 19th November 1838, and received an education partly English, partly Hindu. About 1858 he was attracted by the Brahma Samâj (q.v.), and soon afterwards began the work of his lifetime, a steady endeavour to promote the religious regeneration of his countrymen. In 1866 he founded the more liberal 'Brahma Samâj of India.' After a visit to England in 1870 he organised in Calcutta several schemes of charitable philanthropy on the lines of what he had seen in England. In 1878 a schism broke out in his church, caused by his own autocratic temper, and by his leanings to mysticism. His last years were years of controversy, waning influence, and disappointment; and he died on 8th January 1884. See Max-Müller, *Biographical Essays* (1884).

Senaar. See SENNAAR.

Sénancour, ÉTIENNE PIVERT DE, author of *Obermann*, was born at Paris in November 1770. In a sickly and secluded boyhood he read eagerly, especially travels; at fifteen entered for four years the Collège de la Marche; and here devoured Malebranche, Helvétius, and the 18th-century philosophers, losing his faith completely in the process. At nineteen, with the connivance of his mother, he left home to escape the course at Saint Sulpice required by his imperious father, turned his steps to the lake of Geneva, the next year at Fribourg married a young girl who did not long survive, lost his patrimony through the Revolution, but returned to Paris about 1798, and thereafter made a modest living by his pen, eked out with a pension granted by Louis-Philippe on the recommendation of Thiers and Villemain. He died at Saint-Cloud in February 1846, asking that on his grave might be placed these words only: *Éternité, deviens mon asile*. His fame rests securely on three books: *Réveries sur la Nature primitive de l'Homme* (1799), *Obermann* (1804), and *Libres Méditations d'un Solitaire Inconnu*. In the first book we see the student of Rousseau weighed down by the absorbing dogma of necessity, full of aversion for all human society, returning to his ideal in the patriarchal nomad, the vegetative instinct, and the primordial sensations of man. In *Obermann* his hero travels in the Valais, next to Fontainebleau, and again to Switzerland, writing his thoughts the while in letters to a friend. Here the atheism and dogmatic fatalism of the *Réveries* have given place to universal doubt no less overwhelming. Nowhere is the desolating 'maladie du siècle' more effectively expressed than in this book, which, with affinities enough to Chateaubriand and Madame de Staël, is yet completely original in its inwardness, its sincerity, the delicate feeling for nature it exhibits, and the melancholy eloquence of many of its passages. 'Though he may be called a sentimental writer,' says Matthew Arnold, 'and though *Obermann*, a collection of letters from Switzerland treating almost entirely of nature and of the human soul, may be called a work of sentiment, Sénancour has a gravity and severity which distinguish him from all other writers of the sentimental school. The world is with him in his solitude far less than it is with them; of all writers he is the most perfectly isolated and the least attitudinising. His chief work, too, has a value and power of its own, apart from these merits of its author. The stir of all the main forces, by which modern life is and has been impelled, lives in the letters of *Obermann*; the dissolving agencies of the 18th century, the fiery storm of the French Revolution, the first faint promise and dawn of that new world which our own time is but now more fully bringing to light—all these are to be felt, almost to be touched, there. To me, indeed, it will always seem that the impressiveness of this production can hardly be rated too high.'

Sénancour was neglected in his day, but he has found fit audience in George Sand, Sainte-Beuve, and, amongst ourselves, Matthew Arnold, whose two elegies are known to all lovers of poetry.

See Sainte-Beuve's two essays in *Portraits Contemporains*, vol. i.; the *Cornhill Magazine*, vol. xlv.; the first complete translation of *Obermann*, with introduction, by A. E. Waite (1903); and a study by Merlant (1907).

Senate, the deliberative assembly of the Roman people (see **ROME**). In some modern states, as France (q.v.) and the United States (q.v.), the senate is the upper chamber of the legislature. The governing body of universities is usually called the senate (see **UNIVERSITY**).

Sendai, a town on the east coast of the main-

land of Japan, 220 miles NNE. of Tokyo by rail, seat of the Tohoku Imperial University (1907); pop. 119,000.

Seneca. Annaeus Seneca (prænomen unknown), a Spaniard from Corduba (Córdoba), was born about 54 B.C., and, having come to Rome as a youth, studied eloquence under Marillus. We next find him again in Spain, married to Helvia, by whom he had three sons—Novatus, Lucius Annaeus, and Mela (father of Lucan the poet). About 3 A.D. he returned to the capital a second time to busy himself with rhetoric, till, under Tiberius, he sought his native country once more, and died there, 39 A.D. He was a great admirer of Cicero. With much of the antique Roman fibre, he had moral ballast enough to steer clear of the excesses on which contemporary rhetoricians made shipwreck. Besides a historical work, now lost, he wrote in later life *Oratorum et Rhetorum Sententiæ*; *Divisiones*; *Colores*; ten books of 'Controversiæ', of which the first, second, seventh, ninth, and tenth are complete, the remainder surviving only in extracts; and one book of 'Suasoriæ'—the whole, fragmentary as they are, of high importance for the history of Roman rhetoric. The best edition is that of H. J. Müller (Prague, 1887), while Sander's *Sprachgebrauch des Rhetors Annaeus Seneca* (1880) is of special value to the student of Latin style.

Seneca, L. ANNEÛS, son of the preceding, also a native of Corduba, was born about 4 B.C., and carefully educated for the bar, under his father's eye, in Rome, where, in Caligula's reign, he narrowly escaped the death to which that emperor, jealous of his enlightened liberalism, had destined him. After years of exclusive devotion to philosophy and rhetoric, he entered the Curia, but, 41 A.D., lost the favour he had won with Claudius by getting involved, through the emperor's infamous wife Messalina, in a state-trial which ended in his banishment to Corsica, whence he did not return till after an exile of eight years. Entrusted by Agrippina with the education of her son Nero, he acquired over the youth an influence as strong as it was salutary, and, having already at Agrippina's instance become prætor, he was, at that of Nero (now emperor), made consul, 57 A.D. His high moral aims and intellectual gifts, possibly through defect of the courtier's tact, gradually incurred the aversion of the rapidly deteriorating emperor, who at length came to regard him with jealousy and hatred. He has been taxed by imperial apologists, but unjustly, with vanity and ambition—more plausibly, perhaps, with love of wealth and the power it brings. His wealth, accumulated under Nero's profligate extravagance, excited, it is said, the rapacity of the emperor, whose sinister designs he anticipated by offering to refund it, with the exception of a pittance on which he proposed to retire. These overtures Nero rejected, whereupon, under pretence of illness, he withdrew from the public gaze. An attempt on Nero's part to poison him having failed, he was drawn into the Pisonian conspiracy, accused, convicted, and condemned. Left free to choose his mode of death, he elected to open his veins, and gradually succumbed to syncope, 65 A.D. His second wife, Pompeia Paulina, who wished to die with him, and actually had her own veins incised for the purpose, survived him a few years.

A noble, upright character, Seneca was yet the object of calumnious detraction—to such a degree that the utmost caution is necessary in passing judgment on him. In philosophy he inclined to the Stoic system, though not indisposed to engraft upon it the tenets of the Epicurean school. But

his moral independence is an outstanding feature in his voluminous *dicta*, which, often profound, are always sharply and distinctly reflected in the steel-mirror of his style. Earnestness and self-abnegation are their most memorable note, especially in their inculcation of man's duty to himself and to his neighbour. The relations of his teaching to Christianity have recently evoked a number of treatises, attempting to prove his correspondence, if not personal association, with the apostle Paul, his contemporary in Rome. The points of divergence, however, between him and the teacher of the Gentiles are more numerous than the points of coincidence (see the Dissertation in Lightfoot's *Commentary on Philippians*). His writings, apart from much that has been fathered on him, include three books *De Ira*; three consolatory pieces addressed to his mother Helvia, to Polybius, and to Marcia (*De Consolatione*); treatises *De Providentia*, *De Animi Tranquillitate*, *De Constantia Sapientis*, *De Clementia* (ad Neronem Cæsarem), *De Brevitate Vitæ* (ad Paulinum), *De Vita Beata* (ad Gallionem), *De Otio aut Secessu Sapientis*; seven books *De Beneficiis*; 124 *Epistulæ ad Luciliū*, comprising free speculations on philosophical questions of every kind, in which his characteristic powers appear to special advantage; a scathing satire on the Emperor Claudius, in the form of a parodied apotheosis (*Apocolocyntosis sive Ludus de Morte Cæsaris*); finally, seven books *Questionum Naturalium*, addressed to Lucilius the Younger—the only surviving Roman treatise on physics, if not the first in Latin literature (of the same compass at least). It reveals a decidedly exacter and wider knowledge and a sounder critical faculty than the later work of the elder Pliny.

Seneca had also a poetical side, if we may accept as his the epigrams (mainly referring to his banishment) and the eight tragedies (*Hercules Furens*, *Thyestes*, *Phædra*, *Œdipus*, *Troades*, *Medea*, *Agamemnon*, and *Hercules Cæteus*, along with two scenes from a *Thebais*) usually comprised among his *opera omnia*. These are imitations of Greek models, and are distinguished by great mastery of style, vigorous imagination, and keenness of psychological insight. But their purely rhetorical, eminently undramatic, character unfits them for the stage, if indeed they were ever intended for it. In versification they are 'correct' to a fault, till the monotony of their cadences becomes as wearisome as their declamatory strain.

Of editions of his prose writings that of Gronovius (1661–82), of Ruhkopf (1797–1811), and, best of all, that of Fickert (1842–45), still hold their place, while some of his special treatises have been carefully edited by Koch and Vahlen, and by Gertz. His tragedies may be most conveniently read in the editions of Gronovius (1661–81), of Schröder (1728), of Bothe (1819 and 1822), of Peiper and Richter (1867–1902), of Leo (1878), and of Haase (1898). The Loeb Library includes translations (with texts) of the *Apocolocyntosis* by Rouse (1913), the *Tragedies* by F. J. Miller (2 vols. 1917), and the *Epistulæ Morales* by R. M. Gummere (3 vols. 1917–26). The *Minor Dialogues* were translated by A. Stewart (1889), and the *Tragedies* by Dr Ella Isabel Harris (1904). See (for a portrait of the philosopher-statesman) Westbury's novel *Acté*, Hochart's *Études* (1885), A. P. Ball on the *Apocolocyntosis* (1903), and S. Dill's *Roman Society from Nero to Marcus Aurelius* (1905). There is a life by F. Holland (1920). For influence on English tragedy, see a book by F. L. Lucas (1922).

Seneca Falls, a 'village' of New York, on the Seneca River, 10 miles from the lake and 41 miles by rail WSW. of Syracuse. The river falls 50 feet here, and the place contains a number of mills, foundries, and manufactories of pumps, woollen and leather goods, &c. Pop. 6400.

Seneca Lake, one of a range of narrow lakes in the western part of the state of New York. It

is 36 miles from north to south, 2 miles in average width, and 530 feet deep. Steamers ply from end to end.—For the Seneca Indians, from whom the lake takes its name, see IROQUOIS.—Senega (q.v.) is a form of the same word.—Seneca Oil is an old name for Petroleum (q.v.).

Senecio, a very numerous genus of the great family Compositæ, having a hairy pappus, a naked receptacle, and a cylindrical involucre of linear equal scales, with a few smaller scales at their base. The species are natives chiefly of the temperate and cold parts of the world, the half-shrubby species being from the warmer latitudes, with some trees in Central Africa. Eleven species are reckoned as British, and commonly known as Groundsel (q.v.) and Ragwort (q.v.). *S. saracenicus*, perhaps not a true native of Britain but introduced in the middle ages, has undivided lanceolate leaves, and was once in repute as a vulnerary. *S. hieracifolius* is one of the plants called Fireweed in North America. It receives its name from appearing abundantly wherever a part of the forest has been consumed by fire. Many species of Senecio have a strong, disagreeable smell. A few are rather ornamental as flowers; see CINERARIA.

Senefelder, ALOYS. See LITHOGRAPHY.

Seneffe, or SENEFF, a town in the province of Hainault, Belgium, 27 miles by rail S. by W. of Brussels, with a pop. of 4000, is the centre of a district in which manufactures of pottery and glass are extensively carried on, but is chiefly notable as the battlefield on which William of Orange (III. of England) was defeated after a bloody contest by the Great Condé, 11th August 1674. Here, too, on 2d July 1794 the French general Marceau defeated the Austrians.

Senega, or SNAKE ROOT, is the dried root of *Polygala Senega* used as a cure for snake-bites in America. See MILKWORTS.

Senegal, a river of West Africa, has two main sources, the Bafing which flows north from the plateau of Futa-Jallon, and the Bakhoy which comes from the south-east, the country of Buré, not far from the north bank of the Joliba (Niger). These streams meet at Bafulabé, 700 miles from the coast, and from there the united Senegal flows north-west, west, and south-west, and reaches the Atlantic some 10 miles below St Louis. For three months of the year (July–October) boats drawing 20 feet can get up to Kayes, 40 miles below Bafulabé. The channel is, however, in those higher reaches greatly obstructed by falls and 'narrows,' and in its lower course it is studded with numerous low, flat islands. Although the river is navigable all the year round for about 200 miles up, it is not so serviceable to navigation as it might be because of a formidable bar that lies across its mouth. The difficulties of the navigation are in part overcome by a railway along the left bank of the river, between Kayes and Dioubéba, a place 25 miles beyond Bafulabé, and the French have continued the line to Bammake and Kulikoro on the Niger, communication being continued by steamer to Timbuktu and further.

For the French colonies of Senegal and Upper Senegal-Niger, see SENEGAMBIA.

Senegambia is a general name for the region drained by the rivers Senegal and Gambia, from whose names the word was compounded. In a wider sense it is applied, unofficially, to the French possessions in West Africa that lie to the north of French Guinea, the Ivory Coast, and Dahomey. The French first settled in this part of Africa early in the 17th century; but the settlements (more than once captured by the English, and again restored) languished until the appointment of General Faid-

herbe as governor of Senegal in 1854. He vigorously subdued the Berber chiefs, who prevented the French advance inland, and annexed their territories. This policy was pursued in the same spirit by his successors; districts were annexed and protectorates proclaimed with extraordinary celerity, in spite of great trouble occasioned by two powerful chiefs Ahmadou and Samory from 1887 to 1898. The chief danger was from British rivalry, but the French succeeded in penetrating fast enough down the Niger to cut off the hinterland of the British and German colonies; and by the convention of 1890 their title to the country as far east as Lake Tsad was recognised. A succession of later treaties (1898, 1904, 1906, 1914) further defined the limits of French West Africa. There have been many changes in the number and administration of the individual colonies, but at present the country under the Governor-General of West Africa consists of the colonies of Senegal, French Sudan, French Guinea, Ivory Coast, Dahomey, Upper Volta, Mauritania, and the colony of the Niger, a total area of nearly one and a half million square miles. The governor-general superintends the interests of the colonies as a whole, while each colony has a lieutenant-general to supervise local affairs.

In the north are nomad tribes, Moors, and Tuaregs, but the people belong for the most part to the Peulh and Mandingo tribes of negroes; they are in part Moslems, in part fetish-worshippers. The total population in 1923 was 12,583,111, of whom only 11,747 were Europeans, mostly French.

The principal geographical feature in these united regions is the plateau (2000-4000 feet) of Futa-Jallon; from its valleys issue many rivers that flow west and south-west to the Atlantic (e.g. the Gambia), north to the Senegal, and east and north-east to the Joliba (Niger). The villages of the natives are chiefly planted along these watercourses. In the north rainfall is scant and vegetation is stunted, but farther south there are grass-lands and dense forests thriving on a tropical rainfall. The baobab, butter-tree, kola-tree, oil-palm, and banana are typical. Ground-nuts, gums, fruits, rubber, cotton, cocoa, and timber (including Senegal ebony—see DALBERGIA) are exported; imports are mostly food, textiles, liquor, and machinery. Maize and millet are grown and there is some stock-raising.

The colony of Senegal lies west of the Falmé River and south of the Senegal (along with the north bank of the river). It includes four municipal communes: St Louis, the capital; Dakar, the seat of the governor-general; Rufisque, a port; and Gorée, a small fortified island off Dakar. The natives of the communes are French citizens. The colony sends a deputy to the French Chamber, but has also its own council of twenty representatives of French citizens and twenty of native chiefs. Area 74,112 sq. m.; pop. 1,270,000 (5700 Europeans). French Sudan, called Upper Senegal-Niger till 1920, was formed out of the territories of Senegambia and Niger in 1904. It is hemmed in by the colonies of Senegal, Mauritania, French Guinea, Ivory Coast, Upper Volta and Niger, and by the Sahara. The chief towns are Bamako, the capital (29,000), Kayes (11,000), and Timbuktu (7000). Area 356,471 sq. m.; pop. 2,562,000. Upper Volta, created a colony in 1919, lies in the southern portion of the bend of the Niger; it was formerly part of Upper Senegal-Niger. The chief town is Ouagadougou (20,000). Area, 142,820 sq. m.; pop. 3,000,000. The colony of the Niger was constituted in 1922. Formerly a military territory, it stretches from the Niger to the region of Lake Tsad. The capital is Zinder (5900). Area, 404,914 sq. m.; pop. 1,150,000. See separate articles on DAHOMEY, FRENCH GUINEA, IVORY COAST, MAURITANIA, also NIGER, SENEGAL, TIMBUKTU.

Seneschal (Old French; from the same roots as the Gothic *sins*, 'old,' and *stalks*, 'a servant'; compare *marshal*), a functionary in the household of the Frankish kings corresponding to what in England and Scotland was designed 'steward,' usually rendered into Latin as *senescallus*.

Senigallia, or SINIGAGLIA (anc. *Sena-Gallia*), a seaport on the Adriatic coast of Italy, 16 miles by rail NW. of Ancona, was down to 1869 celebrated for its annual fair, 20th July to 8th August. It was founded by the Senonian Gauls, and colonised by the Romans 289 B.C. The Guelph and the Ghibelline wars brought it to such a condition that it is mentioned by Dante as the type of a ruined city. There are here a cathedral (1787) and a Gothic castle, restored in 1480 by Baccio Pontelli for Giovanni della Rovere, nephew of Sixtus IV. Pius IX. was born here. Pop. (1921) 25,327.

Senior, NASSAU WILLIAM, political economist and 'prince of interviewers,' was born on 26th September 1790, at Compton in Berkshire, the eldest son of the vicar of Durnford, Wilts, and from Eton passed to Magdalen College, Oxford, where in 1812 he took a distinguished first-class in classics. In 1819 he was called to the bar at Lincoln's Inn; during 1825-30, and again during 1847-62, was professor of Political Economy at Oxford; in 1832 was appointed a Poor-law commissioner; and from 1836 to 1853 was a Master in Chancery. He travelled much, and wrote much for the *Edinburgh Review* and other leading periodicals, his twenty works including, besides treatises on political economy, *Biographical Sketches* (1863); *Essays on Fiction* (1864); *Historical and Philosophical Essays* (1865); *Journals, Conversations, and Essays relating to Ireland* (1868); *Journals kept in France* (1871); *Conversations with Distinguished Persons during the Second Empire* (4 vols. 1878-80); and *Conversations and Journals in Egypt and Malta* (1882). He died 4th June 1864.

Senlac. See BATTLE, HASTINGS.

Senlis, a very ancient town of France, dept. of Oise, 33 miles NNE. of Paris. Its older portion is surrounded by walls, flanked with towers, which date from Roman times. The cathedral, a small edifice, with a striking bell tower (1140), is a beautiful example of early Gothic; Senlis ceased to be a bishop's seat in 1801. Here was signed on 23d May 1493 a treaty between Charles VIII. of France and the Emperor Maximilian I. There still exist the ruins of an old royal castle. The town suffered severely in the Great War. Pop. 6500.

Senna is the dried leaflets of two species of Cassia, various preparations of which are used in medicine as purgatives. The Alexandrian senna leaves are obtained from *Cassia acutifolia*, and the Tinnivelly senna leaves from *Cassia angustifolia*. *Alexandrian senna* is chiefly grown in Nubia and Upper Egypt, and is imported in large bales from Alexandria. *Tinnivelly* or *East Indian senna* resembles Alexandrian senna in odour and taste. The leaflets are, however, larger and finer, 'about 2 inches long, lanceolate, acute, unequally oblique at the base, flexible, entire, green, without any admixture.' Senna pods (*Sennæ Fructus*) are also largely used for making purgative medicines.

The active principle in senna is a glucoside, which has been named cathartic acid, and which is closely allied to chrysarobin and the purgative principle in rhubarb; there are also other substances which impart to senna its peculiar odour and taste, as well as a variety of sugar. The different pharmaceutical preparations of senna act as moderately active cathartics, but tend to cause griping. To obviate this, and to disguise the nauseous taste of the drug, they are all made up

with a number of carminative and flavouring substances. The active principles in senna are excreted in the urine, which is coloured yellow,



Cassia obovata.

and by the milk, which is rendered purgative. The official preparations comprise the confection of senna (dose about a tea-spoonful), the infusion of senna (dose 1 to 4 table-spoonfuls), the syrup of senna (dose 1 to 2 tea-spoonfuls), and the compound mixture of senna or 'black draught' (dose 1 to 4 table-spoonfuls). Compound

liquorice powder consists largely of senna. The dose of senna itself is 10 to 30 grains.

BLADDER SENNA (*Colutea*) is a genus of shrubs of the family Leguminosæ, sub-family Papilionaceæ, having pinnate leaves, red or yellow flowers, and remarkably inflated pods, whence the English name. One species (*C. arborescens*) is common in shrubberies in Britain. It is a native of the south of Europe.

Sennaar (properly *Sennar*, sometimes also *Senaar*), a city of the Eastern Sudan, stands on the Blue Nile, about 160 miles SSE. of Khartum. Pop. 8000. It is the chief town of a district lying between the Blue and the White Nile, an old kingdom, now a province of Anglo-Egyptian Sudan. For the disastrous expedition of Hicks Pasha into this province in 1883 see Colborne, *With Hicks Pasha in the Soudan* (1885), and Wingate, *Mahdism and the Egyptian Sudan* (1891). See also article GEZIRA (EL).

Sennacherib, an Assyrian king, son of Sargon, reigned 705 to 681 B.C. The chief events of his reign are enumerated under Assyria (q.v.). He was the originator of great public works, as the embankment of the Tigris, the making of canals, watercourses, and the erection of gigantic palaces at Nineveh.

Senonian. -See CRETACEOUS SYSTEM.

Sens, an old town of France, dept. Yonne, stands on the right bank of the Yonne, 70 miles by rail SE. of Paris, and is still surrounded with its ancient walls. It was known anciently as Agedineun or Agendicum, and was the principal town of the Gallic tribe of the Senones. Its chief ornament is the Gothic cathedral of St Stephen, founded, some say, in the 10th century, but built mainly in the 12th, and restored twice or thrice since. It has splendid portals, fine stained glass, and two large bells; in its treasury are preserved the vestments of Thomas à Becket. There are also the palace and ancient public offices of the archbishop, and a town museum. The chemist Thénard was born in the place. Population, over 15,000.

Sensation may be defined as the change in consciousness which results from the transmission of nervous impulses to the brain. Such impulses arise in sensory end-organs at the periphery of the

body where elaborate nervous mechanisms are developed in connection with the various senses of smell, sight, hearing, and taste. The surface of the skin is a mosaic of tiny sensorial areas, not necessarily connected, and furnished with end-organs known as 'touch-spots,' 'cold-spots,' 'heat-spots,' and 'pain-spots.' From these, impulses are carried to the brain by sensory or afferent nerves, which are separate from the motor nerves. It must be noted, however, that afferent impulses are being constantly carried to the brain from all parts of the body, resulting in motor and other acts necessary to our life, without exciting any sensation at all.

It has been customary to speak of all varieties of general somatic sensibility in terms of touch, pain, heat and cold, for these seem to accord best with what we find by introspection. As these may all be preserved and the patient be still unable to recognise the relationship of a limb in space, or to appreciate movements carried out passively, a hypothetical 'joint-sense' or 'muscular-sense' has been added, and this whole complex was supposed to be transformed by cerebral association and judgment into the mental processes by which we become aware of the physical qualities of the world around. According to the doctrine of specific nerve energy, it was also held that each physical act of sensation was associated with distinct processes which started in the peripheral end-organs and passed unaltered to the cortex of the brain.

The pathway by which sensory impulses find their way from the peripheral end-organs up to the brain is fairly well established, and involves at least three nerve fibres. The nerve cells from which the peripheral fibres arise are situated in the posterior root ganglia. Their axis cylinder processes bifurcate, one branch passing to terminate in the sensory end-organ, the other passing into the spinal cord to terminate round nerve cells in the gray matter. A number of these fibres pass directly upwards in the posterior columns of the spinal cord to terminate round nerve cells in the medulla oblongata constituting the cuneate and gracile nuclei. From these a second neurone, known as the mesial fillet, passes to the *opposite* optic thalamus, which is thus sensory in function. The final connection with the post-central convolution immediately behind the fissure of Rolando in the cortex is not yet established.

The sensory pathway may thus be divided into three parts, the first *peripheral*, the second *intramedullary*, and the third *cerebral*. The fact that a sensation arising in an end-organ cannot pass unaltered to the cerebral cortex has been discovered from the fact that injuries to the peripheral nerves, to the spinal cord, and to the brain, all tend to disturb sensation in a different way. This is now known to be due to a regrouping that afferent impulses undergo on their way to the highest receptive centres. Each end-organ is to be regarded as a resonator tuned to some aspect of physical vibration. It responds by producing an afferent impulse stamped with the characteristic peculiar to the organs in which it has arisen. Each of these impulses acts in turn on a series of receptive mechanisms within the central nervous system which are themselves attuned to certain physiological qualities, and thus here those of like sensory disposition are gathered together whatever their peripheral origin.

Afferent fibres in the *peripheral* nerves may be divided into three systems: (1) Those which subserve *deep sensibility*, and conduct impulses produced by pressure and by movements of joints, tendons, and muscles. They run mostly with the motor nerves, and are not destroyed by division of all the sensory nerves to the skin. They allow recognition of passive movement and the position

of a limb in space. (2) Those which subserve *protopathic* sensibility, and which respond to painful stimuli and to extremes of heat and cold. At least three different types of end-organs are associated with this system. After division of a peripheral nerve, *protopathic* sensibility returns in from seven to ten weeks. (3) Those which subserve *epicritic* sensibility, and which respond to light touch with a well-localised sensation, thus allowing of the discrimination of two points and appreciation of the finer grades of temperature called cool and warm. After division about six months elapses before return of function occurs. Head regards the *epicritic* system as a cutaneous system of later development and higher function which is superposed on the older *protopathic* system. This latter system has certain primitive characteristics, namely, rapid regeneration, strictly specific response, and reaction on the 'all or none' principle, while all sensations arising from uncontrolled *protopathic* activity tend to radiate widely and to be referred to remote parts. *Epicritic* sensibility, which is so much longer in returning after injury, causes a more strictly limited response, radiation no longer takes place into remote parts of the affected area, and the 'all or none' reaction of the heat and cold spots gives rise to one graduated more closely according to the intensity of the stimulus. The activity of the *epicritic* system is essentially modulated according to the intensity and locality of the excitation. It is concerned with the finer degrees of tactile and thermal discrimination, and thus is opposed to and controls the 'all or none' reaction of the *protopathic* system. The internal organs are supplied from the *protopathic* system alone, no controlling *epicritic* mechanism being developed.

When these impulses reach the secondary or *intramedullary* level in the spinal cord, they undergo a regrouping, and it is no longer a question of *protopathic*, *epicritic*, and deep sensibility. They become shunted into tracts which are devoted to the conduction of one specific impulse, such as pain, touch, heat and cold. A lesion of the spinal cord may thus interrupt any one of these tracts independently of the others. This rearrangement and recombination takes place on the same side as that by which the impulses enter the cord. The secondary paths for sensory impulses then cross with greater or less rapidity, so that ultimately all except those subserving the sense of passive position and movement and tactile discrimination have passed to the opposite side within the limits of the spinal cord. Even those sensory impulses cross after reaching the nuclei of the posterior columns. At the same time, within the spinal cord, afferent impulses become separated into sensory and non-sensory, many of the latter being destined for the cerebellum which they reach by the uncrossed cerebellar tracts.

The termination of the *intramedullary* portion of the sensory pathway is the optic thalamus of the opposite side. The exact localisation of the third portion of this pathway, namely, from the thalamus to the post-central cortex, is not yet known. Destruction of the optic thalamus, as may occur in apoplexy, causes loss of sensation on the opposite side of the body. Destruction of the post-central convolution, on the other hand, also profoundly affects sensation, but the sensory changes which result have to be considered in terms of the psychical act and not the physical stimulus. The part played by the cortex is concerned with those physiological processes which underlie projection and discrimination, and fall into three categories: (1) recognition of relationship in space; (2) graduated response to stimuli of different intensities; and (3) appreciation of similarity and differ-

ence in external objects brought into contact with the surface of the body. These three aspects of cortical activity are not all equally represented in different parts of the sensory cortex. The optic thalamus is the seat of those physiological processes which underlie crude sensations of contact, pain, heat and cold, together with the feeling tone they evoke. The optic thalamus is thus the centre for the affective aspect of sensation, while discrimination and spacial projection are the product of cortical activity. The prick of a pin is thus felt by the optic thalamus, while the sharpness or bluntness of the pin is recognised by the cortex. If a glass of water be held in the hand, the recognition of contact, heat, cold, or pain are all due to the optic thalamus, but the roundness, size, and weight of the glass together with the power to appreciate the posture of the hand in which it lies, is a function of the cortex.

The sensations experienced in daily life thus result from excitations of the end-organs of the peripheral nerves. These are complex and cause many diverse afferent impressions. They are sorted out and regrouped in the central nervous system, some facilitated and others repressed, and many remain permanently on the physiological level and never form the basis of a sensation: such control reflex activity and co-ordinate movements of the body and limbs. The remainder undergo a process of prolonged qualitative integration, a struggle takes place between these various impulses for functional dominance, the victor alone appearing in consciousness as a sensation. Otherwise incompatible sensations would co-exist in consciousness, mental activity would be chaotic, and discrimination impossible. The origin of sensory impulses is a physico-physiological problem; their passage through the central nervous system is a process of regrouping of excitations at different physiological levels, and their final fate—i.e. the appearance in consciousness of a sensation—is a psycho-physiological problem.

Pain is a function of the intelligence, a psychical element superposed upon the subconscious protective reflexes. It is one of the most effective weapons of defence of the organism, but appears to be unequally developed at different stages in the animal scale. We have no proof that it exists in the lower animals, the afferent impulses which give rise to pain in higher animals subserving reflex action in lower members of the series. When certain worms have been divided into half, the anterior part has continued to move quietly as though it had felt no pain. Herbivora are less sensitive than carnivora. In imbeciles, idiots, and demented, pain sensibility is low. As it runs parallel with the development of intelligence, it is more developed in the human race as they become more civilised.

LITERATURE.—Papers by Sir Henry Head (London) in *Brain*, vols. xxviii., xxix., xli., 1905, 1906, 1918.

Sensitive Plant, a name commonly given to certain species of *Mimosa* (see *MIMOSIDEE*), on account of the peculiar phenomena of irritability which their leaves exhibit in their collapse when touched or shaken. Numerous species of *Mimosa* possess this property, and, indeed, most of the species in a greater or less degree; but those in which it is most conspicuous are humble herbaceous or half-shrubby plants. They have leaves beautifully divided, again and again pinnate, with a great number of small leaflets, of which the pairs close upwards when touched. On repeated or rougher touching the leaflets of the neighbouring pinnæ also close together, and all the pinnæ sink down, and at last the leaf-stalk itself sinks down, and the whole leaf hangs as if withered. If the

stem is shaken all the leaves exhibit the same phenomena. After a short time the leaf-stalk rises, and the leaflets expand again. On account of this curious and interesting property some of the sensitive plants are frequently cultivated in our hothouses. They are generally treated as annuals, although capable of longer life. *M. sensitiva*, one of the best-known species on the continent of Europe, is a native of Brazil, with prickly stems and leaf-stalks, and small heads of rose-coloured flowers. *M. pudica* is the species most commonly cultivated in British hothouses; it is a branching annual growing from 1 to 2 feet high. *M. casta*, *M. somnians*, and *M. viva* are also among the most sensitive species. See the section on the movement of plants at PLANTS.

Sensorium, the supposed centre of sensation or seat of the soul, once believed to be some spot in the brain. See BRAIN, PINEAL GLAND, SENSATION.

Sentinel, Sentry (from the Lat. *sentire*, 'to feel or perceive,' through the Ital. *sentinella*), a soldier or sailor marine at a point with the duty of watching for the approach of an enemy, or guarding the gun-park, camp, magazine, or other locality. When an army is in the field its front and flanks are protected by 'outposts.' These consist of a chain of pickets (some fifty men each), covered in front by the sentries they throw out, and assisted in rear by other bodies called 'supports.' Each picket would furnish two to four double sentry posts, so that no portion of ground along the front is unwatched. These double sentry posts must be visible to one another and to other sentries (single) who, posted over the piled arms of each picket, report their signals. Sometimes groups of three to six men, one watching, the rest lying down, are used instead of the double sentries. If attacked, sentries fall back on the pickets, and with them retire upon the supports. Each is entrusted with the 'parole' or countersign, and no person, however exalted in position, may approach or pass him without giving that as a signal. As the safety of the army depends upon the vigilance of the sentries, the punishment for sleeping when on sentry-duty on active service is death.

Sentis. See SÂNTIS.

Senussi (*Senüssiya*), a Moslem confraternity of austere and fanatical doctrines, which has done much to unite the Mohammedan population of the north-eastern Sahara in hostility and resistance to foreign and infidel influences. The founder, Sidi Mohammed ben Ali es-Senussi ('of the Senus mountains'), from Mostaganem in Algeria, became famous about 1830 in Fez for his sanctity. He preached his doctrine of a pure and ascetic Islam from Morocco to Mecca, but his teachings met with most success amongst the Bedouins of Cyrenaica, and to that country he repaired to build a college (*zawia*) at Baida. In 1855 he removed to Jaghabub, near the oasis of Siwa. Here he established a prosperous college, and here in 1860 he died, being succeeded by his son, who claimed to be the promised Mahdi (q.v.). The second Senussi lived a saintly life, but came into conflict with the French, who were advancing from Lake Tsad. The French were victorious, and Senussi died in May 1902. He was succeeded by Sidi Ahmad, his nephew, who continued to oppose the French advance, and also aided the Turks against the Italians in Cyrenaica. Siding with Turkey and Germany in the Great War, Sidi Ahmad threatened serious trouble in 1915 to the British forces in Western Egypt. He was finally defeated at Siwa (1917), and abdicated in favour of Sidi Mohammed el Idris es-Senussi, son of Senussi el Mahdi. Sidi

Mohammed wields a powerful spiritual authority over the Senussi confraternity, and has restored the prestige of his house lost by his predecessor. See Rosita Forbes, *The Secret of the Sahara* (1921); Hassanein Bey, *The Lost Oases* (1925).

Seoní, a town in the Central Provinces of India, half-way between Nagpur and Jabalpur on the great Deccan road. Pop. (1921) 12,772.—There is a smaller Seoní (pop. 6000) 35 miles SW. of Hoshangabad.

Seoul, or SÖUL, the capital of Korea, stands on the river Han, 75 miles from its entrance into the Yellow Sea and 57 miles from its port Chemulpo (q.v.). It lies in a natural basin, amongst granite hill-ranges, and is surrounded with walls. The streets are very narrow and very dirty, and the houses beggarly in the extreme. The city includes several wide, desolate squares. The royal palace and its adjuncts cover 600 acres of ground. Silk, paper, tobacco, mats, fans, and similar commodities are the principal products of native industry. Pop. 270,000.

Sepal. See CALYX, FLOWER.

Separate Estate. See HUSBAND AND WIFE.

Separation of married persons is either judicial or voluntary. If the parties enter into a deed or other arrangement to live separate, this is called a voluntary separation, and in general the legal rights of the parties are not altered, except that if the wife is provided with maintenance she has no longer an implied authority to bind the husband. And though voluntary separation is not encouraged by courts of law, yet effect will be given frequently to deliberate contracts of this kind entered into between the parties. Formerly the intervention of a trustee was in all cases necessary, but now an arrangement made directly between husband and wife is enforced by the English courts. In the United States the law of several states confers the right to contract, to maintain actions, &c., on a married woman who, for good cause, is living apart from her husband. See also JUDICIAL SEPARATION.

Separators. See CREAM.

Sephardim. See ASHKENAZ.

Sepharvaim. See BABYLONIA.

Sepia, a brown pigment used as a water-colour. It is prepared from the dark-brown colouring matter of the ink-bag of a few species of Cuttle-fish (q.v.), particularly *Sepia officinalis*, which, though chiefly fished for in the Adriatic and Mediterranean, is also found in British seas. The pigment from the dried ink-bags is dissolved in a solution of ammonia or soda and then precipitated by neutralising the alkali with hydrochloric acid, the precipitate being afterwards washed and dried. An ounce of the natural pigment will darken several thousand ounces of water. Sepia excels all other water-colours in the ease with which its tints can be evenly put on paper with a brush. It is much used by itself for sepia drawings, and also in combination with other colours for various subdued tints. It is, however, not suitable for oil-painting. Sepia is permanent when not exposed to sunshine. Most of the modern sepia is made artificially.

Sepoy, corrupted from the Persian *sipahi*, 'a soldier,' denotes a native Hindu soldier as distinguished from a European soldier (*gora*).

Seps. See SKINK.

Sept. See CLAN.

Septaria are ovate, flattened nodules of argillaceous limestone or ironstone, internally divided into numerous angular fragments by reticulating fissures radiating from the centre to the circumference, which are filled with some mineral substance, as carbonate of lime or sulphate of barium, that has been infiltrated subsequent to their formation. The fissures have been produced by the cracking of

the nodule when drying. They are largest and most numerous in the centre, and gradually decrease outwards, showing that the external crust had first become indurated, and so, preventing any alteration in the size of the whole mass, produced wider rents as the interior contracted. The radiating figure and the striking contrast between the dark body of argillaceous limestone or ironstone and the more or less transparent sparry veins when the nodule is cut and polished have caused them to be manufactured into small tables and similar objects. Calcareous septarian nodules are extensively employed in the manufacture of cement. As they are composed of clay, lime, and iron, they form a cement which hardens under water, and which is known commercially as Roman cement, because of its properties being the same as a famous hydraulic cement made of ferruginous volcanic ash brought from Rome. Such septaria occur in layers in clay deposits, and are quarried for economical purposes in the clays of the London basin. Large numbers are also dredged up off Harwich, which have been washed out of the shore-cliffs by the waves. The septarian nodules of the Carboniferous strata consist generally of clay ironstone, and are sometimes employed in the manufacture of iron. The nodules generally contain a scale, shell, plant, fruit, coprolite, or some other organic substance, forming the nucleus that has apparently excited the metamorphic action which withdrew from the surrounding clay the calcareous and ferruginous materials scattered through it, and aggregated them around the fossil.

September. See CALENDAR.

Septembrists, the perpetrators of the atrocious September massacres in the prisons of Paris, which went on continuously for six days and five nights, September 2-7, 1792. Every violent movement in the history of Paris during the fever of Revolution was a counterpart to some menace or disaster on the frontier, and the immediate occasion of this crowning atrocity was the reaction of panic at the capture of Longwy and Verdun by the Prussians. It assured the political power of the Commune and controlled the elections to the Convention. Las Cases tells us that Napoleon found himself able to suggest apologies for the atrocity in the exigencies of the moment. Taine gives the number of victims as follows: 171 at the Abbaye, 169 at La Force, 223 at the Châtelet, 328 at the Conciergerie, 73 at the Tour-Saint Bernard, 120 at the Carmelites, 79 at Saint-Firmin, 170 at Bicêtre, 35 at the Salpêtrière; among them 250 priests and the Princess de Lamballe. See DANTON, MARAT, and ROBESPIERRE.

Septennial Act. See PARLIAMENT.

Septicæmia. See PYÆMIA.

Septuagesima. See QUINQUAGESIMA.

Septuagint is the name given to the Greek translation of the Old Testament. The name is derived from the account of the origin of the Septuagint which is given in the *Epistle of Aristeas*. According to the story King Ptolemy of Philadelphus (285-247 B.C.) at the instigation of Demetrius of Phalerum, determined to have a Greek translation of the Hebrew Scriptures made for his library at Alexandria, and in pursuit of this purpose despatched an embassy to the High Priest Eleazar at Jerusalem, asking him to send a commission of the most erudite Jewish scholars of the day to carry out the work of translation. Eleazar responded to the request with alacrity and despatched 72 elders—six from each tribe—for the task. Elaborate preparations were made at Alexandria for the comfort of the guests—and at the end of 72 days they were able to present their

translation to the king. In later times the story was embellished by legendary accretions. In the anonymous Christian apology *Cohortatio ad Græcos* (c. 13) it is said that the translators were isolated from each other and placed in separate huts or cells. They all worked independently but at the end it was found that their translations were in complete agreement without the slightest trace of any verbal variations. It is probable that there is a modicum of truth in the story as it is told in the *Epistle of Aristeas*—though there are many discrepancies and inaccuracies in the narrative. It is impossible that the whole of the LXX could have been translated into Greek at so early a date as the reign of Ptolemy Philadelphus, but it is not improbable that a Greek version of the Pentateuch may have been made about this time, and there is every likelihood that the tradition as to the Alexandrian origin of the LXX is correct. It is certain that the other books of the Hebrew Old Testament were translated by other hands and at different times. The main conclusions of modern scholarship may be summarised in the words of Otley 'We may believe without hesitation that the Law—the Pentateuch—was translated at Alexandria within fifty years of the date indicated in Aristeas. The translation of the other books followed bit by bit during the next century and a half. In some cases one book of a group may have been translated first, as the *Kingdoms* among the historical books or Isaiah among the prophets; or again some separate passages, used as lessons in the synagogue, may have been first interpreted when the lessons were read, then committed to writing, and later used as instalments of the translation of those books in which they occur. Various hands would of course be employed in the work, as it extended over several generations.' The use of the LXX soon became popular in the Jewish Diaspora and in many parts of the world threatened to supplant the Hebrew original altogether. When we remember that out of a total Jewish population in the ancient world of some four and a half millions, only 600,000 lived in Palestine—while the rest were scattered throughout the rest of the world, where at the time Greek was the *lingua franca*, it is easy to see the motive for the LXX and the wide field of circulation it would be able to command.

When we compare the LXX with the Hebrew original numerous differences between them at once become obvious. Sometimes the differences extend even to the subject matter and contents of the books. The LXX, for instance, makes very extensive additions to the book of Esther (about 107 verses) and the book of Daniel. In the book of Job, on the other hand, it omits a considerable section of the Massoretic text (about 200 verses). Moreover it contains many books not found in the Hebrew Canon, e.g., the Wisdom of Solomon, Ecclesiasticus 1 and 2, Maccabees, &c. (see APOCRYPHA). In many cases, too, the Greek version departs from the Hebrew original in the matter of translation. Sometimes the variation is due to a misunderstanding of the Hebrew word, sometimes to a different vocalisation from that which appears in the traditional Massoretic text—and in some cases the LXX has preserved an original reading which afterwards became corrupted. The LXX is therefore of immense value for the purpose of textual criticism and is very widely used to-day as a means of correcting the Hebrew text.

In the early period of the Christian era three attempts were made to improve upon the Septuagint translation—viz. (1) the version of Aquila (c. A.D. 130) who aimed at producing an absolutely literal translation of the original; (2) the version of Theodotion (c. A.D. 180) which more closely

resembles the text of the LXX; (3) the version of Symmachus which had more pretensions to Greek style than any of its predecessors. These three versions together with the LXX were put in parallel columns by Origen in his great critical work *The Hexapla*. Most of the *Hexapla* has unfortunately been lost, but the surviving fragments have been collected by Field (1875).

The first printed edition of the LXX was the Complutensian which was published in 1521. This was followed two years later by the Aldine edition. These were superseded by the Sixtine edition, published in Rome in 1587, which formed the basis of many other editions, e.g. the London Polyglot (1657). The first attempts at a critical text were made by Grabe in 1707, and Holmes and Parsons in 1798, and the work received great impetus from the contributions in more recent times of Tischendorf and Lagarde. The standard modern edition is the Cambridge Septuagint, which was edited by Swete (1887-1894, new edition 1902). A larger edition with fuller and more comprehensive textual material is in process of writing under the editorship of Canon Brooke and Mr N. McLean. Genesis was published in 1906 and the Octateuch completed in 1918.

An incalculable service to the study of the LXX was rendered by Hatch and Redpath who compiled and published an invaluable *Concordance to the Septuagint* (1892-1897). The study of the grammar and philology of the LXX has recently attracted a great deal of attention, especially in the light of the Papyri, and valuable contributions have been made by Thackeray in England and Helbing in Germany.

LITERATURE.—In addition (to the works already mentioned) Otley, *A Handbook to the Septuagint* (1919); Swete, *Introduction to the Septuagint* (1901); editions of the *Epistle of Aristeas*, by Thackeray (1917), Andrews (the Oxford Apocrypha and Pseudepigrapha, 1913), and Wendland (1900); a valuable article on 'Septuagint' by Nestle in Hastings's *Dictionary of the Bible*; Hatch, *Essays in Biblical Greek* (1889); Psichari, *Essai sur le Grec de la Septante* (1908).

Sepulchral Mound. See BARROW, BURIAL, CAIRN, STONE CIRCLES.

Sepulchre, THE HOLY. See JERUSALEM.

Sepúlveda, JUAN GINÉS, a Spanish historian, was born at Pozoblanco, in the neighbourhood of Córdoba, about 1490, studied first at Córdoba and Alcalá de Henares, and went to Bologna in 1515, where and at Rome he became acquainted with the most celebrated savants of Italy and Spain. In 1536 he returned to Spain as historiographer to Charles V. and preceptor to his son, afterwards Philip II. After living successively in Valladolid, Córdoba, and Madrid, he was made a canon of Salamanca. In that town he died on 23d November 1574. He won a reputation as the champion of humanism against the prevailing scholasticism. His principal work is entitled *Historia Caroli V.*, published with a biography and Sepúlveda's other works by the Madrid Academy in 4 vols. in 1780. His other works include a Life of Alborno, a History of the Reign of Philip II., and a History of Spain in the New World.

Séquard. See BROWN-SÉQUARD.

Sequence. See HYMN.

Sequestration, the Scots legal term for Bankruptcy (q.v.).—In English law sequestration is a prerogative form of process, by which commissioners are empowered to take possession of the property of a person who is in contempt. There is also a special form of sequestration issued against a clergyman, by which the bishop is commanded to sequester the profits of the debtor's benefice to answer the plaintiff's claim. On sequestration the

bishop is required to appoint a curate and assign him a stipend.

Sequin (Ital. *zecchino*, from *zecca*, the name of the Venetian mint), a gold coin of Venice, equivalent to the gold Ducat (q.v.).

Sequoia, a small genus (two species) of evergreen coniferous trees belonging to California. *S. gigantea*, better known in Britain as *Wellingtonia*, is the 'Mammoth Tree' of California. Sequoia is

a Latinised form of the name of the famous Cherokee chief, Sequoyah (see CHEROKEES).

The existence of this mammoth tree, which is rivalled in height only by the Eucalyptus (q.v.) of Australia, is said to have been recorded by Menzies in 1796; the tree was introduced into Britain in 1853 by Lobb. The tree, though found at elevations varying from 4000 to 7000 feet above sea-level, affects only sheltered valleys, in which it occurs in groves intermixed with other trees. The most remarkable of those groves is in Calaveras county; only less remarkable is that of Mariposa near the Yosemite Valley. The 'Mammoth Grove' of Calaveras consists of from 90 to 100 trees of gigantic proportions. A notable Sequoia was the 'Mother of the Forest' (327 feet, girthing 75 feet near the base). The bark, about 18 inches thick, was removed in sections to the height of 116 feet (causing the death of the tree), and fitted up as it came from the tree in the Crystal Palace, Sydenham, to illustrate the proportions of the mammoth tree; this erection was destroyed by fire in 1866. Near by the 'Mother' lies prostrate the trunk of the 'Father of the Forest,' which girths at the ground 110 feet. In falling the trunk had broken over at the height of 300 feet. At that point the girth is 40 feet, and taking the average taper of the surrounding trees, this dead giant may reasonably be computed to have exceeded 400 feet at the time of its fall. Inside the fallen trunk there is a tunnel 35 feet long, and from 8 to 10 feet high. The 'Pioneer's Cabin,' a cavity in the trunk of another giant in this grove, is large enough to accommodate a numerous party at dinner. The 'Three Graces' (see fig. 1), growing within a few feet of each other, became famous for their symmetry and beauty; they attain almost equally to the height of 265 feet. The age of these larger specimens is variously estimated at from 1000 to 3000 years; such estimates, however, based as they are on the enumeration of the concentric rings of the trunk, are not to be implicitly relied upon, particularly in the case of evergreen trees. The timber of the mammoth tree is reddish in colour when matured, non-resinous, and inodorous, the fibre short, porous, and brittle; it is not regarded as durable. In Britain, when planted



Fig. 1.—*Sequoia gigantea*—the 'Three Graces.'

of Mariposa near the Yosemite Valley. The 'Mammoth Grove' of Calaveras consists of from 90 to 100 trees of gigantic proportions. A notable Sequoia was the 'Mother of the Forest' (327 feet, girthing 75 feet near the base). The bark, about 18 inches thick, was removed in sections to the height of 116 feet (causing the death of the tree), and fitted up as it came from the tree in the Crystal Palace, Sydenham, to illustrate the proportions of the mammoth tree; this erection was destroyed by fire in 1866. Near by the 'Mother' lies prostrate the trunk of the 'Father of the Forest,' which girths at the ground 110 feet. In falling the trunk had broken over at the height of 300 feet. At that point the girth is 40 feet, and taking the average taper of the surrounding trees, this dead giant may reasonably be computed to have exceeded 400 feet at the time of its fall. Inside the fallen trunk there is a tunnel 35 feet long, and from 8 to 10 feet high. The 'Pioneer's Cabin,' a cavity in the trunk of another giant in this grove, is large enough to accommodate a numerous party at dinner. The 'Three Graces' (see fig. 1), growing within a few feet of each other, became famous for their symmetry and beauty; they attain almost equally to the height of 265 feet. The age of these larger specimens is variously estimated at from 1000 to 3000 years; such estimates, however, based as they are on the enumeration of the concentric rings of the trunk, are not to be implicitly relied upon, particularly in the case of evergreen trees. The timber of the mammoth tree is reddish in colour when matured, non-resinous, and inodorous, the fibre short, porous, and brittle; it is not regarded as durable. In Britain, when planted

in rich alluvial soil in well-sheltered positions, it is found to rival the Larch or any of the more rapid growing timber-trees in the production of timber in a given time. The tree is hardy enough to resist the severest frost likely ever to be experienced in Britain, but will not endure wind, especially that from the north and east. There are several varieties in commerce, the result of cultivation—viz. *S. g. pendula* and *S. g. aurea*, which cannot be said to be in either case improvements on the faultless cone-like symmetry of growth which characterises the typical form. *S. sempervirens*, the other species, is the Redwood or Bastard-tree of the Californian settlers, a handsome tree also of gigantic proportions. Though apt to assume a rusty appearance in winter in Britain, the effect of wind, the tree is perfectly hardy, and grows with great rapidity when planted in good soil and in sheltered



Fig. 2.

a, twig of *Sequoia gigantea*, with cone; b, *Sequoia sempervirens*, with male inflorescence; c, cone of latter.

places. The timber is light, beautifully grained, and durable, but splits with remarkable facility; it is used in California and also exported to China and Australia to be made into furniture. Both species are prized as ornamental trees, and no collection of choice conifers can be regarded as complete without them. See CONIFERÆ.

Sequoyah. See CHEROKEES.

Seraglio, an Italian word meaning 'enclosure' (from *sera*, 'a bolt'), once used in English for any enclosure such as the Jews' Ghetto at Rome, but now restricted to mean a harem or suite of women's apartments, apparently from a confusion with the similar but totally distinct Persian (and Turkish) word *serai*, 'a king's court,' 'palace,' also 'a caravanserai.' The Old Seraglio (*eski serai*, 'old palace'), the ancient residence of the sultans at Constantinople, stands in a beautiful situation, where Stamboul juts farthest into the Bosphorus, and encloses within its walls a variety of mosques, gardens, and large edifices, the chief of which is the Harem (q.v.). Conversion into a museum was announced in 1926. See CONSTANTINOPLE.

Seraievo. See SARAJEVO.

Seraing, a town of Belgium, 4 miles by rail SW. of Liège, stands on the right bank of the Meuse, and is connected by a handsome suspension bridge with the village of Jemeppe. It is the seat of a colossal manufactory of steam-machinery, locomotives, &c., which was established by an Englishman, John Cockerill (q.v.), in 1817 in the old summer palace of the bishops of Liège. On his death in 1840 the concern passed into the hands of the John Cockerill Society. In this establishment were made the first locomotive used on the Continent (1835), the machinery for boring the Mont Cenis tunnel, and the great lion on the field of Waterloo. Pop. (1827) 2000; (1922) 39,000.

Serampur, a town of India, built in the European style, and extending a mile along the

right bank of the Hugli, 13 miles by rail N. of Calcutta. Paper and mats are manufactured. It was at one time a Danish settlement, but was transferred by purchase to the British in 1845. It is celebrated for the labours of the Baptist missionaries Carey, Marshman, and Ward. Pop. (1921) 33,197.

Serang. See CERAM.

Serao, MATILDE, an Italian novelist, was born at Patras in Greece, on 7th March 1856, the daughter of an Italian political refugee and a Greek lady. She was brought up partly in Greece, partly in Italy, and, as a telegraph clerk (see her *Telegrafi dello Stato*), began her literary career in 1878 by writing tales and sketches for various journals. Her fame was established in 1881 and 1883 by two ambitious romances, *Cuore Inferno* and *Fantasia*, which, whilst giving evidence of her study of French models of the realistic school, revealed also her own high talents of observation and description. Her defect, indeed, is a too liberal use of these talents, for her canvas is often overcrowded. Her best books are those dealing with various phases of Neapolitan life. Worthy of note are *Il Ventre di Napoli*, *Riccardo Joanna*, *All' Erta Sentinella*, *Piccole Anime*, *Addio Amore*, *Il Paese di Cuccagna*, *Nel Paese di Gesù*, *La Ballerina*. Most of them exist in English translations. With her husband she founded a daily journal at Rome, *Il Corriere di Roma*; it was followed by *Il Corriere di Napoli*, *Il Mattino* and *Il Giorno* (Naples).

Seraphim, celestial beings on either side of the throne of Jehovah, seen by Isaiah (vi. 2-6). They have each six wings, two of which cover their faces in awe of the divine glory, and two cover their feet—an oriental sign of reverence—as the cherubim do their bodies (Ezek. i. 2), while the two remaining outspread wings support them. They stand above on both sides of the throne like two semicircular choirs, worshipping Him that sits on the throne. The cherubim of Ezekiel are three-fourths in animal form, and the writer of the Apocalypse gives animal forms to three of the four *ῥῶα* ('beasts'; R.V., 'living creatures'), which are six-winged like the seraphim of Isaiah (Rev. iv. 7, 8); the seraphim thus appear, apart from what was human-shaped in them, necessarily to be represented as winged dragons; for the serpent lifted up by Moses is called *Sārāph* (Num. xxi. 8). They recall the winged griffins of Egyptian tombs and the animal guardians of Assyria.

Seraphine, a keyed musical instrument in which the sounds were produced by the action of wind on free vibratory reeds. It was the precursor of the Harmonium (q.v.).

Serap'is, or SARAPIS (also found as *Osarapis*), the Greek name of an Egyptian deity, introduced into Egypt in the time of Ptolemy I. or Soter, and really a combination of the Greek Hades and Egyptian Osiris. He was not an Egyptian, but the Greek deity, with some Egyptian characters super-added; and his temple was not admitted into the precincts of Egyptian cities, finding favour only in the Greek cities founded in Egypt. It is said that forty-two temples were erected under the Ptolemies and Romans to this god in Egypt. His resemblance to Osiris consisted in his chthonic or infernal character, as judge of the dead and ruler of Hades. The god had a magnificent temple (the *Serapeum*) at Alexandria, to which was attached the celebrated Library; another at Memphis, in the vicinity of the cemetery of the mummies of the Apis, which was excavated by Mariette in 1850; and another temple at Canopus. It appears that he represented or was identified with the Hesiri Api, or Osorapis, the 'Osirified' or 'dead Apis,' who was also invested

with many of the attributes of Osiris. The worship of Serapis, introduced into Egypt by the Ptolemies, subsequently became greatly extended in Asia Minor; and his image, in alliance with that of Isis and other deities, appears on many of the coins of the imperial days of Rome, where the worship was abolished by the senate, on account of its licentious character. A celebrated temple of Serapis also existed at Puteoli (see POZZUOLI), near Naples, and the remains of it are still seen. In Egypt itself the worship of the deity subsisted till the fall of paganism, the image at Alexandria continuing to be worshipped till destroyed, at the end of the 4th century, by Theophilus, archbishop of that city. Busts of Serapis are found in most museums, and his head or figure engraved on certain stones was supposed to possess particular mystic virtues.

Seraskier, the name given by the Turks to the commander-in-chief of the army or to the minister of war.

Serbia (*Srbija*), formerly a kingdom of the Balkan Peninsula, now the south-eastern part of the kingdom of the Serbs, Croats, and Slovenes (Yugoslavia). The name is often loosely used for the whole. Serbia in the narrower sense has an area of about 37,000 sq. m. out of the whole kingdom's 96,000. The surface is on the whole mountainous. There are, however, few well-defined mountain-chains, except the Kopanik Mountains (6382 feet) in the centre of Serbia; but there are a great number of isolated mountain peaks and mountain groups, clothed in many parts with fine forests of oak, beech, walnut, chestnut, and other trees, and parted by fertile valleys, which afford excellent pasturage. The valleys of the Morava and Vardar open up the country from north to south, and form the main artery of communication. Serbia is essentially an agricultural country, especially in the northern plains and in the river valleys. The principal crops are wheat, maize, and other cereals, grapes for wine, sugar-beet, and tobacco. Fruit is grown in very great abundance, especially plums, which are dried and exported, and from which also the brandy of the Serbians is extensively made. Great numbers of cattle, sheep, and pigs are reared. Large herds of swine used to be fed on the acorns and beechmast of the forests, and then driven into Hungary to be sold. Maize is largely used now as provender for pigs and cattle. The exports are live-stock, pork, wheat, and other cereals, timber, wine, prunes, cordage. The imports consist principally of cottons, woollens, salt, timber, iron, steel, and other metals, hides, sugar, coffee, glass, paper, machinery, &c. Before the Great War Austria-Hungary practically controlled the foreign trade of Serbia in her own interests. Serbia survived a tariff war with the Dual Monarchy (1906-11), and the reaction against foreign interference prevented a speedy recovery after the events of 1914-18. The export and import trade is largely with Italy, Austria, and Czechoslovakia. Industry suffers from lack of capital. Manufacturing is still in its infancy, though the government is trying to encourage it by the system of monopolies. There are, however, now in operation flour-mills, sugar-factories, breweries, brick-works, cooperages, sawmills, and factories for making cloth, paper, tobacco, and gunpowder. Clothing and carpets are made by the women in their own homes. The country is naturally rich in minerals, though they are not extracted to anything like the extent they might be; nevertheless lignite, coal, copper, quicksilver, lead, silver, antimony, bauxite, pyrites, manganese, and oil shales are mined. Trade is concentrated at Belgrade (*Beograd*), the capital of the country, though some is done by

Niš, the chief town of south-eastern Serbia, by rail (since 1889) through Salonika (q.v.), where Yugoslavia has possessed a free zone since 1923. Along the valley of the Morava passes part of the chief railway line connecting Vienna with Constantinople. Belgrade is also the terminus of a line running through Zagreb to northern Italy. There is rail connection between the Morava and lower Danube regions and the port of Dubrovnik (Ragusa) on the Adriatic.

The Serbians are a well-built, stalwart race, proud and martial by temperament, with a warm love of home and country, of dance and song, hospitable, brave, and energetic, but at the same time quick-tempered and prone to violence. They are a primitive people, cling to old customs and beliefs, and are thoroughly democratic in their institutions. A striking feature of their social life is the family community or *Zadruga*, which, however, has for long been disappearing. The farms are small in size, and worked by their owners; agriculture, though still backward, is improving. Pop. (1884) 1,901,736; (1900) 2,493,770; (1921) 4,129,638. The whole kingdom had in 1921 12,017,323 inhabitants.—See article by G. Djurić in the *Journal of the Royal Statistical Society* lxxxii., pt. iii. (May 1919); article by Miss M. R. Shackleton in the *Scottish Geographical Magazine* (November 1925); Foreign Office Handbook No. 20, *Serbia* (1920); Admiralty Handbook, *Serbia* (1920); N. Krebs, *Beiträge zur Geographie Serbiens und Rasciens* (Stuttgart, 1922); D. A. Wray, *The Geology and Mineral Resources of the Serb-Croat-Slovene State* (1921).

HISTORY.—The Serbians emigrated with the Slovenes from the slopes of the Carpathians to the regions now called Yugoslavia in the 5th, 6th, and 7th centuries. For long they had no organisation that could be called a state, but government was on the basis of family groups, and was more or less on democratic principles. Their religion was originally a type of nature-worship, but in the 9th century they accepted Christianity in the form adopted by the Eastern or Byzantine Church. Meanwhile a state known as Raska, the germ of the later Serbia, began to take shape. It had to fight sternly for the preservation of its independence, and in the long run successfully withstood the power of Byzantium, as well as resisted the unceasing attacks of the Bulgarians. Stefan Nemanja, a powerful chieftain, extended the boundary of Raska from the Morava to the Adriatic before he abdicated in 1196. Under his son Serbia definitely adopted the Orthodox creed, and was granted an archbishopric, and virtually a national church. The next great ruler of Serbia was Stefan Dušan (1331-55), who after subjugating Bulgaria, Macedonia, Albania, and the greater part of the peninsula, conceived the ambitious design of welding Serbia, Bulgaria, and Byzantium into an empire strong enough to resist the assaults of the Osmanli Turks. In 1346 Dušan was proclaimed emperor of Serbia and Greece. In 1355 he was preparing an attack on Constantinople, but death cut short his career. Under his feeble son and successor the great nobles divided the power amongst them, and consequently weakened the country. This favoured the aggressive advance of the Turks, who routed the chief Vukašin on the Maritza in 1371, and Prince Lazar at Kosovo, on the celebrated 'Field of the Blackbirds,' in 1389. By this last fight, which figures very prominently in the national ballads, the independence of Serbia was virtually lost; she was made tributary to the sultan, and gradually became a pashalik of the Ottoman empire, though hopes of freedom were revived for a time by the great successes of the Hungarian captain and ruler Hunyady and the Albanian chief Scanderbeg in the middle of the 15th century.

During the next three hundred years the Turkish rulers, supported by the ruthless janizaries, ground down the unhappy people, taxing and subjecting them to almost every kind of injustice and barbarity: many of the chief families were exterminated, 200,000 persons were carried off as slaves. In 1691, at the invitation of the Emperor Leopold, many thousands of families left their country for good and settled in Hungary. The people who remained behind were little better than serfs, and every seven years their boys were taken from them to be brought up in the Moslem faith and forced into the corps of the janizaries. The victories of Prince Eugene brought about the peace of Požarevac (1718; see PASSAROVITZ), by which Serbia was ceded to Austria; but Austria had to restore it to the sultan twenty-one years later. At length the exasperated people, goaded to desperation, rose in 1804 under the leadership of Kara George, a stalwart and determined, though morose, swine-owner, a rich man and a man of influence, who by 1807 effectually drove the tyrannical janizaries out of the country, and stormed and took possession of Belgrade and the other fortresses. The struggle before its conclusion had taken on the character of a racial and religious war, Christian Serbian against Mohammedan Turk. In 1809 and 1810 the Turks made determined efforts to recover their hold upon the country, and did overrun the districts east of the Morava; but with the assistance of the Russians they were at length beaten off again. By the treaty of Bucharest, which Russia made with Turkey (1812), it was decreed that the sultan's troops should regarrison the fortresses, but that the Serbians should govern themselves in respect of all internal affairs. But the Turks refused to observe these terms, and in 1813 assailed Serbia on both sides with such vigour that Kara George fled to Austria and the enemy recovered the country. Turkish oppression again provoked an uprising of the people in 1815; they chose as their leader Miloš Obrenović, a herdsman, who in a single campaign expelled the enemy, except the garrisons in the fortresses. This man was henceforth the leading spirit in the struggle of the Serbians for independence. In 1817 he caused his rival Kara George, who had returned, to be assassinated, and was himself proclaimed chief ruler of Serbia. In 1829 the Ottoman government at last formally agreed to the provisions of the treaty of Bucharest, and in the following year recognised Miloš as hereditary prince of Serbia. But his rule was arbitrary and despotic, and in 1839 he was compelled to abdicate in favour of his son Milan (died same year). Before he abdicated the Turkish minister of Foreign Affairs and the Russian ambassador at Constantinople had drawn up a constitution, curtailing the power of the prince and giving much authority to a senate of the nobles. Milan's brother and successor, Michael (1839-42), was driven out of the country by a rival faction, who elected Alexander, son of Kara George, as their prince. Alexander leaned to Turkey and to Austria rather than to Russia, whose tsar regarded himself as the rightful 'Protector of Serbia,' and by this policy and his incapacity he lost the sympathy of his people and provoked many enemies about him. In 1859 he was compelled to abdicate, his successor being the aged exile, Miloš Obrenović.

On his death, less than two years later, the chief power passed to his son Michael, who had been expelled in 1842. Under his rule a new era began for harassed Serbia; the animosities of faction were smoothed away, the supremacy of the law was successfully vindicated and maintained, the national spirit was encouraged and foreign interference lessened, the national militia was organised,

armed, and trained, and the country began to move forward along the path of progress and prosperity. In 1867 Michael procured the departure of the last Turkish garrisons from Serbian soil, namely those of Belgrade, Šabac, and Smederevo; all the others had been withdrawn in 1862. In 1868 Prince Michael was assassinated near Belgrade, partisans of the rival Kara George faction being blamed for the deed. He was succeeded by Milan IV., a grand-nephew of the heroic Miloš. In 1875 a revolt broke out in Bosnia and Herzegovina against Turkish oppression; Serbia joined in, was hopelessly defeated and only saved from humiliation by an armistice enforced by Russia. She had more success in the Russo-Turkish war of 1877, obtaining possession of Niš. In 1878 the Treaty of Berlin placed Bosnia-Herzegovina under Austro-Hungarian administration, and gave Serbia complete independence from Turkey and considerable territorial accessions. At the same time she was effectively hemmed in on the N., W., and S.W. by Austria-Hungary, while Milan did not improve matters by entertaining secret dealings with that country. Prince Milan was proclaimed king in 1882. In 1885 he entered into a war with Bulgaria, and was defeated at Slivnica. A futile monarch, he resigned his throne in 1889, and was succeeded by his equally futile son, Alexander, who, with his wife, was assassinated in 1903. Prince Peter of the rival Karageorgević dynasty was acclaimed king the same year, and the tide seemed to turn. Economic bullying by Austria, who attempted to control Serbia's exports, resulted in a tariff war—the Pig War—which had no worse effect for Serbia than the diversion of her trade into other and better channels. Hatred for Austria was fanned when that country in 1908 formally annexed Bosnia-Herzegovina, but war was averted. Turkish oppression in Macedonia and the ineffectiveness of intervention by the European powers led to the formation of the Balkan League of 1912. Alliances were concluded between Serbia and Bulgaria, Serbia and Montenegro, and Greece and Bulgaria. Two short and highly successful wars were waged against the Turks (1912-13). Trouble arose over the division of Macedonia. Serbia was suddenly attacked by her late ally, Bulgaria, but was soon victorious, and dictated severe terms in the Treaty of Bucharest, extending her boundary southwards to include Old Serbia, and restoring contiguity with Montenegro. Austrian apprehension at the increasing power of Serbia became more and more conspicuous until the murder of the Archduke Franz Ferdinand at Sarajevo on 28th June 1914 gave a pretext for war (see WAR, GREAT). After initial successes the Serbians were ruthlessly crushed, and their country was overrun by German, Austrian, and Bulgarian forces. But in 1918, after three years of waiting, the Serbians drove out their enemies, and on 1st November entered Belgrade. On 1st December the formation of a Yugoslav kingdom—the kingdom of the Serbs, Croats, and Slovenes—was announced.

YUGOSLAVIA OR JUGOSLAVIA.—The main threads of the Yugoslav (South Slav) movement may be conveniently indicated here, as its fortunes came to be linked up with those of Serbia. The name Yugoslav should strictly apply to all those Slavs who migrated to the north and north-west of the Balkan Peninsula; the Bulgarians, however, though linguistically akin to the others, have so far not been regarded as Yugoslavs. It was the misfortune of these peoples that they should find themselves on the border-line between East and West, that they should act as buffers to the European aspirations of the Turk and the *Drang nach Osten* of Germany and Austria. Divided politically, they also came under the influence of different religious

creeds—Catholic, Orthodox, and Moslem—as well as the different civilisations of east and west. Yet they remained linked together by linguistic affinity and a common heritage of tradition and folklore. During the 19th century the bonds were gradually strengthened by the growth of a spirit of nationality among Yugoslav peoples. Serbia threw off the Turkish yoke in 1878. In Croatia a Yugoslav academy and university were established at Zagreb. The movement simmered gently during the last quarter of the 19th century, but, with the new dynasty in 1903, Serbia's rise from virtual impotence awoke a new enthusiasm in Croatia. In 1905 representatives of Croats and Dalmatian Serbs met at Zara and identified themselves with a policy of national unity. A few years later a Serbo-Croat coalition became a major force in the Croat parliament at Zagreb, and remained so till 1918 in spite of opposition and repression by Austria-Hungary (see CROATIA). Indeed the Yugoslav movement was costing Austria much thought. Expediency had led her definitely to annex Bosnia-Herzegovina in 1908, and her treatment had bred disaffection, which culminated in the assassination of the Archduke Franz Ferdinand in 1914. Meanwhile Serbia had humbled Turkey and Bulgaria, and in the early days of the European War proceeded to invade Austrian territory. Here was indeed a saviour for the southern Slav peoples. But Serbia fell upon evil days, and Yugoslav schemes had to be cast differently. While Austrian oppression of the Yugoslavs now within her military dominions alienated their sympathies more than ever, an important committee of Yugoslav refugees in London began to lay plans for a united Yugoslavia—a service premature perhaps, but nevertheless invaluable. The movement was aided in 1917 by the Russian revolution, which abstracted Russia from Balkan politics—Russia did not favour a united Yugoslavia—and by the crumbling away of Austrian power. From Corfu in 1917 came a manifesto issued by the Yugoslav Committee and the Serbian government announcing a projected kingdom of the Serbs, Croats, and Slovenes, under the Karađević dynasty. Thus formulated, the idea gathered momentum. The Austrian Yugoslavs were united under a Slovenian priest, Korošec. Croatia supported the movement, and hopes ran high when Serbia began to clear her country of the enemy in the autumn of 1918. At Zagreb on 19th October a Yugoslav National Council, representing the Yugoslav lands of the Austro-Hungarian monarchy, declared for a state of the Slovenes, Croats, and Serbs, and a few weeks later a union with Serbia was announced, the kingdom being proclaimed at the beginning of December as that of the Serbs, Croats, and Slovenes. There were initial jealousies and uncertainties, chiefly owing to Serbian preponderance in the new scheme, but now Yugoslavia seems to be consolidating her position as a new power. At the Peace Conference the principle of nationalities largely guided the delimitation of the frontiers. The new kingdom comprises Serbia, Montenegro, Bosnia-Herzegovina, most of Dalmatia, Croatia, Slavonia, the Banat, Bačka, and Baranya regions, a part of Carniola, and of Carinthia, and the Strumica salient taken from SW. Bulgaria. The north-western frontier with Italy was settled by the Treaty of Rapallo, Lawlessness on the Albanian and Bulgarian frontiers has caused the new kingdom considerable trouble.

King Peter died 16th August 1921, and was succeeded by his son Alexander, Prince Regent since 1914. Provisional governmental arrangements had been made in 1918, but on 21st June 1921 a new constitution was adopted. It is a constitutional and hereditary monarchy. The king is

commander-in-chief of the forces, concludes treaties, promulgates laws, appoints and dismisses ministers, and dissolves the National Assembly, but all his actions are subject to the approval of the Assembly or his cabinet of eighteen ministers. There is a single chamber, the Narodna Skupština, of 313 deputies elected for a term of four years on a basis of proportional representation. The Council of State is the supreme court of justice. There is complete freedom for all religions recognised by law. In 1921 47 per cent. of the people were of the Orthodox confession (see GREEK CHURCH), 39 per cent. Roman Catholics. By arrangement with the Vatican in 1914 an archbishopric was established in Belgrade. Education is compulsory, and, in its primary forms, free. Military service is obligatory for all men between the ages of twenty-one and forty-five; eighteen months are spent with the colours. The army numbers normally some 115,000 men, and there are sea, river, and air squadrons. See separate articles on the constituent regions of the kingdom.

See L. Leger, *Serbes, Croates et Bulgares* (Paris, 1913); H. W. V. Temperley, *History of Serbia* (1917); R. G. D. Laffan, *The Guardians of the Gate* (1918); H. Baerlein, *The Birth of Yugoslavia* (2 vols. 1922); J. Buchan (ed.) *Yugoslavia* (Nations of To-day Series, 1923); A. Mousset, *Le Royaume Serbe Croate Slovène: son organisation sa vie politique et ses institutions* (1926). A four-volume work in Serbian on Serbian history began to appear in 1924.

LANGUAGE AND LITERATURE.—The Serbian language belongs to the southern division of Slav tongues, having for its nearest congeners Bulgarian, Slovenian, and Russian; and it is the language of Croats, Montenegrins, and Bosniaks also. The Slav apostles, Cyril (q.v.) and Methodius, introduced a modified form of the Greek alphabet among the Serbians, who have retained it as the Cyrillic. The Croats, influenced more by western civilisation, use the Latin alphabet.

Slovene fragments of the 10th and 11th centuries exist, but the earliest productions in Serbian date from the 12th century. Cultural life of mediæval Serbia was centred in the abbeys—Studénica, Gracanica, Decani, and others—whence emanated monkish chronicles and letters; in the 13th and 14th centuries various lives of the saints and kings, and annals, were written by Stefan Nemanja, St Sava, Archbishop Daniel, and others. But perhaps the most interesting production of this period is the collection of laws (*Zakonik*) made in 1349, when Stefan Dušan was king. Then came the battle of Kosovo and the long period of Turkish oppression, and during all that time there was no Serbian literature except annals. But the language was not wholly uncultivated. From the end of the 15th down to the end of the 17th century a vigorous school of writers in Serbian, or Croato-Serbian, flourished at Ragusa (q.v.) and other towns on the Adriatic. It was not, however, a purely national literature, but was strongly influenced by Italian culture. The literary productions of the Ragusa epoch were nearly all in verse, chiefly lyrics (modelled after the Italian love-poems), poetic dramas (sacred and profane), epics, and eulogies. The greatest writers were Gundulić (1588–1638), author of the epic *Osman*, which celebrates the war of 1621 between Poland and Turkey; Julius Palmotić (1606–57), a writer of dramas, songs, and epics, most of these last clever imitations and foreign models; Marulić (1450–1524 or 1528), author of the poetic *History of St Judith*; Cubranović (died 1550), author of a celebrated masque, *The Gipsy Girl*; Mencić Vlahović (1457–1501) and Držić (died 1510), who both excelled in love-poems, the latter also being a dramatist; Lucić (1480–1540), the ‘father’ of

the Ragusan drama; Vetranić-Cavčić (1482-1576), who wrote several mystery-plays; Naljesković (1510-87), author of pastorals, comedies, and love-poems; Jorjić (1676-1737), who wrote (like some others of the above mentioned) in Latin, Italian, and Serbian, in the last-named tongue chiefly didactic and religious poetry; and Kacić-Miosić (1690-1760), a very popular writer of songs with a good deal of the ring of the national poetry in them.

When the Serbians began to awaken, towards the middle of the 18th century, to a renewal of their national life, their literature began to revive at the same time. The movement passed the bounds of Serbia, and stirred all the Yugoslav peoples to a sense of unity, a cultural unity that fostered the desire for political unity. The pioneer in this renaissance was Dositej Obradović (1739-1811), a man of wide travel and self-acquired learning, who laboured for the enlightenment of his people, and bade Serb, Croat, and Slovene forget their differences. But the foremost person in the revival was Vuk Karadžić (1787-1864): he made the first collection (in 1814-15) of the national folk-songs of the Serbians, the greatest literary treasure they possess, encouraged education, codified the laws, collected the fairy-tales and proverbs of his people, translated (1847) the New Testament into the Serbian vulgar tongue, effected after a hard struggle a reform of the orthography, prepared a grammar and a dictionary of Serbian, and in fact converted the vulgar tongue into a literary language. Several of Vuk's folk-songs have been translated into English by Sir J. Bowring (*Servian Poetry*, 1827) and Lord Lytton (Owen Meredith, *Serbski Pesme* 1861, new ed. 1917), and in another collection by Mrs Mijatović (*Kosovo*, 1881); into German by Mrs Robinson or 'Talvj' (*Volkslieder der Serben*, 1853); and into Swedish, very well done, by Runeberg (1833). These national songs are the product of different periods and of different, mostly unknown, authors. Their chief themes are the deeds of the national heroes, especially Marko Kraljević, and the occurrences of domestic life. The former class are written in a uniform metre of ten-syllabled trochaics, and are recited to the accompaniment of a simple one-stringed lute, called a *gusle*. The metre of the second class is varied; they are generally sung by a youth and a maiden, and are very often the accompaniment to the *kolo*, or national dance. One of the greatest names in modern Serbian literature is Milutinović (1791-1847), who wrote poems, a eulogy on Serbia (*Serbianka*, 1826), a *History of Montenegro* (1835), a *History of Serbia, 1813-15* (1837), and published a collection of national songs. Other writers worthy of note are: Raić (1726-1801), who wrote a good *History of the Serbian People* (1794-95); J. Popović (1806-56), the author of lyrics and historical dramas; Lazarević, who wrote one of the best of Serbian dramas (*Vladimir and Kosara*, 1829); J. Subotić (1817-86), author of *Stefan Dečanski* (1846), which caught the spirit of the national poems; Radićević (1724-1853), who has been called 'the Serbian Burns,' and Prince Peter Njegoš (1813-51) of Montenegro, the two most celebrated lyrists of modern Serbian literature; F. Prešern (1800-49), the father of modern Slovene literature, who wrote ballads, sonnets, and an epic, *The Baptism on the Savica*; and P. Preradović (1818-72), a Croatian, who wrote a famous *Ode to Slavdom*. L. Kostić (1841-1910), Serbian poet and dramatist, translated several of Shakespeare's plays; S. Matavulj (1852-1908), Serbian novelist, born in Dalmatia, wrote vivid novels of Yugoslav life; A. Aškerz (1856-1912), Slovene poet, wrote ballads and romances; V. Ilić (1862-94), Serbian poet,

wrote under the influence of the Russian romantic poets. Other writers of merit are A. Šantić (b. 1868), Serbian poet, a master of metre, who translated Heine's *Intermezzo*; J. Dučić (b. 1874), Serbian poet, whose verse betrays French symbolistic influence; V. Nazor (b. 1876), Croatian poet, a writer of charming lyrics and sonnets; M. Rakić (b. 1876), Serbian poet and patriot; S. Stefanović (b. 1877), Serbian poet and disciple of the English Pre-Raphaelites, a distinguished sonneteer and translator; J. Kosor (b. 1879), Croatian poet, novelist, and dramatist, of peasant stock and self-taught, a writer of plays which have been translated into English. Towards the middle of the 19th century an attempt was made on the western side of the Balkan Peninsula to create a sort of revival of the Ragusan period. The centre of the new movement was Agram, and its leader Dr Ljudevit Gaj (1809-72). Its strongest feature was an aggressive sympathy with the Pan-Slavist agitation. The reform of language and spelling carried out by Karadžić in Serbia was adopted, though the Latin alphabet was retained. A similar revival and reform took place among the Slovenes. Besides Gaj the most important writers of this school were Vraz (1810-51), a Slovene, and author of some beautiful lyrics; Bleiweis, also a Slovene; Vukotinović, who wrote lyrics and historical tales; Bogović, from whose pen came dramas, poems, and historical novels; Ivan Mazuranić, a Croat, whose *Death of Ismail Agha*, the 'epic of hate,' is one of the most popular poems in Serbian. Kukuljević-Sakcinski is the author of poems, dramas, stories, and very valuable historical records of the southern Slavs. Daničić (1825-82) was a first-rate philologist. Jagić and Novaković have each written a good *History of Serbian Literature*. The chief literary organ is the *Glasnik*, published at Belgrade since 1847.

See Subotić and Forbes, *Serbian Grammar* (1918); an article in the *Englishwoman* for January 1917; Pypin and Spasović, *Geschichte der Slavischen Literaturen* (vol. i. 1880); A. Dozon, *L'Épopée Serbe* (Paris, 1888); and Mijatović, *Serbian Folklore* (Eng. trans. by Denton, 1874); V. M. Petrović, *Hero Tales and Legends of the Serbians* (1914); M. A. Mügge, *Serbian Folk-songs Fairy Tales, and Proverbs* (1917); M. S. Stanoyević, *Early Yugoslav Literature* (1921).

Serenade (Ital. *serenata*), originally music performed in a calm night; hence an entertainment of music given by a lover to his mistress under her window—especially in Spain and Italy.—A piece of music characterised by the soft repose which is supposed to be in harmony with the stillness of night is sometimes called a serenade, more usually a Nocturne (q.v.).

Seres, a town of Greece (since 1913), 43 miles NE. of Salonika; pop. 20,000.

Sereth, an affluent of the Danube, rises in the Bukowina (Rumania), runs southward through almost the whole length of Moldavia, and joins the Danube just above Galatz, after a course of nearly 300 miles.

Serf (Lat. *servus*, 'a slave'), the term usually given to the villeins of mediæval Europe. The *serf* was distinguished in a general way from the *slave* by being attached to the land and having certain definite rights, whereas the *slave* was the absolute chattel of his master. But serfdom falls to be treated as part of the subject of Slavery (q.v.).

Serge, a kind of twilled worsted cloth which has a wide range of quality, strength, and thickness. The surface of the fabric is not smooth like that of a milled woollen cloth. Serges are generally dyed a dark blue or black, and good qualities are very durable.

Sergeants, or **SERGEANTS** (through the Fr. from Lat. *serviens*, 'serving'), are non-commissioned officers of the army and marines in the grade next above corporal. In the infantry each commands a section, of which there are four in each company, and there is one colour-sergeant in each company. They also command small bodies of men as guards, escorts, &c. (see also **NON-COMMISSIONED OFFICERS**). Each squadron of cavalry has ten sergeants, including sergeant-major and quartermaster-sergeant. In the Household Cavalry the corresponding non-commissioned officers are called corporals of horse (two per troop). In the Royal Horse Artillery there are per battery seven sergeants, one quartermaster-sergeant, and one battery sergeant-major. A regimental sergeant-major is a warrant officer on the staff of a battalion of infantry, regiment of cavalry, or corresponding body of troops. Unlike the sergeants, the sergeant-major does not command any particular portion of the corps, but generally superintends the whole of it, and in respect of discipline, &c., is the assistant of the adjutant. There is a separate article on **COLOUR-SERGEANT**. For the Quartermaster-sergeant, see **QUARTERMASTER**; for Sergeant-drummer and Sergeant-trumpeter, see **BAND**.—In ancient times the rank of sergeant was considerably more exalted. In the 12th century the sergeants were gentlemen of less than knightly rank, serving on horseback. Later the sergeants-at-arms were the royal bodyguard of gentlemen armed *cap-à-pie*.

Sergeanty. See **GRAND SERGEANTY**.

Sergipe, a maritime state of Brazil, the smallest in the republic, is bounded on the N. by the São Francisco, which separates it from Alagoas, and on the W. and S. by Bahia. Area, 15,000 sq. m.; population, 477,000, about 75 per cent. of whom are negroes, with very few Europeans. The shores are low and sandy, the interior mountainous. The east part is fertile, well wooded, and produces sugar and cotton; the western plateaus are devoted principally to the rearing of cattle. The capital is Aracaju, a port with 37,000 inhabitants.

Sericite. See **MICA**.

Series, in Algebra, is the sum of a set of terms formed according to some definite law. For example, let n be any integer, and $\phi(n)$ a definite function of n . Then, by giving n the successive values 1, 2, 3, &c., and forming the corresponding functions $\phi(1)$, $\phi(2)$, &c., we are able to construct the series $S = \phi(1) + \phi(2) + \dots + \phi(m)$, where m is the highest value of n that is to be involved. If $\phi(n)$ is simply a multiple of n , we get an Arithmetical Progression (q.v.), viz. $a + 2a + 3a + \dots$. Again, if $\phi(n)$ is of the form a^n , we get a Geometrical Progression (q.v.), viz. $a + a^2 + a^3 + \dots$. These simplest cases of series are considered under their special headings, and shall not be again referred to except by way of illustration.

It is evident that if a finite number of terms be taken, and if no term has an infinite value, the series itself will have a finite and determinate value. We may suppose, however, that no limit is to be assigned to the number of terms that are to be taken—in other words, that the highest value (m) of n is to be larger than any assignable quantity. We thus get a series with an infinite number of terms. But it does not follow that such an Infinite Series, as it is called, has necessarily an infinite value. Consider, for example, the Geometrical Series $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots$ to infinity. Draw a line ABC equal in length to two

by BD, the half of BC; the third by DE, the half of DC; and so on indefinitely. It is evident that, however far we may go, we shall always fall short of C by an amount equal to the last bit added on. Thus

$$1 + \frac{1}{2} + \frac{1}{4} + \dots + \frac{1}{2^n} = 2 - \frac{1}{2^n}.$$

But by taking n large enough we may make $1/2^n$ as small as we please. Hence the value of the Infinite Series is 2.

It will be seen that the terms in this series approach zero indefinitely, while the sum approaches a definite limit. Any series in which the latter condition is satisfied is called a Convergent Series. In all convergent series the former condition just stated must also be satisfied. But it does not follow that a series whose successive terms approach zero indefinitely is necessarily convergent. For example, the series $1 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \dots$ to infinity has not a finite value, is not convergent, although its infinite term is zero. Such a series is divergent, and cannot be summed to infinity. To prove this throw the series into groups of terms, the first group being the first term, the second the next two, the third the next four, the fourth the next eight, and so on. Thus the fifth group will consist of sixteen terms, beginning with $\frac{1}{16}$ and ending with $\frac{1}{16}$. Each of these fractions is greater than $\frac{1}{32}$ or $1/2^5$; so that their sum is greater than sixteen times this quantity or $2^4/2^5$ or $\frac{1}{2}$. Hence, if we go as far as m groups, the series will be greater than $1 + \frac{1}{2}m$. Thus by taking m large enough we can make the sum as large as we please. The series is divergent and cannot be summed. We may, however, by simply changing the algebraic sign of every alternate term, obtain a series which is convergent—viz. $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$ to infinity. That this series has a finite sum may be made evident graphically thus: Take AB equal to unity; this is the first

A C E F D B

term. Move back half-way to C; this gives the second term *minus* one-half. Move forward to D, where CD is one-third; then back to E, where DE is one-fourth; and so on indefinitely. It is clear that we shall ultimately oscillate through diminishing ranges about some point between C and B; so that the sum of this series is less than 1 but greater than $\frac{1}{2}$. The series, in fact, is the Napierian logarithm of 2, and has the value .69315... A series like that just given, which is convergent only when the signs of the successive terms differ according to some definite rule, is usually called *semi-convergent*. A series which converges when all its terms have the same sign is said to be *absolutely convergent*. Sir G. B. Stokes long ago distinguished them as *accidentally* and *essentially* convergent, a terminology which seems in many respects superior to that in common use.

It is important to have a test of convergency; and the most useful test is to take the ratio of two consecutive terms, and consider what value this ratio approaches as we take the terms higher and higher. This ratio is called the ratio of convergency; if it is ultimately less than unity the series is convergent; if greater than unity, divergent. This test, however, gives no information when the ratio is ultimately unity. As an example, consider the exponential series:

$$1 + x + \frac{x^2}{1.2} + \frac{x^3}{1.2.3} + \frac{x^4}{1.2.3.4} + \&c.$$

Here the ratio of the $(n+1)$ to the n th term is $x/(n+1)$, which is ultimately zero, since whatever value x may have n can be taken as large as we

A B D E F C

units. AB (= 1) will represent the first term of the series; the second term may be represented

please, so that the ratio may be made smaller than any assignable quantity. As is well known, the value of this series is e^2 , where e has the value 2.71828... (see LOGARITHM). Convergent series are of indispensable service in the calculation of logarithms and trigonometrical functions and in many important physical applications. Not a few of their properties were consequently known to the earlier analysts; but it is to Cauchy (1827) that we owe the foundation and partial development of the modern theory of convergence. Dirichlet, Abel, Gauss, De Morgan, Bertrand, Kummer, Du Bois-Reymond, and others have ably supplemented Cauchy's work. A very complete introduction to the whole subject is given in Chrystal's *Algebra* (vol. ii.) There also will be found a discussion of certain parts of the subject which we can only name, such as oscillating series, double series, infinite products, reversion of series, and the like. See CIRCLE and TRIGONOMETRY for some particular cases of series.

Seringapatam (properly *Sri Ranga Patanam* = 'City of Vishnu'), the capital of Mysore state in Southern India from 1610 to 1799, is built on an island in the Kaveri, 10 miles NE. of the city of Mysore. The island is three miles long and one broad; at its western end stands the fort, surrounded by strong walls of stone, and enclosing the palace of Tippoo Saib and the principal mosque. Outside it are the garden in which was built the mausoleum of Tippoo and his father, Hyder Ali, and Tippoo's summer palace. The fort was besieged by Lord Cornwallis in 1791, and again in 1792. On the second occasion the terms dictated by the British to Tippoo were very severe. A British army appeared before the walls again in 1799, and on the 3d May of that year the fort was stormed and Tippoo slain in the vicinity of his own palace. Pop. 150,000 in Tippoo's day; 32,000 in 1800; and in 1921 7217, mostly in the suburb of Ganjam. The ancient city is very ruinous; but a railway now runs through it, and various improvements have made it look somewhat more prosperous.

Seringham (*Srirangam*), a town in the Madras Presidency, on an island in the Kaveri, 11 miles W. of Trichinopoly, with a pop. (1921) of 23,153. The place is noted for its great temple of Vishnu, a vast complex of halls and gopuras (colossal gateways) built on no very regular plan, but enclosing so large an area that most of the houses of the town are within the temple walls. Notable is one 'hall of a 1000 columns' (960 really), 450 feet by 130.

Serjeant-at-Arms, in the English Court of Chancery, is the officer who attends upon the Lord Chancellor with the mace, and who executes by himself or deputies various writs of process directed to him in the course of a Chancery suit, such as apprehending parties who are pronounced to be in contempt of the court. A similar officer attends on each House of Parliament, and arrests any person ordered by the House to be arrested.

Serjeant-at-Law used to be the highest degree of barrister in the common law of England. The degree is of great antiquity, and formerly a barrister could only be appointed after being of sixteen years' standing. Formerly, also, they had exclusive audience in the Court of Common Pleas. The proper forensic dress of serjeants was a violet-coloured robe with a scarlet hood, and a black coif, represented in modern times by a patch of silk at the top of the wig. A serjeant was appointed by a writ or patent of the crown. The Chief-justice of the Common Pleas recommended the barrister to the Lord Chancellor, who advised the crown. The degree of serjeant was entirely honorary, and merely gave precedence over barristers; and when he was appointed he was rung out of the Inn of

Court to which he belonged, and thereafter joined the brotherhood of Serjeants, who formed a separate community. By ancient custom the common-law judges were always admitted to the order of serjeants before sitting as judges, but this practice was abolished in 1874. The society of Serjeants' Inn was dissolved not long after, leaving the title to become extinct with the death of the last survivor, Lord Lindley (1828-1921). See the article COIF; Pulling's *Order of the Coif* (1884); and Worbryde's *Eminent Serjeants-at-Law* (1869).

Sermons. See PREACHING.

Serous Fluids, various fluids occurring in the animal body, are arranged by Gorup-Besanez under three heads: (1) Those which are contained in the serous sacs of the body, as the cerebro-spinal fluid, the pericardial fluid, the peritoneal fluid, the pleural fluid, and the fluid of the tunica vaginalis testis; (2) the tears and the fluids existing in the eyeball, the amniotic fluid, and transudations into the tissue of organs; (3) morbid or excessive transudations, such as dropsical fluids, the fluids occurring in hydatids, and in blebs and vesicles on the skin, and transudations from the blood in the intestinal capillaries, as in cases of intestinal catarrh, cholera, or dysentery. All these fluids bear a close resemblance to one another, both in their physical and chemical characters. In so far as relates to their physical characters they are usually clear and transparent, colourless or slightly yellow, of a slight saline, mawkish taste, and exhibiting an alkaline reaction with test-paper. They possess no special formal or histological elements, but on a microscopic examination blood-corpuscles, cells of various kinds, molecular granules, and epithelium may occasionally be observed in them. The ordinary chemical constituents of these fluids are water, fibrin (occasionally), albumen, the fats, animal soaps, cholesterin, extractive matters, urea (occasionally), the same inorganic salts which are found in the serum of the blood, and the same gases as occur in the blood.

Serous Membranes. There are seven of these membranes in the human body, three being median and single, while two are double and lateral. They are the pericardium, the peritoneum, and the cerebro-spinal, with the two pleuræ and tunicae vaginales testis. They are all closed sacs; and each sac or continuous membrane consists of two portions—a parietal one, which lines the walls of the cavity, and a visceral or reflected one, which forms an almost complete coating or investment for the viscera contained in the cavity. The interior of the sac contains a small quantity of fluid, usually merely enough to moisten the contiguous surfaces and thereby enable them to glide easily upon each other. With regard to their structure, it is sufficient to state that they consist essentially of (1) endothelium; (2) basement membrane; (3) a stratum of areolar or cellular tissue, which constitutes the chief thickness of the membrane, and is the constituent on which its physical properties are mainly dependent. This layer is more liable to variation than the others, and one of the most common alterations is an augmentation of the yellow fibrous element, by which an increased elasticity is given to the membrane, which is thus better adapted for distention, and for a subsequent return to its original bulk. The situations in which this augmentation is found are, as Dr Brinton (*Cyclopædia of Anatomy and Physiology*, vol. iv. p. 524) pointed out, in exact conformity with this view: in the peritoneum, which lines the anterior abdominal wall and covers the pelvic surface of the bladder, it attains its maximum; in the elongated folds of the mesentery, in the costal pleuræ, and in the suspensory ligament of the liver it is still

very prominent; while on the posterior wall of the belly, and in serous membranes covering the heart, liver, &c. it is almost absent. For some of the principal serous membranes, see the articles PERICARDIUM, PERITONEUM, PLEURISY, and RESPIRATION.—Synovial membranes (q.v.) present many points of similarity to serous membranes.

Serpent, an obsolete bass musical wind-instrument. It is said to have been invented by a



Serpent.

French priest at Auxerre in 1590. It consists of a tapered tube 8 feet long, built of wood and covered with leather, and twisted about like a serpent, whence the name. It is sounded through a cupped mouthpiece like that of the bass Trombone (q.v.). It had originally six holes for three fingers of each hand, but in its later years had keys added. The form of its bore and the material of which it is made give it a tender and soft tone which is very effective in certain kinds of music, but its difficulties and the uncertainty of its intonation have led to its disuse.

Serpentine, a mineral composed of silica and magnesia in almost equal proportions, with about 13-15 per cent. of water, and a little protoxide of iron. Serpentine occurs generally massive; never in crystals, save as pseudomorphs; colour some shade of green, also red and brownish yellow; has a smooth but sometimes greasy feel; is soft enough to be scratched with calcite. *Precious Serpentine*, or *Noble Serpentine*, is of a rich, dark-green colour, hard enough to receive a good polish, translucent, and sometimes contains imbedded garnets, which form red spots, and add much to its beauty. It is a rare mineral. It occurs at Baireuth in Germany, in Corsica, at Portsoy in Banffshire, in the Shetland Islands, &c. It is generally found along with foliated limestone associated with schistose rocks. The ancient Romans used it for pillars and for many ornamental purposes; and vases, boxes, &c. are still made of it, and much prized. The ancients ascribed to it imaginary medicinal virtues. *Marmolite* is a scaly, foliated serpentine; *Chrysotile* is a delicately fibrous variety, with a silky lustre, often met with as veins in ordinary serpentine. *Common Serpentine* is a rock rather than a mineral. It often occurs in winding irregular veins; hence the name serpentine. It is generally green or red, the colour being sometimes uniform, at other times mottled, spotted, streaked, veined, or clouded. It occurs not only in veins, but forming irregular sheets and masses, and is usually associated with crystalline schists and granitoid eruptive rocks. The mineral serpentine is always a product of the chemical alteration of other minerals; and there is reason to believe that most of the masses of serpentine are highly altered igneous rocks which were rich in olivine or peridot. Many peridotites are proved to have been altered into serpentine. Concerning the origin of some of the serpentines associated with the crystalline schists there is still much uncertainty.

Serpents (Lat. *serpere*, 'to creep'), the more formal and old-fashioned term for all members of the genus Ophidia, more popularly known as Snakes (q.v.), under which heading the general characters and classification of the Ophidians are treated, as also snake-charming.

SERPENT-WORSHIP.—The cult of the serpent is old and widespread. In the mythology of all races

the serpent plays an important part, sometimes as a kindly and beneficent power, sometimes as hostile to man. The origin of the cult of the serpent is a problem whose solution depends on the answer to the wider question of how men came to make gods at all.

Four of the more important theories may be mentioned. The psychological school of anthropologists regard both the cult itself and its universal spread as due to the fear caused by the serpent's deadly venom, its mysterious movements, its habit of dwelling in holes beneath the earth, its strange power of casting its skin, and other characteristics. Closely connected with this point of view is the explanation of the serpent cult as due to its widespread adoption as a totem. Secondly, the cult is connected with nature myths: the serpent is the celestial river of the Milky Way, or the constellation Hydra. It is also identified with certain attributes of the sun. Thirdly, the Freudian school regard the serpent as the most important phallic symbol, and explain the presence of the serpent in myths, cults, and folklore as the racial counterpart of the individual dream, that is, as evidence of a deep-rooted sex-interest in the subconscious memory of the race. Lastly, and most recently, is the theory of Elliot Smith in *The Migrations of Early Culture*, that serpent-worship was carried about the world as the result of a migration of culture. This theory, while providing for the rise of serpent-worship in outlying parts of the world, still leaves the question of its origin unsolved.

Turning next to the distribution of the serpent-cult in time and space, we find evidence of the use of the serpent as a symbol in pre-historic times in Europe. Serpents are found depicted on the painted pebbles of the Mas d'Azil. In Sumerian and Babylonian civilisation we find that the terrible goddess of the underworld Ereshkigal or Allatu is identified with a serpent. The pair of twined serpents on a vase of Gudea is the emblem of Ningishida. We find a very early serpent deity of doubtful gender called the lord, or lady, of life. The serpent is frequently depicted on early boundary stones with the divine emblems. One of the earlier pictorial representations of Tiamat, the goddess of primeval chaos, is in the form of a great serpent.

The serpent abounds in Egyptian myth and cult under the dual aspects of good and evil. The monstrous Apep serpent, enemy of the gods, corresponds to the Babylonian Tiamat. The cobra, not found in Babylonian pictorial representations, is an attribute of the sun-god, and in the uræus is an invariable divine and royal symbol. In an early papyrus a serpent-headed goddess stands before the throne of Osiris, while an enormous serpent with upraised head lies before the god. In Minoan Crete we have representations of the Great Mother grasping a serpent, and with serpents in her hair. In Greece of pre-Homeric times, as well as later, the serpent appears constantly in art and myth. Zeus Meilichios appears as a snake. Among his many transformations Dionysus assumes the form of a serpent. The Erinyes are serpent-goddesses. The serpent also represents the ancestor, and the Agathos Daimon, the good luck or guardian deity of various cities.

The cult of the serpent in India goes back to pre-Aryan times, and is still assiduously practised everywhere. In spite of the number of fatalities due to snake-bite it is impossible to induce a native to kill a snake. Everywhere are shrines sacred to the serpent-god in his various forms. In the Panjab snake-worship is associated with the cult of Devi, the mother goddess. In Central India Nāg-deo is worshipped, sometimes at a shrine, sometimes at the snake's hole; while the Naths

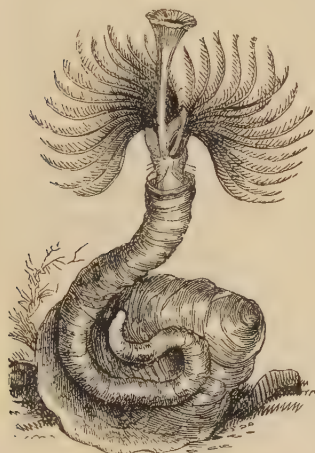
carry snakes about at the Nagpanchami festival for worship.

In North America the serpent abounds in folklore and cult. The Zuni carry the image of Koloowisi, the plumed serpent, in procession at their initiation and fertility rites. The rattlesnake is the species whose cult is most widespread. The Hopi have a remarkable annual snake-dance whose object is to gain fertility. The great serpent mound of Wisconsin points to the early practice of the cult. Both Maya and Mexican culture show the great plumed serpent under various forms as the most important of their gods. The serpent is widely worshipped in Africa, where the python is usually the species represented in the cult. In Australia the serpent occurs chiefly in folklore and as a totem. A great serpent lies in the Milky Way, and is connected with the rites of initiation.

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Serpukhov, an ancient Russian town, 57 miles by rail S. of Moscow, on the Nara, 3 miles from its confluence with the Oka. It contains a cathedral (1380), and is a place of considerable commercial and industrial importance, manufacturing chiefly cottons, woollens, leather, paper, furniture, and earthenware. Pop. 28,000. It was formerly a fortress protecting Moscow on the south.

Serpula, a genus of sedentary Chetopod worms, living in twisted calcareous tubes fastened to shells and rocks in the sea, or even to other animals, such as crabs. From the mouth of the tube the



Serpula contortuplicata (with gill-filaments), on the back of an Oyster-shell. The horny stopper is also shown.

head of the worm is stretched out into the water, and bears numerous exquisitely coloured gills and a stopper or operculum which closes the mouth of the shell when the head is retracted. It is a transformed gill-filament. The colour of the gills is in great part due to the blood which is seen through the thin skin. The food consists of minute organic, and especially vegetable, particles, which are wafted into the mouth by the cilia on the gills. The

process by which the worm makes its tube of lime is not clearly understood; it is interesting to observe that in situations where the light comes in one definite direction the calcareous tubes point that way. Several species of *Serpula* are common on British coasts, and large forms of this genus and of nearly related genera are common in warmer seas.

Serrano y Domínguez, FRANCISCO, DUQUE DE LA TORRE, a Spanish statesman, was born at San Fernando near Cádiz on 17th December 1810, and pushed himself to the front in the war against the Carlists. Having gained an intimate place in the favour of the dissolute Queen Isabella, he made

the most of his influence and played an active part in the dismal political changes of that sovereign's reign, sometimes being in arms against the ministers of the day and sometimes himself holding the highest administrative posts of the kingdom. He was by profession a liberal, and for some years (1854-66) lent faithful support to O'Donnell. On the overthrow of O'Donnell's government by Narváez Serrano was banished, but returning two years later (in 1868) he defeated the queen's troops, and, having driven her away into France, became the chief ruler (as regent) of Spain until the accession of Amadeus of Savoy (1870). He waged successful war against the Carlists both in 1872 and in 1874. During the greater part of this latter year he was again at the head of the government, until he resigned the power into the hands of Alfonso XII. He was ambassador at Paris in 1883-84, and died at Madrid on 26th November 1885.

Serres. See SERES.

Serres, OLIVIA. See OLIVE (PRINCESS).

Sert, JOSÉ MARÍA, Spanish artist, was born at Barcelona in 1876, but in Italy was much impressed by Tintoretto and Tiepolo; since 1900 he has lived in Paris. He has produced mural decorations for various large mansions, but his chief work has been the splendid decorations, commissioned in 1904, for the whole interior of the cathedral (1780) of Vich in Catalonia.

Sertorius, QUINTUS, one of the ablest Roman commanders in the later ages of the Republic, was a native of Nursia, in the country of the Sabines. He began his military career in Gaul, and fought (105 B.C.) in the disastrous battle on the Rhone in which the Roman proconsul, Q. Servilius Cæpio, was defeated by the Cimbri and Teutones, and took part in the splendid victory at Aquæ Sextiæ or Aix (102 B.C.), where Marius annihilated the same barbarians. On the breaking out of the sanguinary struggle between the party of the nobles under Sulla and the popular party headed by Marius (88 B.C.), he espoused the cause of the latter, though he could not respect Marius himself. For morally Sertorius was much superior to the military adventurers of his time; and the impression we have of him from Plutarch's picturesque biography is that of a valiant, resolute, honest, and stubborn Roman, such as was commoner in the 3d than in the 7th century of the Republic. None of the Marian generals held out so long or so successfully as he against the victorious oligarchy. He fought in conjunction with Cinna the battle at the Colline Gate, which placed Rome at the mercy of the Marians. But he took no active part in the bloody massacres that followed; on the contrary, he slew 4000 of Marius' cut-throat slaves who had committed the worst excesses. On the return of Sulla from the east (83 B.C.) Sertorius, finding it impossible to act in concert with the other military leaders of his party, went to Spain, where he continued the struggle in an independent fashion. At first he was unable to maintain his ground, and was obliged to put to sea. In the Mediterranean and in Morocco he led an adventurous life, sometimes fighting against the partisans of Sulla, sometimes mixing in the quarrels of native chiefs. But his fame grew, and at length he was invited back to Spain by the Lusitani; and from them and Roman refugees he formed troops who successfully defied the power of Rome for eight years or more. Sulla sent army after army against him commanded by such men as L. Domitius Ahenobarbus, Q. Metellus Pius, and young Pompey; but none of them was a match for him and his methods of guerilla warfare. The contest was at last terminated by the assassination of Sertorius in 72 B.C. The assassins were all Romans, men proscribed by Sulla, who were fighting under Sertorius.

The chief of them was Perperna, who was jealous of his chief, and cherished ambitions of his own. Sertorius seems to have aimed at establishing a strong, stable government in Spain: he created a senate of 300 members from amongst the Romans of his party, and founded a school at Osca (Huesca) for the education of the sons of the Spanish chiefs. But jealousies broke out between the Spaniards and the Romans, and the sternness of Sertorius changed to cruelty and tyranny. But when at the height of his power he was regarded with almost superstitious veneration by the Lusitanians, and the feeling was enhanced by the fact that the great commander was constantly followed about by a tame fawn.



A Sertularian Colony
(natural size).

Sertularia, a common genus of Hydroids, in which the branched horny investment of the plant-like colony forms a sessile cup around each polyp. "The polyps are arranged in a double row, and the colony is attached to stones, shells, seaweeds, and the like. Among the hydrothecæ or cups surrounding the polyps larger pear-shaped capsules or gonothecæ occur, within which the reproductive elements are formed from special generative zooids. The Sertularians never liberate medusoid reproductive 'zooids.' See HYDROZOA.

Serum. See BLOOD; and for serum-therapy, the preventive treatment of certain contagious diseases by inoculation with blood-serum (generally of horses that have been infected with the malady in question), see ANTITOXIN, DIPHTHERIA.

Serval (*Felis serval*), Tijger-bosch-kat of the Cape Dutch, widely distributed in Africa, commonest in the south. It frequents thick vegetation



Serval (*Felis serval*).

near water and grassy plains; it hunts small antelopes and other game. The body is about a yard long; the tail only about sixteen inches. The general colour is tawny with black spots. The fur is in request, and known as *Tiger Cat*.

Servant. See MASTER AND SERVANT.

Servetus, MICHAEL, or MIGUEL SERVETO, a theologian and physician, was born at Tudela in Navarre in 1511, though he stated that he was born at Villanova near Lérida, and from about 1535 always styled himself Michael Villanovanus. His father sent him to study law at Saragossa and at Toulon. His interest in theological discussions was awakened whilst he was yet a student, and having gone to Italy (1530) in the company of

Quintaña, confessor to Charles V., he passed on from there into Germany, and came into contact with Luther, Œcolampadius, Bucer, and others of the Reformers. But his own views, especially in respect of the Trinity—he denied that there are three Persons in the Trinity and refused to acknowledge the eternity of the Son, and in other respects professed tenets similar to those of Socinus (q.v.)—were in discord both with those of the Reformers and the authoritative teaching of the Roman Catholic Church. The essay in which he propounded his speculations—*De Trinitatis Erroribus* (1531)—provoked considerable discussion. In 1536 he began to study medicine at Paris, and after a few years of wandering settled down to practise at Vienne (1541). Four or five years later he began to correspond with Calvin, and in spite of Calvin's openly avowed enmity wished to visit him at Geneva. At length, having secretly reprinted (1553) his collection of theological tracts, he was betrayed, and denounced, it is alleged at the instance of Calvin, to the inquisitor at Lyons. He was arrested, but managed to escape from prison; yet rashly venturing into Geneva he was again arrested, and after a trial of more than two months was burned alive (27th October 1553), the day after sentence was pronounced, at Champel near Geneva. As a scientific inquirer he is best known by a popular book on syrups and by his demonstration of the pulmonary circulation of the blood.

See CALVIN; Tollin, *Charakterbild Michel Servet's* (1876), *Das Lehrsystem M. Servet's* (3 vols. 1876-78), and other books; Trechsel, *Die protestantischen Antitrinitarier vor F. Socin* (1839); Pünjer, *De M. Serveti Doctrina* (1876); Willis, *Servetus and Calvin* (1877; to be used with great caution); Osler, *Michael Servetus* (1910).

Servia. See SERBIA.

Service (*Pyrus domestica*, the *Sorbus domestica* of many botanists; see PYRUS), a tree of rarely more than 30 feet in height, with leaves and flowers like the Rowan Tree (q.v.), but the former downy beneath.

The chief distinction between the two is in the fruit, which in the service is much larger than in the rowan, and shaped like a small pear. The service has found a place in British floras solely on the strength, it appears, of a single tree having been found in the forest of Wyre near Bewdley, which in all probability had been planted where it stands. On the continent of Europe and in Russian Asia it appears in company with the rowan. It is more cultivated in Italy, Germany, and France than in Britain. The tree is of very slow growth and attains a great age. The timber is valuable, very heavy, fine-grained, and susceptible of a high polish, possessing a strength and durability which particularly adapt it for some purposes of the machine-maker. It is used also for making mathematical rulers, &c. The name Wild Service is given to an allied species, *Pyrus torminalis*, also called the Sorb, a



Service Tree (*Pyrus domestica*),
branch in flower:
a, fruit, showing section.

common native of the middle and south of England and of the middle and south of Europe—a small tree with a spotted fruit considerably larger than that of the common hawthorn, which, like the fruit of the true service, becomes mellowed and pleasant by keeping, and is regularly brought to the market in many parts of Europe. Large quantities are brought to London from Hertfordshire. The dried fruit is used in some places as a cure for diarrhoea. The wood is highly valued. It is hard and tough, yellowish white, with brownish-red and dark-brown streaks.

Service, MUSICAL. The musical arrangements of a full cathedral service in the Church of England are usually as follows: The introductory prayers of morning and evening service, up to the conclusion of the Lord's Prayer, are sung in monotone. The versicles and responses before the Psalms, after the Creed and Lord's Prayer, and the Litany are sung to the plain-song adapted to them by Marbeck from the equivalents in the Catholic Directory, with some traditional variations; the responses are, however, usually sung in harmony, either in the festal form by Tallis, with the plain-song mostly in the tenor, or in the everyday or ferial form, in simpler harmony. The remaining prayers are sung in monotone, with plain-song inflections and endings. The *Venite* (Psalm xcvi.) and Psalms of the day are sung antiphonally to appropriate chants, of which many different collections are in use. Various collections of anthems are also found in different churches. The Canticles (*Te Deum*, &c.) are sung sometimes to chants, but usually to special settings by the various English writers from Tallis downwards; the term 'service' is used as denoting a complete set of music for these parts of the ritual, and is distinguished by the composer's name and the key. An ordinary Morning Service consists of settings of the *Te Deum* and *Jubilate*, or its alternative the *Benedictus*. The *Benedicite* is seldom sung. An Evening Service contains settings of the *Magnificat* and *Nunc Dimittis*, or more rarely of their alternatives the *Cantate Domino* and *Deus Misereatur*. A Communion Service includes choral settings of the *Kyrie Eleison* (the response after each of the Ten Commandments), the Nicene Creed, the *Sanctus* and the *Gloria in Excelsis*, and recent composers add the Doxologies before and after the Gospel, the *Sursum Corda*, the *Agnus Dei*, and the *Benedictus*. The style of music of a service (in the latter restricted meaning) varies very considerably with the different periods to which the composers belong. Among the most eminent of these are Thomas Tallis (c. 1515–85), Orlando Gibbons (1583–1625), John Blow (1648–1708), Henry Purcell (1658–95), William Croft (1677–1727), William Boyce (1710–79), Thomas Attwood (1765–1838), and Samuel Wesley (1766–1837). The style of the last has been largely followed by the innumerable modern writers. The most outstanding are Dykes, Stainer, Sullivan, Parry, Stanford, Davies. See the collections of Boyce, Arnold, Rimbault, and Ouseley, containing also biographical notices. There are also what are known as Chant Services, the music of which is a free form of chant, of which the well-known 'Jackson in F' is a hackneyed example. See Stainer's *Cathedral Prayer-book*, and J. S. Bumpus, *History of English Cathedral Music, 1549–1889* (2 vols. 1908).

Servile Wars. See ROME, SPARTACUS.

Servites, the common name for the order of the 'Religious Servants of the Holy Virgin,' founded in 1233 by seven Florentine merchants, who soon removed to Monte Senario, 9 miles from the city. They adopted the rule of St Augustine, with many modifications, receiving papal sanction

in 1255 and definitely in 1304. In 1487 Innocent VIII. bestowed on them all the privileges of the other mendicant orders. The movement spread rapidly to Germany, France, Spain, Poland, and even to Crete and India. Houses were established in England at the end of the 19th century and in America at the beginning of the 20th. They number at present about sixty, mostly in Italy. The habit is black.

Servitude, in Scots law, is a burden affecting land or other heritable subjects, by which the proprietor is either restrained from the full use of his property or is obliged to suffer another to do certain acts upon it, which, were it not for that burden, would be competent solely to the owner (Erskine, *Inst.* II. ix. 1). The term is also used to express the correlative right or privilege of the proprietor of the land or other heritable subject which is benefited. The name is borrowed from Roman law, and most of the rules regulating this class of rights in the countries of western Europe are derived more or less directly from the same source.

In Roman law servitudes are either predial or personal. Predial or real servitudes are those constituted over one subject or tenement in favour of the proprietor of another subject or tenement. It is only as owner of the property that a person enjoys the predial servitudes accessory thereto; and when the property is transferred the servitudes pass along with it. The tenement in respect of which the servitude is enjoyed is called the dominant tenement, and its owner the dominant owner; while the tenement in or over which the right is exercised is called the servient tenement. There is thus always a right on the one side and a corresponding obligation on the other. Personal servitudes, on the other hand, are those constituted over any subject in favour of a person in his own right, and not as owner of another subject. The rights classed under this head in Roman law are the different kinds of usufruct. Real or predial servitudes are divided in Roman law into urban and rural—the former including all servitudes which are for the advantage of a building, the latter all those which are for the advantage of a piece of land, whether situated in town or country. *Urbanum praedium non locus facit, sed materia* (Dig. 50, 16, 198). Rural servitudes comprise rights of road or way, of drawing water, of pasturage, as well as rights of burning lime on, and taking away sand or gravel from, the ground of the servient subject. Urban servitudes comprehend such rights as eavesdrop or stillicide, support, and various rights in respect of light, air, or prospect. Roman law also recognises another division, very useful in practice, of servitudes into two principal classes, which are termed positive and negative. By a positive servitude the dominant owner is entitled to perform some act, affecting the servient tenement, which, but for the servitude, the servient owner could have prohibited; thus, all the rural servitudes above mentioned are positive. By a negative servitude the owner of the servient tenement is prohibited from the exercise of some natural right of property—as where he is prevented from building on his own land to the obstruction of light.

These classifications of servitudes, obtaining in Roman law, have been adopted in Scots law. The only personal servitude recognised in Scotland, however, is usufruct or liferent, which is a right to use and enjoy a thing during life, the substance of it being preserved. In modern Scots law this right has ceased to be regarded as a servitude, and the term 'servitude' is applied only to a burden imposed on a tenement, consisting of lands or other heritable subjects, for the benefit of another tene-

ment. There must be two tenements, and these tenements must be owned by different persons. A positive servitude may be constituted by grant in writing. The written grant, if it is to be effectual against singular successors of the grantor, must either be recorded or be followed by exercise of the right. Positive servitudes may also be constituted by implication, where one property is severed into two or more distinct properties. Thus, where the proprietor of a tenement transfers the ownership of part of it to another, there will pass by implication to the transferee all those rights of servitude over the part remaining in the ownership of the transferor which are necessary to the reasonable enjoyment of the part transferred, and which, prior to the severance, were exercised by the owner of both parts for his own convenience. Further, a positive servitude may be acquired by prescription; that is to say, by the exercise of the right for forty years. Negative servitudes, on the other hand, can be constituted only by express written grant; but, if the servitude granted be one of the known servitudes, it is not necessary that the grant be published in the records.

The benefit of a servitude is confined to the dominant tenement; but the owner of that tenement must exercise his rights *civiliter*—in the way least burdensome to the servient tenement. The servient proprietor must refrain from doing anything to diminish the use or convenience of the servitude; but he is not bound to do anything—e.g. to keep in repair for the use of the dominant proprietor a road or a drain. The dominant proprietor is entitled to access for doing, at his own cost, any work which may be necessary for the proper use or preservation of the servitude. Servitudes may be extinguished by express discharge granted by the dominant proprietor in a holograph or tested writing; by acts of the dominant proprietor inferring an abandonment of the right, or acts of the servient proprietor which are inconsistent with the servitude and are acquiesced in by the dominant proprietor; by the two tenements coming into the ownership of the same person; by nonuser, prolonged for the prescriptive period of forty years; or by force of statute. See EASEMENT.

Servius, a commentator on Virgil and one of the most intelligent of the Latin 'grammatici,' lived at Rome about 400 A.D. But much of what is ordinarily cited as his work is by later hands.

Servius Tullius, the sixth king of Rome (q.v.).

Sesame, an annual herbaceous plant of the genus *Sesamum*, family Pedaliaceæ, a family related to Bignoniaceæ but characterised by wingless seeds, and placentæ with woody lobes attached to the inner wall of the fruit. The calyx of *Sesamum* is five-parted; the corolla irregular five-parted; the stamens four, two longer than the others, and a rudimentary fifth stamen; the capsule is oblong, almost four-celled, two-valved, many-seeded. *S. indicum* is cultivated in a vast number of varieties, especially in India. *S. radiatum* is grown more in Africa. Sesame is cultivated throughout the East for the sake of the seeds, which yield by expression *gingili-oil*. The oil is used in cookery—as a substitute for butter in the same way as olive-oil—for lighting, for soap-making, and for lubrication. It is inodorous, has a sweet taste, and keeps for years without becoming rancid. In Egypt and Arabia it is preferred to olive-oil. It is used in connection with medicine. Egyptian women consider it the best of cosmetics and the most perfect preservative of the hair. Nine pounds of the seeds yield two quarts of the sweet oil. The sweet oleaginous seeds are used

in some countries, as in Central Africa, for making a kind of hasty-pudding. The oil-cake is a cattle-food, and, mixed with honey and preserved citron, is an oriental luxury. The leaves abound in a gummy substance, which they readily impart to water, making a rich bland mucilage, which is used in the southern parts of the United States (where it is grown a little) as a demulcent drink. Sesame is sometimes called *til-seed*.

Sesamoid Bones are small bones met with in the substance of tendons in the neighbourhood of certain joints. They derive their name from their resemblance to grains of sesame. In the human subject the patella is the best example; and besides it they are commonly met with on the palmar aspect of the joint which unites the metacarpal bone of the thumb with the first phalanx, and in the corresponding position in the great toe, there being two in each position, and their object to increase the leverage of the short flexor muscles of the thumb and great toe. They are much more numerous in the great majority of mammals than in man.

Sesostris, the Greek name of a celebrated Egyptian monarch, whose name has passed into the series of those conquerors who have almost achieved universal empire. According to the Greek legendary history, Sesostris at the head of a large army invaded Libya, Arabia, Asia (penetrating farther east than Darius), Europe, Thrace, and Scythia, leaving a colony at Colchis on his return. In the south he subdued Ethiopia, and, placing a fleet on the Red Sea, conquered the adjacent isles, and extended his dominions to India itself. He brought back with him large numbers of captives, who were employed on public works, the building of temples, and the construction of canals and mounds. Memorials of his reign were left as steles or tablets in the conquered countries; Herodotus saw some in Palestine, which in reality are supposed to have been the tables of Rameses II. There has always existed the greatest divergence of opinion amongst historians as to the identity of Sesostris. Herodotus places his reign long before that of Cheops of the 4th dynasty. Dicaearchus makes him rule 3712 B.C., and is followed by Aristotle and other authors. Bunsen supposes that there were more than one monarch of this name, and that one was a king of the 3rd dynasty, another a king of the 12th dynasty. Lepsius conjectures that his exploits are confused reminiscences of Sethos I. and Rameses II. of the 19th dynasty. Modern scholars now consider that the three kings of the 12th dynasty, who all bore the name Senusert, were confused by the Greeks into one heroic figure.

Sessa Aurunca, a city of Southern Italy, 32 miles NW. of Naples, and 27 WNW. of Caserta, has a fine Romanesque cathedral, and ruins (amphitheatre, a bridge of brickwork with twenty-one arches, &c.) of the ancient *Suessa Auruncorum*. On its hills was grown the famous Falernian wine of the Romans, and it was a place of some importance. The more ancient stronghold of the Aurunci probably lay on the summit of the SW. edge of the extinct crater of Rocca Monfina. Pop. (1921) 21,488.

Sessions. See JUSTICE OF THE PEACE, QUARTER SESSIONS, COURT OF SESSION.

Sestertius, a Roman coin, was the fourth part of the *Denarius* (q.v.), and thus contained at first $2\frac{1}{2}$ asses or *libre*. The symbols for it were indifferently HS or IIS, the former being only a modification of the latter, which expresses two units and S for the additional half-unit (*semis*). In the Latin classics the phrase *sestertius nummus*, or merely *nummus*, is frequently employed to denote this coin. When the denarius was made to contain

16 *asses* the relation between it and the sestertius was preserved, and the latter from that time contained 4 *asses*. Till the time of Augustus, when the relation of the denarius to the *as* was changed, the sestertius was worth fully 2d., but after this about an eighth less. *Sestertium* (before Augustus = £8, 15s. sterling) came to be used as if a neuter singular for 1000 sesterces; but with a numeral adverb attached, as *decies sestertium*, was used to signify 100,000 sesterces. It was the 'money of account' (never a coin) used in the reckoning of large sums. HSX = *decem millia sestertium*; HS[X] = *decies sestertium*.

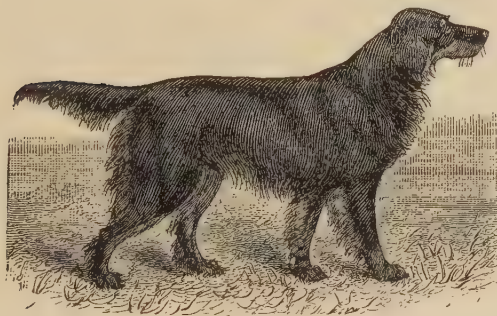
Sestos. See ABYDOS.

Sestri Ponente, a suburb of Genoa, $4\frac{1}{2}$ miles to the west, has shipbuilding-yards, machine-shops, and manufactures of tobacco, leather, &c., and in the neighbourhood alabaster mines; pop. 23,417.

Sethites, or SETHIANS, a division of the Ophites (q.v.), described by Hippolytus, and so called either from the part played by Seth in their cosmogony or from the fact that their doctrines were taught in a book bearing the name of Seth.

Sette Comuni. See VICENZA.

Setter, a breed of dog employed in shooting, where he fills the same vocation as the pointer. The setter is divided into three varieties—the English setter, the Gordon setter, which is native to Scotland, and the Irish setter. There was also at one time a variety known as the Welsh setter, but it is now extinct, and probably never differed widely from the English setter. As early as the 16th century the then Duke of Northumberland owned a dog trained by himself to set game, an idea soon followed by others. For many years, however, the spaniel or any other suitable dog



Setter, 'Heather Grouse.'

was selected to train to the habit of setting game; and it is not until the beginning of the 19th century that any reliable record of a distinct breed of setting dogs can be found. The English setter is bred from the spaniel probably by crossing with the pointer. Though at one time setters were known of nearly all colours, at the present time the English setter is generally white with red markings, or ticked with black spots known as a 'blue Belton.' Edward Laverack of Manchester founded a distinct strain, known as Laverack setters, all bred from one brace of dogs, a strain which has become widely diffused. The Gordon setter was founded by the Duke of Gordon about 1800, by crossing the existing setter with a collie bitch which had been trained to set. The Gordon was originally a black, tan, and white dog, though white has gradually disappeared from the breed. The Gordon setter should now be a rich and glossy black marked with tan on face, chest, and legs. The origin of the Irish setter is unknown,

and it is hard to say where the peculiar blood-red colour was obtained. In conformation the three varieties differ very slightly, though the Irish setter is a lighter and more leggy dog than the others. The setter should be a smart and active dog, not built on too heavy a scale; chest very deep, though not wide; shoulders sloping back; and with good strong legs and feet. Though the setter can endure much more fatigue and hard weather than the pointer, yet he is more headstrong and requires repeated breaking. The Irish setter is the chief sinner in this respect, but is a splendid dog when properly broken. See Colonel J. K. Millner, *The Irish Setter* (1924).

Settle, a little gray town in the West Riding of Yorkshire, on the Ribble, and at the base of the Castleberg cliff (300 feet), 43 miles N.W. of Leeds. Dr Birkbeck was a native. Pop. 2600.

Settle, ELKANAH, was born at Dunstable, 1st February 1648. He entered Trinity College, Oxford, at eighteen, but soon betook himself to London, to make a living by his pen. In 1666 he made something of a hit by his tragedy of *Cambyses*, and the Earl of Rochester and others, to annoy Dryden, loudly hailed him as the superior genius of the two. Rochester got his next tragedy, *The Empress of Morocco*, played at Whitehall by the lords and ladies of the court, and in this way a great run was secured for it when it came before the public. In the insolence of success the author printed along with it a Preface, in which Dryden was severely assailed. In his great satire, *Absalom and Achitophel*, Dryden scourged him with his scorn, and so gave him immortality, if only as a shrieking ghost. Having no real strength of talent, Settle speedily relapsed into obscurity. By writing as poet for the city verses for pageants and festivities, and producing pieces to be acted in the booths of Bartholomew Fair, the some-time rival of Dryden was fain to eke out a wretched subsistence. In his destitute age he was admitted to the Charterhouse, where in 1723 or 1724 he died, and his works followed, if indeed they did not predecease him.

Settlement, in English law, includes any deed, will, or other instrument by which successive interests are created in the same property, the use or income being given to one person, while the corpus of the property is preserved for his successor. A will is revocable in its nature; a settlement made by deed is irrevocable unless it contain an express power of revocation. See the articles DISPOSITION, ENTAIL, ESTATE, LAND LAWS, HUSBAND AND WIFE; in the last of which the distinction between ante-nuptial and post-nuptial settlements is explained. In Scotland the term settlement includes any general will or disposition to take effect after death. In the United States settlements other than marriage settlements are little in use; and marriage settlements are of less importance, most of the states having long since adopted the principle of the married women's property act. A person is said to have a settlement in a parish when by residence or otherwise he has acquired a claim to be relieved out of the rates if destitute; see POOR LAW.

Settlement, ACT OF. See ELIZABETH (Queen of Bohemia).

Setu'bal (once called by the English ST UBES), a seaport of Portugal, stands on the north side of the Bay of Setubal, 17 miles by rail SE. of Lisbon. The harbour is protected by five forts. The town owes its importance chiefly to its trade in wine, sea-salt, and oranges. Fishing is carried on with considerable activity, Setubal being the centre of the sardine industry. Setubal is the old Roman *Cetobriga*. In 1755 it suffered severely from the earthquake that devastated Lisbon. Pop. 37,000.

Pilgrimages are made to the monastery of Arrabida, with its neighbouring stalactite cave. The poet Bocage (see PORTUGAL) was born at Setubal.

Seurat, GEORGES (1859–91), French painter, was born at Paris, and studied there at the École des Beaux-Arts under Lehmann. Seurat and Signac are credited with the introduction of Pointillism (q.v.), in which it was sought, by means of Charles Henry's theory of complementary colours, to establish direct relation between the sciences of light and colour, and the empiric laws of painting. Seurat's work is remarkable; it is full of vibrating and shimmering light, but it also possesses a strong decorative effect that is thoroughly individual.

Sevastopol. See SEBASTOPOL.

Seven was frequently used as a mystical and symbolical number in antiquity. The origin is doubtless astronomical, or rather astrological—viz. the observation of the seven planets and the phases of the moon, changing every seventh day (see WEEK). As instances of this number in the Old Testament, we find the Creation completed within seven days; every seventh year was sabbatical, and the seven times seventh year ushered in the jubilee year. The three *Regalim*, or pilgrim festivals (Passover, Festival of Weeks, and Tabernacles), lasted seven days; and between the first and second of these Feasts were counted seven weeks. The first day of the seventh month was a 'Holy Convocation.' The Levitical purifications lasted seven days, and the same space of time was allotted to the celebration of weddings and the mourning for the dead. In innumerable instances in the Old Testament and later Jewish writings the number is used as a kind of round number. In the Apocalypse we have the churches, candlesticks, seals, stars, trumpets, spirits all to the number of seven, and the seven horns and seven eyes of the Lamb. The same number appears again either divided into half ($3\frac{1}{2}$ years, Rev. xiii. 5, xi. 3, xii. 6, &c.), or multiplied by ten—seventy Israelites go to Egypt, the exile lasts seventy years, there are seventy elders, and at a later period there are supposed to be seventy languages and seventy nations upon earth. To go back to the earlier documents, we find in a similar way the dove sent out the second time seven days after her first mission, Pharaoh's dream shows him twice seven kine, twice seven ears of corn, &c. Among the Greeks the seven was sacred to Apollo and to Dionysus, who, according to Orphic legends, was torn into seven pieces; and it was particularly sacred in Eubœa, where the number was found to pervade, as it were, almost every sacred, private, or domestic relation. On the many ancient speculations which connected the number seven with the human body and the phases of its gradual development and formation, its critical periods of sicknesses—partly still extant as superstitious notions—we cannot here dwell. The Pythagoreans made much of this number, giving it the name of Athene, Hermes, Hephaistos, Heracles, the Virgin unbegotten and unbecoming (i.e. not to be obtained by multiplication), Dionysus, Rex, &c. Many usages show the importance attached to this number in the eyes not only of ancient but even of our own times, and it is hardly necessary to add that the same recurrence is found in the folklore of every race.—The Seven Champions of Christendom are St George for England, St Andrew for Scotland, St Patrick for Ireland, St David for Wales, St Denis for France, St James for Spain, St Anthony for Italy.—The Seven Churches of Rev. i.–iii. are Ephesus, Smyrna, Pergamos, Thyatira, Sardis, Philadelphia, and Laodicea.—The Seven Principal Virtues are faith, hope, charity, prudence, temperance, chastity, and fortitude.—The Seven Gifts of the Holy

Ghost are wisdom, understanding, counsel, ghostly strength or fortitude, knowledge, godliness, and the fear of the Lord.—For the Seven Free Arts, see ARTS.

Seven Bishops. These were Archbishop Sancroft of Canterbury, and Bishops Ken of Bath and Wells, Lake of Chichester, White of Peterborough, Turner of Ely, Lloyd of St Asaph, and Trelawny of Bristol, who were tried on the charge of publishing a seditious libel, but acquitted (June 30, 1687) amid the greatest popular enthusiasm, the very soldiers cheering even within hearing of the king. Their seditious libel was none other than a petition to James II. against his injunction that the clergy should read his Declaration of Indulgence at divine service, in London on the 20th and 27th of May, in other parts of England on the 3d and 10th of June. The order was obeyed in but four out of the hundred parish churches of London, and by not one in fifty all over England. All became Nonjurors except Lloyd and Trelawny. See Miss Strickland's *Lives of the Seven Bishops* (1866).

Seven Deadly Sins. The early Christian fathers singled out certain sins as being more heinous than others (cf. Acts xv.), and later, under the influence of mediæval monasticism, a definite list of seven (sometimes eight or more) mortal sins was formulated. Gregory the Great arranged them as a climax of evil, thus: *Superbia* (pride), *avaritia* (covetousness), *luxuria* (lust), *invidia* (envy), *gula* (gluttony), *ira* (anger), *acedia* (sloth)—*saligia* being a convenient mnemonic formed from the initial letters. The list, however, was varied by some of the schoolmen. The Deadly Sins had a considerable place in mediæval Christian philosophy, and they made a ready appeal to imaginative poets, as Dunbar and Spenser. See CONFESSION.

Seven Dolours of the Blessed Virgin Mary, FEAST OF, a festival of the Roman Catholic Church, dating from 1423, and since 1725 celebrated on the Friday preceding Palm Sunday. The 'dolours' or sorrows of the Blessed Virgin have long been a favourite theme of Roman Catholic devotion, of which the pathetic hymn *Stabat Mater* (q.v.) is the best known and most popular expression; and the festival of the Seven Dolours is intended to individualise the incidents of her sorrows, and to present them for meditation. The seven incidents referred to under the title of 'dolours' are (1) the prediction of Simeon (Luke ii. 35; of which, indeed, the whole seven are the fulfilment); (2) the flight into Egypt; (3) the loss of the child Jesus in Jerusalem; (4) the sight of Jesus bearing the cross; (5) the sight of Jesus upon the cross; (6) the descent from the cross; (7) the entombment. The festival is now observed as a 'greater double' (see FESTIVALS). A second one, instituted by Pius VII. in 1814, falls on the third Sunday of September.

Sevenoaks, a pleasant town of Kent, on an eminence 22 miles SE. of London. It has a Perpendicular church with some interesting monuments, the Walthamstow Hall (1882) for 100 daughters of missionaries, and a grammar-school founded in 1432 by Lord Mayor Sir W. Sennocke, incorporated by Queen Elizabeth, and reconstituted as a first-grade modern school in 1877, at which Grote and Bishops Christopher and Charles Wordsworth were educated. Knole, the magnificent seat of Lord Sackville, is close by. It was mainly built between 1460 and 1608 by Archbishop Bouchier and Thomas Sackville, first Earl of Dorset, and has a park of 1000 acres, 5 miles in circumference. Pop. 9000.

Seven Sleepers, the heroes of a celebrated legend, which is first related in the West by Gregory of Tours (*Passio Septem Dormientium*

apud Ephesum) in the close of the 6th century, but assigned to the 3d century, and to the persecution of the Christians under Decius. The earliest text is of Syrian origin, and probably belongs to the early 6th century. According to the story, during the flight of the Christians from the persecution, seven Christians of Ephesus took refuge in a cave near the city, where they were discovered by their pursuers, who walled up the entrance in order to starve them to death. They fell instead into a preternatural sleep, in which they lay for nearly 200 years. This is supposed to have taken place in 250 or 251; and it was not till the reign of Theodosius II. (447) that they awoke. They imagined that their sleep had been but of a single night; and one of the seven went secretly into the city to purchase provisions, and he was amazed to see the cross erected on the churches and other buildings. Offering a coin of Decius in a baker's shop he was arrested, his startling story not being believed until he guided the citizens to the cavern where he had left his comrades. The emperor heard from their lips enough to convince him of the life beyond the grave of the dead, whereupon they sank again to sleep till the resurrection. Gregory explains that his story is of Syrian origin—it is widely current in the East, and was adopted by Mohammed (*sur.* xviii.), who even admits their dog Kitmer also into Paradise. The Roman Catholic martyrology commemorates them on June 27. The names usually given are Maximianus, Malchus, Martinianus, Dionysius, Joannes, Serapion, and Constantius. Paulus Diaconus (8th century) locates a similar story in Germany, and Rydberg makes out a good case that the myth is of Teutonic origin intimately connected with the return of the dead Balder and of the other dead men from the lower world, with the idea of resurrection and the regeneration of the world, but possibly enough first Christianised in Syria or Asia Minor. The seven sons of Mimer awakening from their long sleep at the blast of Heimdall's trumpet to take their part in the final struggle of the universe is a close parallel to the seven saints of Ephesus. Both in Germany and Sweden the seven sleepers are connected with the weather—if it rains on their day rain will follow for seven weeks together. They are supposed also to take especial care of sailors. See Koch, *Die Siebenschlüferlegende* (Leip. 1882); Huber, *Die Wanderlegende von den Siebenschlüfern* (Leip. 1910); and Rydberg, *Teutonic Mythology* (Eng. trans. 1889).

Seventh-day Baptists. See SABBATH.

Seven Wise Masters, the most common title given to a famous mediæval collection of stories, grouped round a central story, the history of which is almost the most important among the problems of storiology. The leading story itself is briefly as follows: A young prince is born in answer to prayer as the only son of the aged king Kûrush, and the astrologers foretell a great danger overhanging his fate at twenty. At seven years he is entrusted to masters, but at thirteen he has not learned anything. The sages then recommend Sindibâd as the best master, but for six and a half more years the young prince studies under him uselessly, and at nineteen and a half he has still learnt nothing. The king again assembles the wise men, and Sindibâd offers to teach the prince everything in six months or forfeit his life. He now shuts himself up with his pupil, who this time succeeds to his master's satisfaction. Before bringing him back Sindibâd consults the stars, and sees that the prince will die if he should speak before seven days. Sindibâd therefore hides himself, and the prince at court is found to be dumb. One

of the king's women now tempts him as the wife of Potiphar did Joseph, and in the fury of disappointed rage accuses him to the king of an attempt on her virtue. The king condemns him to death, whereupon the seven viziers resolve to intercede to stay his execution. The first goes to the king, and by two tales against women obtains the suspension of the execution for that day. Next day the woman by a tale of contrary character obtains a confirmation of the sentence; but a second vizier again procures a suspension by two tales; and so on till the end of the seventh day when the prince is free to speak. He now comes to the king attended by the sages and by Sindibâd, whereupon the woman is duly punished, and the king, after seeing proof of his son's wisdom, gives him his throne and retires into solitude to serve God.

Of variant versions there are two principal groups, the Eastern and the Western, the first including all the texts in Eastern languages, and some more or less free translations from Oriental texts; the other including the *Dolopathos*, the *Historia Septem Sapientum*, the *Erasto*, and many others. The Oriental texts have so many elements in common that they obviously spring from one book as a common basis, of which they are more or less faithful translations, at different epochs and in different literatures. The Western texts, though derivable from the Eastern, show great divergencies alike in the fundamental story and in the tales inserted in it. The real cause of this is that in the Western cases *oral* tradition has transmuted the contents.

The earliest version of a *Book of Sindibâd* is found in Arabian writers of the 10th century. The more important Eastern versions are the following: (1) The *Syntipas*, a Greek text translated from the Syriac by Michael Andreopoulos during the last years of the 11th century (ed. by Dr A. Eberhard in vol. i. of *Fabulæ Romanenses Græce Conscripæ* (Leip. 1872). A Syriac text was found by Rödiger, and was edited, with a German translation, by Dr Baethgen (Leip. 1879). (2) The Hebrew version entitled *Parables of Sandabar* (*Mischle Sandabar*), translated from the Arabic, probably in the first half of the 13th century. There is a German translation by Sengelman (Halle, 1842), a French by Carmoly (Paris, 1849). (3) The *Sindibâd-Nâmeh*, an unedited Persian poem, written in 1375. (4) The eighth night of the *Tûti-nâmeh* of Nachschebi, a Persian poet who died in 1329. Of this there is a German translation by Professor Brockhaus (Leip. 1845). (5) *The Seven Viziers*, an Arabic text, forming part of some redactions of the *Thousand and One Nights*, of uncertain age, but not ancient. (6) An ancient Spanish translation of an Arabic text existing in a 15th-century codex—the version closest to the *Syntipas*. It was first printed by Comparetti in his *Ricerche intorno al Libro di Sindibâd* (Milan, 1869; Eng. trans. of Comparetti's study and the old Spanish text, Folklore Society issues, 1882).

Western versions exist in the most perplexing variety and number—Latin, French, Italian, Catalan, Spanish, English, German, Dutch, Icelandic, Swedish, Danish, Polish, Russian, Hungarian, and Armenian. The *Dolopathos* is a French metrical version supposed to have been made by Herbert in the reign of Louis IX. from the Latin romance of Jean de Haute-Seille, *Historia de Rege et Septem Sapientibus*. This Latin text (*Johannis de Alta Silva Dolopathos*) was edited by Oesterley (Strasb. 1873) and Hilka (Heid. 1913); other Latin versions varied widely. A French metrical version was printed by Keller (Tüb. 1836); *Li romans de Dolopathos*, by Ch. Brunet and A. de Montaigon (1856); two prose versions of the *Sept Sages de Rome*, by Gaston Paris (1876). A Scottish metrical version is included in the early 16th-century Asloan MS. (ed. Craigie, 1925). To

the middle of the century belong an English prose version and a second Scottish metrical version (by John Rolland of Dalkeith; ed. Laing, 1837). One English metrical version was printed by Henry Weber (1810), another by T. Wright for the Percy Society (1845). Among Italian versions we have a 13th-century translation from a French prose version, printed by Professor A. d'Ancona (*Il Libro dei Sette Savi di Roma*, Pisa, 1864); the latest is the 16th-century book, *I Compassionevoli Avvenimenti di Erasto*. German versions begin with the metrical rendering of 1412 by Hans v. Büchel, *Diocletianus Leben*, edited by A. Keller (Quedlinb. 1841). A second and anonymous poetical version is given in Keller's *Altdeutsche Gedichte* (Tüb. 1846). The prose *Volksbuch* was first printed in the 15th century, and will be found in Simrock's collection. See Professor Mussafia, *Beiträge zur Litteratur der sieben weisen Meister* (Vien. 1868); Dr Marcus Landau, *Die Quellen des Dekameron* (2d ed. 1884); and W. A. Clouston, *The Book of Sindibād*, from Pers. and Arab. (1884).

Seven Wise Men, the collective designation of a number of Greek sages, whose moral and social experience, according to the ancients, was embodied in certain brief aphorisms. Their names, as usually given, and their characteristic aphorisms are as follows: Solon of Athens—'Nothing in excess'; Thales of Miletus—'Suretyship brings ruin'; Pittacus of Mitylene—'Know thine opportunity'; Bias of Priene in Caria—'Too many workers spoil the work'; Chilon of Sparta—'Know thyself'; Cleobulus, tyrant of Lindus in Rhodes—'Moderation is the chief good'; and Periander, tyrant of Corinth—'Forethought in all things.'

Seven Wonders of the World were in ancient times reckoned to be the Pyramids of Egypt, the Hanging (i.e. terraced) Gardens of Semiramis at Babylon, the Temple of Diana at Ephesus, the Statue of Jupiter at Athens by Phidias, the Mausoleum, the Colossus at Rhodes, and the Pharos of Alexandria. This cycle of seven wonders originated among the Greeks after the time of Alexander the Great, and they were described in a work by Philo of Byzantium, edited by Orelli (1816) and by Hercher (Paris, 1858). See also E. J. Banks, *The Seven Wonders of the Ancient World* (1916).

Seven Years' War, THE, was the third, and by far the longest (1756-63) and most terrible, of the contests for the possession of Silesia (q.v.). During the two former wars the Empress Maria Theresa had been too much engrossed in maintaining her claims to the Austrian dominions to offer any very effective resistance to the aggression of Frederick the Great of Prussia; but after emerging triumphantly from that contest she began to concert measures for the recovery of her lost province. Frederick, however, with his usual astuteness, foresaw her purpose and resolved to anticipate her. Accordingly in August 1756 he made a sudden advance upon Dresden with 60,000 men; and, when the elector refused either to side with him or to promise strict neutrality in the coming struggle, he shut up the Saxon army (17,000 strong) between Pirna and Königstein. An Austrian army, commanded by Marshal Browne, advanced to relieve the Saxons, but was defeated by Frederick at Lobositz (October 1). The Saxons then surrendered (October 14), and were mostly incorporated with the Prussian army, whilst their country was treated by Frederick, in the absence of the elector, who fled to Poland, as a conquered province. This action on the part of Frederick thoroughly roused his enemies, and made them rapidly perfect their alliances, so that, when the second campaign began in the following year, the Prussian king was opposed by 100,000 Russians, more than that number of French troops, and by armies raised by Sweden and the empire. His own armies,

including 40,000 Hanoverians, English, and Hessians, numbered less than 200,000. In April Frederick, leaving a corps of 24,000 under Lehwaldt to oppose the Swedes and Russians, invaded Bohemia and managed to shut up the Austrian army under Duke Charles of Lorraine in Prague; but Marshal Daun headed another army for the Duke's release, and inflicted a crushing defeat upon Frederick at Kolin (June 18). Meanwhile a large French army under Marshal d'Estrées advanced into Hanover, defeated the incapable Duke of Cumberland at Hastenbeck (July 26), and intimidated him into disbanding, by the Convention of Closter-Seven, the whole of his army excepting the Hanoverians. Another French army under Soubise effected a junction with the Imperialists under the Prince of Hildburghausen in the direction of Saxony; but Frederick turned and smote them at Rossbach, and after half an hour's fighting put them completely to rout. This diversion left the victorious Austrians unopposed, and they soon made themselves masters of Silesia and Breslau. Frederick, however, taught them what stuff he was made of by defeating an Austrian army three times as numerous as his own at Leuthen (December 5), and thereby recovered Silesia. These victories induced the Russians to vacate the province of East Prussia, which they had seized after defeating Lehwaldt at Grossjagersdorf (August 30). The English government, rejecting Cumberland's engagements of Closter-Seven, raised another army for 1758 and put it under the leadership of Duke Ferdinand of Brunswick, who effectually held his own against the French, and even drove them out of Westphalia and beyond the Rhine, defeating them at Krefeld (June 23) and Minden (August 1, 1759). The king of Prussia had in the spring of 1758 pushed into Bohemia, but could make no headway before he was called back northwards to meet the Russians, who had invaded Brandenburg. He defeated them in a desperate battle at Zorndorf (August 25). At this time Frederick's brother, Prince Henry, was being hard pressed in Saxony by Daun with superior forces, and the king, the Russians being in rapid retreat for Poland, sped back to his help. Daun, however, contrived to take Frederick completely by surprise, and gave him a terrible beating at Hochkirch (October 14). Nevertheless, before the end of the year the Prussians were again in possession of Saxony.

The fourth campaign (1759) in the east of Prussia was altogether disastrous to the Prussians. The king was not able to carry out his desire of hindering the conjunction of his enemies, the Russians and Austrians, through the defeat of his general Wedell near Züllichau (July 23). He himself suffered terrible losses against the allied armies at Kunersdorf (August 12). Three months later Daun compelled a Prussian force under General von Finck to capitulate at Maxen in the south of Saxony, and thereafter established himself in that country. With greatly diminished strength, an exhausted treasury, a desolated territory incapable of affording either men or supplies, and gloomy forebodings of the final issue, though with unflinching resolution never to yield, Frederick prepared for the fifth campaign (1760). His army in Prussia, now reduced to 90,000 men, mostly foreigners and raw recruits, was still further diminished by the capture of Fouqué with 8000 men in Silesia, followed by Marshal Loudon's conquest of that province, though by the brilliant victory of Liegnitz (August 15) Frederick successfully prevented the Austrians and Russians from uniting their forces. In spite of this his strength was now becoming ominously insufficient

for the task he had set himself; the Russians and Austrians captured and plundered Berlin (October 9), the Swedes came down from the north, and Loudon closed in upon the king from Silesia. But he fell with incredible fury upon Daun at Torgau (November 3), slew 12,000 of his men and took 8000 more prisoners, and by the retreat of the Austrians was once more left in possession of Saxony. In the following year (1761) the French were again worsted by Duke Ferdinand at Vellinghausen (July 15). In Silesia Frederick as usual attempted, but in vain, to prevent the Austrians from joining the Russians, and only found relief when scarcity of provisions compelled the Russians to retreat to Poland. Loudon, however, captured Schweidnitz, whilst farther north the Russians and Swedes drove the Prussians out of Pomerania. To add to Frederick's difficulties, all subsidies from Britain were stopped by the Earl of Bute after George II.'s death, and Prussia was utterly at the end of her resources of all kinds.

But suddenly the death of the empress Elizabeth (January 5, 1762) freed him from one of the most powerful of his enemies. At the same time the new tsar (Peter III.) induced Sweden to retire from the war. Thereupon Frederick took up the contest with renewed vigour; on July 21 he stormed the Austrian entrenchments at Burkensdorf, and, following up this success, routed Daun at Reichenbach (August 16) and took Schweidnitz (October 9), thus recovering Silesia. Contemporaneously with these events his brother, Prince Henry, by a series of fortunate manoeuvres possessed himself of the passes of the Erzgebirge, and overthrew the imperial forces at Freiberg (October 29). In the west the Duke of Brunswick still held his ground gloriously against the French, routing them at Wilhelmsthal (June 24), capturing Cassel, and recovering the whole of Hesse. France now gave up a contest from which she had gathered nothing but military disgrace, and concluded treaties with Britain and Prussia; and towards the end of the year the minor German states also withdrew from the coalition. Maria Theresa was now left alone, and Austria being exhausted as well as Prussia, was compelled, sorely against her will, to conclude the peace of Hubertsburg (February 15, 1763; England made peace with France by the treaty of Paris on the 10th), which finally acknowledged Frederick as the lord of Silesia.

This long and desperate struggle cost Europe a million lives, and prostrated the strength of almost all the powers who had engaged in it. It made no change in the territorial distribution of Europe, but it increased tenfold the moral power of Prussia, and gave its army a prestige which it retained till the battle of Jena. But outside of Europe, in North America and India, it brought about a new epoch. According to Parkman, it crippled the commerce of France and blighted her colonial power; it gave England the mastery of North America and India, and made her the first commercial nation.

See Carlyle's *History of Frederick the Great*; Frederick II., *Histoire de la Guerre de Sept Ans*; and histories by Auchenholz (11th ed. 1879), the officers of the Prussian General Staff (8 vols. 1827-47, and 1901-5), Maslowski (Russian account), Longman (in 'Epochs of History' series), H. Lloyd (1781-90), and R. Waddington (in French; Paris, 1903-4); Corbett, *England in the Seven Years' War* (1907); H. St Paul, *First Two Campaigns of the Seven Years' War* (1914); Charteris, *Duke of Cumberland and the Seven Years' War* (1925); and vol. vi. of *Cambridge Modern History*; also the article FREDERICK II. For America and India, see Parkman, *Montcalm and Wolfe* (1884); Seeley, *The Expansion of England* (1883); and the articles CANADA, CLIVE, HAWKE, INDIA, WOLFE.

Severalty. An estate in severalty is held by one owner without being joined with others having common interests, as opposed to Coparcenary (q.v.), Joint-tenancy, Tenancy-in-common, Tenancy by entirety, which were the four distinct kinds of co-ownership recognised by the law. After 1925 Joint-tenancy is the only co-ownership recognised as regards legal estates. In the Indian legislation of the United States land in severalty is that allotted to individuals which was once held by the tribe. In English law a contract of several persons is joint and not several—i.e. one cannot be sued separately, but they must all be sued together—unless the words 'we jointly and severally promise' are introduced into the contract, promissory-note, &c. In Scotland the general rule is the reverse; in a *conjunct* contract each is liable for the whole.

Severn (Lat. *Sabrina*), one of the most important and beautiful and, after the Thames, the largest of the rivers of England, rises, 1500 feet above sea-level, from a chalybeate spring on the eastern side of Plinlimmon, 12 miles west of Llanidloes, in Montgomeryshire, North Wales. Flowing eastward from its source to Llanidloes, to which town it retains its original British name of Hafren, it afterwards flows north-east past Newtown (465 feet) and Welshpool to the eastern boundary of Montgomeryshire, then east-south-east past Shrewsbury and Bridgnorth in Salop, and finally southward through Worcester and Gloucester, in which last it begins to form the estuary that merges in the Bristol Channel (q.v.). Its entire length is 210 miles (though the distance from source to mouth as the crow flies is only 80), and it drains an area of more than 6000 sq. m. The chief affluents of the Severn are the Terne and the Upper and Lower Avon on the east, and the Teme and Wye on the west. A ship canal from Sharpness near Berkeley materially shortens the navigation of its lower course; and from Gloucester up to Stourport the river is canalised. Various canals establish communication between the Severn and the Thames, Trent, Mersey, and the other important rivers of the middle districts of England. In some of the reaches below Gloucester, especially near Newnham, the tide, which flows with great velocity, produces from the peculiar configuration of the estuary a bore (locally termed *hygre*) or wave sometimes 5 or six feet high, which not infrequently overwhelms lighters navigating the river. The railway twice crosses the estuary—near Berkeley by a viaduct (1879), 1194 yards long, and near Chepstow by a tunnel (1873-85), 4½ miles long. Schemes have been discussed for a road and railway bridge and barrage (to utilise the tides) near Chepstow. See TIDES.

Severn, JOSEPH (1793-1879), an artist chiefly known as the faithful friend of Keats (q.v.). From 1861 to 1872 he was British consul at Rome. See Sharp, *The Life, Friendships, and Letters of Joseph Severn* (1892).

Severo, CAPE. See CHELYUSKIN.

Severus, L. SEPTIMIUS, a Roman emperor and a soldier of great vigour and courage, was born of equestrian rank, near Leptis Magna in Africa, 146 A.D. He became prætor at Rome in 178, and was at length appointed to the command of the army in Pannonia and Illyria. After the murder of Pertinax (193) he was proclaimed emperor at Carnutum, and promptly marched upon Rome, where the puppet Julianus had by purchase obtained the imperial purple. His arrival before Rome was the death-signal for Julianus; and after taking vengeance on the murderers of Pertinax, converting his most formidable rival, Clodius Albinus, into an ally by creating him Cæsar, and distributing an extravagant largess to his soldiers,

he marched against his second rival, Pescennius Niger, and conquered him at Issus (195). A glorious campaign in the East, and the three years' siege and capture of Byzantium, were followed by a desperate struggle with his jealous rival, Clodius Albinus, whom, after an obstinate conflict near Lyons, he conquered (197). After the usual games to the degenerate citizens of Rome and largesses to the troops, Severus returned to Asia, accompanied by his sons Caracalla and Geta, had the most brilliant success in the campaign of 198 against the Parthians, and took and plundered their capital, Ctesiphon. He returned to Rome in 202, and gratified the popular taste by the exhibition of shows of unparalleled magnificence, also distributing another extravagant largess to the citizens and pretorians. A rebellion in Britain drew him thither in 208, and at the head of an immense army he marched, it is said, to the north of the island, encountering enormous hardships. To secure to some extent the natives of South Britain from the incursions of the Meatae and Caledonians, Severus repaired or partially built the wall which is often called after him, and died soon after at Eboracum (York), 4th February 211. Some authorities believe that the wall has as much right to bear his name as that of Hadrian; see Life by M. Platnauer (1918); also article HADRIAN'S WALL.—For the emperor ALEXANDER SEVERUS, see that article; and for SULPICIUS SEVERUS, see SULPICIUS.

Sévigé, MADAME DE, the queen of letter-writers, and one of the most charming figures in the literature of France, was born at Paris of an ancient Burgundian family, February 6, 1626. Her maiden name was Marie de Rabutin-Chantal, and she was the second and only surviving child of her parents. Her father's mother had entered a convent under the advice of Saint Francis de Sales, became founder of the Order of the Visitation, and was afterwards canonised. When the child was but one year old her father fell fighting against the English at Ré; a few years later her mother followed, leaving her to be brought up at Livry by her maternal uncle, the Abbé de Coulanges, the 'Bienbon' of her life-long affection. She received a careful education under Ménage and Chapelain, and learned Latin, Italian, and Spanish. From her childhood she saw clearly the whole comedy of life, and all her days she was 'une grande dévoreuse de livres'—history, Virgil, Plutarch, Tacitus, Nicole, Montaigne, and even Rabelais. At eighteen (August 4, 1644) she married the young and handsome Marquis Henri de Sévigé, the head of an ancient family of Brittany, but unfortunately for her happiness a spendthrift and a libertine. Her daughter Françoise Marguerite was born at Paris, October 10, 1646; her son, Charles, at her famous country-house, the Rochers, in 1648. She loved her husband in spite of his infidelities and indifference; forgave him even his passion for Ninon de Lenclos, who lived to cast for a moment the same evil spell upon her son; and when he was killed in a duel by a rival in a more sordid intrigue (February 5, 1651), mourned him sincerely, yet forgot him so completely that in the long correspondence of later years with her children she does not once mention his name. Madame de Sévigé at the moment of her widowhood was but twenty-five, brilliant in her beauty and fascination; yet without hesitation she embraced that holy vocation of undivided motherhood to which she was to give such complete and exquisite expression. Her handsome figure, splendid complexion, fair, wavy hair, and brilliant eyes are spoken of by all who have described her; but her beauty was more that of expression than of feature, and she herself has

told us that her nose was somewhat square, her blue eyes ill-matched (*bigarrés*). Her portraits are not satisfactory, and do not give the idea of beauty, but doubtless her charm was of that subtle kind that eludes the painter. After about a year's retirement at the Rochers she returned to society, but all the flatteries of the most brilliant court in the world failed to touch her heart. The Prince de Conti, Turenne, Fouquet the *Surintendant* of Finance, Rohan, and her cousin Bussy-Rabutin (1618-93) sighed for her in vain; and, stranger still, in the midst of that age of gilded corruption, her name remains without a stain. She was virtuous by temperament, with warmth only in the intellect, says Bussy in his malicious portrait of her; but the intended sneer recoils upon himself, as if it were no virtue for that warm heart and impulsive temperament to be virtuous! Her heart was entirely occupied by a purer love—an intense devotion to her children, and a warmth of friendship almost beyond example. For no one ever had so many and such devoted friends—no woman ever knew like her how to transform a lover into a friend. La Rochefoucauld said she fully satisfied his ideal of friendship, and Madame de la Fayette said, almost at the close, after forty years of friendship without a cloud, 'Croyez, ma très chère, que vous êtes la personne du monde que j'ai le plus véritablement aimée.' The real secret of this affection was her own goodness, which is reflected on every page of her letters; even the follies of her friends she touches with a light hand; her wit never stings, she has a charitable interpretation for everything. Her sweet and happy temper played lightly even with sorrow and wrong-doing. She was pure in an age when purity was rare, and if she had a single fault it is that she was merely something too lenient in her tolerance. She was a genial optimist, not from general indifference, but from love, for her friendships made a real part of her existence. The graphic letters to Pomponne describing the trial of Fouquet prove a noble fidelity of heart that defies misfortune and disgrace. Some of her own letters, discovered among the fallen surintendant's papers and read by the king, caused for a moment much talk and scandal, in allaying which Bussy did his cousin a good service. Yet furtively he had done her a grievous wrong. Having been in difficulties about 1656 he had applied to her for a loan of 10,000 écus (£2400), but, some delay being occasioned by Bienbon's desire to look into the securities, he took offence, found the money from the Marquise de Montglas, and, during the enforced solitude of a short banishment to his country-house for some scandalous impieties, wrote a few satirical sketches of the courtiers for the amusement of this mistress—the *Histoire amoureuse des Gaules*. In this unclean company a cruel and lying description of Madame de Sévigé was inserted, and when the book was printed at Liège (1665), without Bussy's knowledge, she had the mortification to find herself in the mouths of all the scandal-mongers of the day. Bussy was arrested on the 17th April, imprisoned in the Bastille for thirteen months, and sentenced to banishment from Paris for seventeen years. It needed only to be unfortunate to ensure the sympathy of Madame de Sévigé, and the reconciliation, which was complete by 1668, perhaps left the repentant Bussy, says Mesnard, 'with a more tender and serious feeling than he had ever experienced in his life before.' She herself invented the word *Rabutinage* to express the family ties and the common sympathy which substantially bound the two together.

Meantime her daughter had grown up with a beauty, if not a personal charm, that far surpassed

her mother's, and Madame de Sévigné's heart was filled with joy at the sensation made by 'the prettiest girl in France' on her first appearance at court in the winter of 1662-63. In January 1669 she married François Adhémar, the Comte de Grignan, then Lieutenant-général of Languedoc, but ere the close of the year, of Provence—an office which obliged him at once to leave Paris. He had been twice married already, was thirty-seven, of ancient race, honourable in his life and dignified in manners, but he was overwhelmed in financial difficulties which were yet to cause much trouble to Madame de Sévigné. The great grief of her life was this separation from her much-loved daughter, but it is mainly to it that we owe those letters extending, with intervals of union (longest as well as most frequent between 1677 and 1688) over the twenty-five years until her death.

At fifty her splendid health was first shaken at the Rochers by a violent fit of rheumatism; thereafter till the close her only troubles were her son-in-law's vast expenditure and ever-increasing debts, and one by one the deaths of her dearest friends. Her life wore itself away in a round of duties at Paris, at the Rochers, and in visits to the country-houses of her friends and to her daughter in Provence. Nothing in her was more wonderful than her adaptability of disposition; she is happy alike by the bedside of a sick friend, in her drives with Madame Scarron, soon to be virtual queen of France, in the society of the court, and alone under the dense leafage of her park at the Rochers. One thing only we would have had otherwise than it is, but it would be a complete anachronism to ask for more sympathy than she has to show for the miserable Breton peasants under the cruel campaign of 1675. Her son Charles had some follies which cost money, before his marriage (1683); but he stands out an attractive figure enough, generous and warm-hearted, content with an unequal half of his mother's heart. Bienbon died in 1683; Bussy and Madame de la Fayette in 1693. Her letters grow sadder as she begins to find herself alone, yet some of the latest stand among the first in literary value. She never grew old, for her heart retained its warmth; yet she lived to see son and grandson married, and after nursing her daughter through a tedious illness was herself attacked by smallpox, and died calmly and without fear, 18th April 1696.

Madame de Sévigné's twenty-five years of letters to her daughter reveal the inner history of the time in wonderful detail, but the most interesting thing in the whole 1600 (one-third letters to her from others) remains herself. She was genuinely religious without superstition, a strong sympathy with Port-Royal manifest throughout; she had read widely and gained much from conversation, and she had lived in the time of Pascal, Molière, Racine, Bossuet, and La Rochefoucauld. Still more, she possessed the great natural gifts of a solid understanding and strong good sense. But it needed the warm touch of affection to make all these qualities live, and to give her letters the freedom, the rapidity, the life of spoken words. Hence her sparkling wit, her swiftly changing emotions, her unstudied yet admirable phrase, clear, firm, and natural, the tenderest sentiments and gayest flights of fancy ever expressed with unflinching grace and the indefinable charm of style. Her imagination, warmed by sympathy and love, realises the conditions of those to whom she writes, and enables her to enter into the thoughts of others, as well as to reflect as in a mirror the world around herself. Yet over all there is a gravity and reserve characteristic of that stately and ceremonious age. She never once *thous-and-thees* anybody; a certain dignity remains even in the most intimate relations. The perfection of her

letters was from the first moment recognised, and the question has often been asked did that piquant grace of detail, that charming variety in the repetition of the same thoughts, cost her pains? No doubt she knew she wrote well, however little she thought of fame, yet this knowledge did not exclude sincerity, and she must have written fast to have written so much—'Je fais de la prose avec une facilité qui vous tue,' she says.

The earliest of her letters that were published were those to Bussy, printed in his *Mémoires* (1696-97). The first edition of the *Lettres* was printed in 1726 by Bussy's son, the Abbé de Bussy, to whom her granddaughter Pauline (Madame de Simiane) had given transcripts of the originals. A more complete edition, authorised by the family, was the final one of those edited by the Chevalier Marius de Perrin (8 vols. 1754). Further editions were innumerable—three only need be mentioned, those of the Abbé de Vauxcelles (1801), Gouville (1806), and M. de Monmerqué—an abiding monument of patient industry (10 vols. 1818-19). The final edition is, however, that in the 'Grands Écrivains de la France,' begun by M. de Monmerqué, and finished by A. Régnier, Paul Mesnard, and E. Sommer (14 vols. 1865-67; vol. i., with Mesnard's life; vols. xiii.-xiv. a Lexique by Sommer), especially as supplemented by Ch. Capmas in *Lettres inédites de Madame de Sévigné* (2 vols. 1876). See Walckenaer, *Mémoires touchant la Vie et les Écrits de Madame de Sévigné* (5 vols. 1842-52; vol. vi. by Aubenas, 1865); the Comtesse de Puliga, *Madame de Sévigné, her Correspondents and Contemporaries* (2 vols. 1873); the admirable studies by Miss Thackeray in 'Foreign Classics' (1881) and Gaston Boissier in 'Les Grands Écrivains Français' (1887), as well as those by Combes (1885) and Valléry-Radot (1888); Léon de la Brière's *Madame de Sévigné en Bretagne* (2d ed. 1882); and Saporta's *La Famille de Madame de Sévigné en Provence* (1889). See also Sainte-Beuve's *Portraits de Femmes, Causeries du Lundi* (vol. i.), and *Nouveaux Lundis* (vol. i.); E. Scherer's *Études sur la Litt. Contemp.* (vols. ii. and iii.); Amelia Gere Mason's *Women of the French Salons* (1891); Janet Aldis's *Queen of Letter Writers* (1907); Faguet's *Mme. de Sévigné* (1910).

Seville (Span. *Sevilla*), one of the most famous of Spanish cities, stands on the left bank of the Guadalquivir, 62 miles N. by E. of Cádiz, and is connected with a large lower class suburb (Triana) on the right bank by an iron bridge (1848). It has had two periods of great splendour in its history, first as the capital of a Mohammedan emirate, and later in the 16th and 17th centuries as the headquarters of Spanish painting and the chief port of Spanish commerce; and it is now rapidly recovering a good deal of its former commercial prosperity as the result of dredging of the Guadalquivir. Seville had long the appearance of a picturesque Moorish town—the streets narrow, tortuous, and shady, the houses built round handsome court-yards and gardens, the squares studded with fountains. But it has been greatly modernised by the clearing away of the narrower quarters to make room for wide straight streets and modern houses and shops, with fine gardens and parks. The climate is delightful, and the city is very gay with its white houses and masses of coloured flowers. Seville is famous for its religious festivals, especially those of Holy Week, and for its annual *Feria* in April—a cattle-market, but also a holiday outing for all ranks and classes. Only a few fragments now remain of the former circular city wall, which was adorned with sixty-six towers. The water-supply was formerly brought from Alcalá de los Panaderos by an old Roman aqueduct of 410 arches, but this was superseded by water-works constructed by Englishmen in 1883. The greatest ornament of the city is the vast cathedral, built in 1401-1519 on the site of a Moorish mosque. Of superb proportions, it is the largest Gothic church in the world, and contains important paintings by Murillo (a native

of Seville), Valdés Leal, De Vargas, and other masters; magnificent Flemish stained glass of the 16th century; one of the largest organs in the world; the tombs of King Ferdinand III. of Castile, of Christopher Columbus and his son Ferdinand, and other notabilities; and much most excellent artistic work in bronze, wood-carving, and sculptured work, besides a valuable treasury. Close beside the cathedral stands the beautiful Campanile (q.v.) or bell-tower called Giralda, 285 feet high, two-thirds of it built by the Moorish Abu Jussuf Jakub in 1196; the upper part, with its beautiful open work, dates from 1568. The Giralda has twenty-two sweet-toned bells, and is surmounted by a bronze statue of Faith, serving as a weather-vane. Both cathedral and tower were damaged by earthquakes in 1884 and 1899. Another of the glories of Seville is the gorgeous Alcázar, or Moorish royal palace, begun in the end of the 12th century, but considerably enlarged and beautified by Peter the Cruel and other Spanish monarchs; its halls and gardens are surpassed only by those of the Alhambra, the Hall of the Ambassadors being especially wonderful for its rich ornamentation and wealth of detail. Amongst the other interesting buildings and public institutions of the city must be mentioned the House of Pilate, built by a Spanish nobleman in 1533 in imitation of the reputed palace of Pilate in Jerusalem; the museum, with masterpieces by Murillo, Zurbarán, Pacheco, Valdés Leal, Herrera, and other artists of the Seville school, but containing nothing by Velázquez (also a native of Seville); the charity hospital, with fine pictures by Murillo and Valdés Leal; the exchange, built by Herrera in 1585, sheltering the valuable archives of the Americas; the university, which was founded in 1254, though the present buildings were erected in 1567; the ornate town-hall (1526-64); the bull-ring, which can accommodate 18,000 spectators, being exceeded in size by that of Madrid only; and numerous churches and palaces. Seville is famous also for its association with the play of Beaumarchais, *The Barber of Seville*, with the operas of Mozart and Rossini, and with Bizet's *Carmen*.

There is considerable manufacturing industry, especially in the production of cigars, iron, machinery, pottery, silks, cottons. There is a considerable river trade. The exports consist chiefly of lead, quicksilver, wine, copper, oranges, olives and olive-oil, and corks. Pop. (1878) 133,938; (1910) 153,366; (1920) 205,529. This city was the Roman *Hispalis*, a place of trade in those days. Here two provincial synods of the church were held, in 590 and 619, and a Spanish council in 782. From 712 to 1248 the city (*Ishbilīa*) was an important Moorish town, usually the seat of an emir, in more or less close dependence on the khalifs of Córdoba. In 1091 the Almoravides dispossessed the Abbadites of the town. When Ferdinand III. of Castile captured it (1248) about 300,000 Moors abandoned the place, and it was a century or two before it began to recover. In 1493 Christopher Columbus was formally received here after his first voyage. Its second period of prosperity gradually closed in as Cádiz rose into importance. Seville was the seat of the Spanish government in 1808-10, and suffered severely from Soult's troops in 1810.—The province has an area of 5428 sq. m. and a pop. of 703,747.

Sèvres, a small town of France, dept. Seine-et-Oise, 10½ miles SW. of Paris by rail, is celebrated for its manufacture of artistic porcelain (see POTTERY), an industry carried on under state control since the establishment of the factory by Boileau in 1756. The Sèvres vases are of great value and are known the world over. Painted glass and mosaic are also made. The factory was moved in 1876

to the present situation in the park of St Cloud, the old building being now occupied by an École Normale Supérieure for girls. The Porcelain Museum in the new building contains a large and curious collection of articles in china and earthenware from all parts of the globe. The abortive Treaty of Sèvres (superseded by that of Lausanne) was signed on 10th August 1920 between Turkey and the Allied Powers, disposing the former of large parts of its ancient territories. Pop. 11,500.

Sèvres, DEUX-, a dept. in the west of France, part of the old province of Poitou. Area, 2337 sq. m.; pop. (1891) 354,282; (1921) 310,060. It takes its name from two rivers of the same name, the Sèvre-Niortaise, which flows west into the sea, and the Sèvre-Nantaise, an affluent of the Loire. The northern portion is taken up with the woody plateau of Gâtine. In other parts the soil is fertile, yielding large crops of wheat, oats, barley, potatoes, clover, lucerne, and vegetables. The mules and cattle are celebrated. The principal industries are in cloth, leather, linen, spirits, flannel, &c., and there are potteries, and weaving of wool and cotton. The arrondissements are Niort, Bressuire, Melle, and Parthenay. Niort is the capital.

Sewage. See SEWERAGE.

Seward, ANNA, the 'Swan of Lichfield,' was born in 1744 at the rectory of Eyam in Derbyshire, but from the age of ten lived all her days at Lichfield, where her father, himself a poet, became a canon residentiary. Dr Darwin and Mr Day were notable figures in the society of Lichfield; her dearest friend was Honora Sneyd, who married Edgeworth; Dr Johnson, like the prophet of the proverb, had more honour everywhere else than among his own people. Miss Seward only escaped a nearer connection with the lexicographer by the death of her only surviving sister Sarah on the eve of marriage with Lucy Porter's brother. Her own father died in 1790, but she continued to live as before in the bishop's palace, dear to her friends and correspondents—Mrs Piozzi, Hayley, Southey, Scott—and died 23d March 1809. She published her poetical novel, *Louisa*, in 1782; her *Sonnets* in 1799; her *Life of Dr Darwin* in 1804; but bequeathed to [Sir] Walter Scott the care of the collected edition of her poems (3 vols. 1810). Her long-winded, florid letters, on which she piqued herself even more than her poems, were collected in six volumes (1811-13). Boswell received from her 'some obliging communications concerning Johnson,' but after his book was published quarrelled with her, accusing her of malevolence towards his hero. Her monody on Major André and an elegy on Captain Cook were thought her best poems. In the letters she is Johnsonian without strength, metaphorical beyond all measure, feeble and absurd to a degree. Horace Walpole says of her and some other harmonious virgins, 'Their thoughts and phrases are like their gowns—old remnants cut and turned.' See *A Swan and her Friends*, by E. V. Lucas (1907).

Seward, WILLIAM HENRY, an American statesman, was born at Florida, Orange county, New York, 16th May 1801, graduated at Union College in 1820, was admitted to the bar at Utica in 1822, and thenceforth made his home at Auburn. He early took an active interest in politics, and in 1827 presided over a young men's convention held at Utica to advocate the re-election of John Quincy Adams to the presidency. In 1830 he was elected, as an anti-Mason, to the state senate, where he remained four years, leading the opposition to the dominant Democratic party. In 1834 he was the unsuccessful Whig candidate for the governorship of the state of New York, but was elected to that

position in 1838, and again in 1840. A noteworthy incident of his administration was a controversy with the governor of Virginia in regard to three negro seamen, whom the latter claimed as fugitives from justice, on the charge of inciting a slave to escape, and whom Governor Seward refused to surrender. Having declined a third nomination, he was engaged from 1843 to 1849 in the practice of his profession, being especially sought after in criminal and patent cases. In 1847 he defended John van Zandt, accused of aiding in the escape of fugitive slaves, and incurred obloquy by his defence of the negro murderer, Freeman, on the plea of insanity. His argument in this case was pronounced by Gladstone 'the greatest forensic effort in the English language.' Seward continued to give active support to his party, while at the same time making himself remarked as an opponent of the pro-slavery policy. In a speech against the admission of Texas into the Union he said: 'To maintain the slave-holding power is to subvert the constitution;' and at Cleveland, during the campaign of 1848, he told his hearers, in speaking of slavery: 'It must be abolished, and you and I must do it.' In February 1849 he was elected to the United States senate, where he served two full terms, being re-elected in 1855. He was much consulted by President Taylor, but declined to be put on any important committee lest his opinions on slavery should embarrass the administration. In 1850, while urging the admission of California into the Union, he declared that the national domain was devoted to liberty, not only by the constitution, but by 'a higher law than the constitution'—a phrase which became famous. He opposed the Compromise Bill of 1850; separated himself from those Whigs who followed President Fillmore in his pro-slavery policy; opposed the Know-Nothing (q.v.) party; and on the formation of the Republican party became one of its leaders. His speeches in the senate on the repeal of the Missouri Compromise and the admission of Kansas made a great impression, as did also an address delivered at Rochester in 1858, in which he spoke of the 'irrepressible conflict' between freedom and slavery.

In 1860 Seward was a candidate for the presidential nomination, but on failing to receive it gave his hearty support to Lincoln, whose cabinet he entered as Secretary of State, an office which he held through two administrations, from 1861 to 1869. The civil war, which was in progress during the first half of this period, rendered the foreign relations of the United States unusually delicate, especially in view of the attitude of the governments of France and Britain. In the 'Trent' affair he was obliged, in opposition to popular clamour, to admit the justice of England's claim and to advise the president that the Confederate envoys should be given up. He protested against the fitting out of the *Alabama* and similar vessels in British ports, and declared that the United States would claim from the English government indemnities for damages resulting from this breach of the obligations of a neutral power. On the subject of the French invasion of Mexico he maintained a prudent reserve, until the conclusion of the war enabled him to insist on the withdrawal of the French troops. On April 14, 1865, while confined to his bed with a broken arm and jaw, the results of a carriage accident, he was attacked and severely cut on the face and neck by an accomplice of J. B. Booth. He supported President Johnson's reconstruction policy, thereby placing himself in opposition to the majority of his own party and incurring much bitter censure. In 1867 he negotiated with Russia the treaty for the purchase of Alaska. After leaving office he

travelled in 1869 to California and Alaska, returning through Mexico, where he was warmly welcomed as the guest of the nation; and in 1870-71 he made a tour round the world, his narrative of which was edited and published (1873) after his death by his adopted daughter, Olive Risley Seward. He died at Auburn, 10th October 1872. Without being a creative statesman, Seward had great practical ability controlled by sound notions of truth and justice; always a party man, he was never an extreme partisan, and rather made public opinion than followed it. Strong convictions joined to a conciliatory disposition rendered him a fitting representative of the moderate anti-slavery sentiment and a worthy fellow-worker with Lincoln in preserving the Union.

See his Autobiography, continued to 1846 in a memoir by his son (1877), and to 1872 in his *Life and Letters* (2 vols. 1891); *Life by the same* (3 vols. 1895); also C. F. Adams's *Address on his Life, &c.* (1873), the memoir by G. E. Baker, with his *Works* (3 vols. 1853; 2 other vols. 1862-84); the *Life* by F. Bancroft (1900); and by E. E. Hale (1911).

Sewellel. See HAPLODON.

Sewerage is the term applied to the whole process of the collection and removal of the liquid and solid excrements of men and animals, the washings from the streets and slaughterhouses, the waste waters used in cleansing operations, the contents of baths, basins, and sinks, and the organic liquid refuse from certain manufactories, together at times with a quantity of rainfall. It involves, therefore, the problem of the design of house sanitary fittings, the lay out of house drains and their connections to the sanitary fittings, the construction of the sewers or channels for conveying the discharge from the house drains, the washings from the streets and all other fouled water technically called 'sewage' to the outfall works, and, finally, in the case of inland districts, the whole of the processes for the purification of this sewage prior to its final discharge into a river.

The most important of the sanitary fittings which require to be provided in a house are baths, basins, sinks, and water-closets, and special care must be devoted to the design of each of these fittings in order that they may properly fulfil their purpose and be, as far as possible, self-cleansing. The old plan of enclosing these fittings with wood-casing is most insanitary; baths, whatever material is employed in their construction, should be supported on short legs, so as to permit free access for cleaning to every part of the bath and to the adjacent walls and the floor beneath. For similar reasons all basins and sinks should be supported by some form of attachment to the walls; water-closets generally rest upon and are secured to the floor, but in hospitals it is desirable to adopt a form of water-closet which can by means of lugs be supported directly from the wall without any attachment to the floor, thus allowing the floor of the lavatory to be kept rigorously clean.

Various types of water-closets are in use at the present day, and all of those described below have been found by experience to be more or less satisfactory from a sanitary point of view; these types may be classified under the headings of wash-down, siphonic, wash-out, and valve. The wash-down (fig. 1) is perhaps the form most generally used; it is not expensive to make, is simple in construction, and has no working parts likely to get out of order when in use. The siphonic type (fig. 2) is one in which the contents of the pan are discharged by siphonic action, and the trap is refilled by an after-flushing device. The wash-out closet (fig. 3) has certain serious disadvantages when compared with the wash-down types, the

standing water in the pan is too shallow, and it is difficult to secure a complete clearance of the contents of the pan by the ordinary flush, and even when this is attained the trap is frequently not cleared properly. The valve-closet (fig. 4), although it has mechanical devices not present in any of the other types which have been described, is on the whole a most satisfactory type for use in

domestic houses and in other situations where closets are not subjected to possible rough usage.

An important attachment to any water-closet is the flushing cistern (fig. 5), a water-waste prevention device which automatically allows only a known volume of water—two gallons or three gallons—to be used for each flush of the pan of the closet. It consists of a small tank, fixed gener-



Fig. 1.—Wash-down W.C.

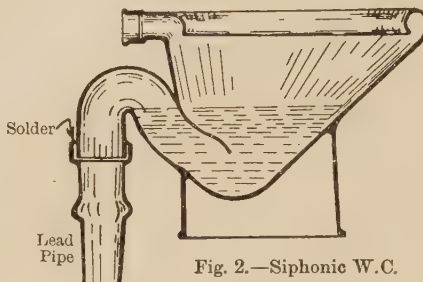


Fig. 2.—Siphonic W.C.

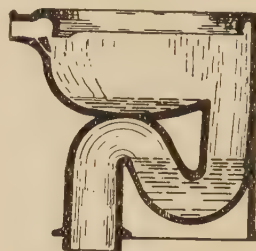


Fig. 3.—Wash-out W.C.

ally at a height of four or five feet above the closet, and connected to the latter by means of a pipe of at least $1\frac{1}{4}$ inch diameter. The flushing water is released by pulling a chain which sets in action a siphon and allows the flushing water in the little tank to pass into the connecting pipe; the tank is then again automatically refilled, a ball-valve cutting off the supply as soon as the necessary volume of fresh water has entered the tank. The flushing cistern must be distinct from any cistern containing drinking-water, and must be provided

with an overflow pipe led away to an external outlet.

Between every sanitary fitting and the waste or soil pipe into which its contents are discharged there must be interposed a trap of simple construction (fig. 6) which holds always a certain amount of water and thus prevents the passage of foul air from the waste or soil pipe into the house. The depth of the water-seal should be great enough to prevent the risk of unsealing the trap by evaporation of its contents under any circumstances, a depth of

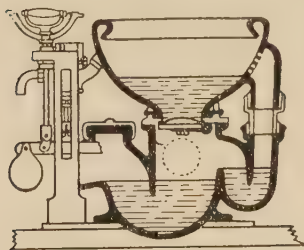


Fig. 4.—Valve-closet.

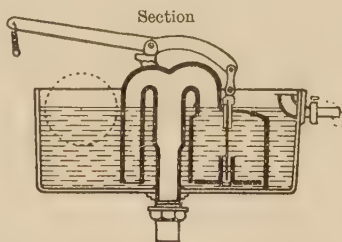


Fig. 5.—Flushing Cistern.

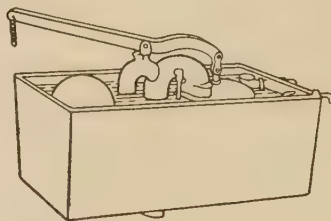


Fig. 6.—Trap.

about 2 inches is enough for this purpose. The traps of sanitary fittings may also be unsealed by siphonic action when several fittings are attached to the same waste or soil pipe, especially when these fittings are situated on different floors of the house. This siphonic unsealing is due to the discharge of one fitting tending to cause a partial vacuum in the branches connected to other fittings,

and thus tending to cause the water in the traps to be sucked out. To prevent this action most sanitary authorities insist that every trap shall be ventilated by the use of what is called the 'anti-

siphon' pipe. This anti-siphon pipe is a vertical pipe fixed to the wall side by side with the waste and soil pipes, open at its upper end, and connected by a short branch to each trap just beyond the highest point of the trap on its discharge side. In the London County Council bylaws, for example, it is provided in the case of water-closet traps that the connection to the anti-siphon pipe shall start from a point on the trap not less than 3 inches and not more than 12 inches from the highest point of the trap on its discharge side. The discharge from

water-closets and urinals passes into what is termed the soil pipe, the pipe receiving the discharge from other fittings being termed a waste pipe; this latter pipe does not discharge direct into the house drains, but into a gully trap from which the contents pass into the drain; on the other hand the soil pipe is connected direct to the drain, no trap being interposed. The waste pipes, which are preferably fixed to the outside walls of the house, are of lead, iron, or stoneware, and they discharge into the open air above a gully trap. The soil pipes, if fixed internally, should be lead with wiped joints; if fixed to external walls, they are usually cast-iron or lead.

House Drains.—These are usually glazed stoneware pipes, varying in diameter from about 4 inches to 9 inches; for an ordinary house it is rarely necessary to exceed 6 inches in diameter for the main discharge pipe and 4 inches for the single branch lines taking the discharge from the respective fittings. The pipes are usually 2 feet in length, of the socket and spigot type; to join two successive lengths, the spigot end of the one is pushed into the socket end of the other, maintained in a truly central position by a little gasket thrust into the gap between the inside of the socket and the outside of the spigot, and then the whole of the rest of this space is carefully filled with neat

Portland cement mortar. This is a somewhat rigid type of joint, and there are several other well-known types of patent joints employing bitumen or some such similar material, which give greater flexibility to the line of pipes and allow a small settlement to take place without risk of injury to the joint and the possibility of leakage at the joint. In order to lessen the risk of settlement of the line of pipe and resultant fractured pipes or joints, the pipes should not be laid direct upon the earth at the bottom of the trench, but upon a bed of concrete at least 6 inches thick, well benched up at the sides of the pipe. When stoneware drains pass under a house—a very undesirable practice—they should be entirely surrounded with concrete at least 6 inches in thickness.

Instead of stoneware, cast-iron pipes are often employed for house drains; they have certain advantages—they are much stronger and therefore less liable to fracture, they are made in lengths of 6 and 9 feet and therefore have many less joints, the joints are made with molten lead instead of with Portland cement. They should always be employed when the drains pass under a house.

The drains should, as far as possible, be laid in straight lines, and, wherever a change of direction is necessary, good bends should be provided, so as to change gradually the direction of flow. Whenever a junction with a branch pipe occurs, or a change in direction, inspection brick chambers should be provided, with open half-pipes in the chamber instead of closed pipes; this provides access to the different lines of pipes and allows drain-rods to be used for clearing stoppages; the half-pipes at the bottom of the pit should be benched up, so as to allow the liquids which may overflow the edges of the half-pipes to pass quickly away from the chamber when the rush of water has ceased. In order to secure a sufficient velocity of flow in the drains to carry forward all solid matter that might remain in the pipes and decompose, all drains must be laid with a sufficient gradient which, as far as possible, should be uniform from end to end. For a 6-inch pipe a gradient of 1 in 80 is about the minimum permissible—this will give a velocity of about 3 feet per second; generally, the gradient in drains will vary from about 1 in 30 to 1 in 80.

It is generally specified that just as the indoor and outdoor house pipes are disconnected by the interposition of a trap, so too the main discharge drain should be disconnected from the sewer by a special form of trap known as the disconnecting trap (fig. 7). This trap should be placed as near as possible to the point where the drain joins the sewer, and it should always be placed in an inspection chamber or manhole. This trap makes it practically impossible for sewer-gas to pass into the house drains with the risk of dangerous gases finding their way into the house. The inspection chamber containing this disconnecting trap must be adequately ventilated, and should be covered with a cast-iron cover fitting into a cast-iron frame with grooves, so as to seal the chamber.

Testing of Drains.—After the drains have been laid and the various joints have been made, the whole system must be thoroughly tested for water-tightness before refilling the trenches in which the pipes have been laid; care should be taken, however, not to make this test too soon after the completion of the jointing operations, as time must be given for the cement joints to set hard—about two days is sufficient for this. There are several methods of making this test—the most searching test is that of water pressure; for this purpose the lowest end in the drain is closed by a rubber stopper, then the top end may be closed and water pumped into the pipe system until a

predetermined pressure is reached, a pressure-gauge is fitted to the apparatus, and when this gauge shows the desired pressure is reached the pumping is stopped and the gauge is watched—if the reading of the gauge remains steady, then it is known that the pipe system is water-tight and the work of laying and jointing has been carried out satisfactorily. For stoneware pipes the test pressure should not exceed that due to 5 or 6 feet of water, or about $2\frac{1}{2}$ lb. per square inch; in the case of cast-iron pipes the pressure may be as high

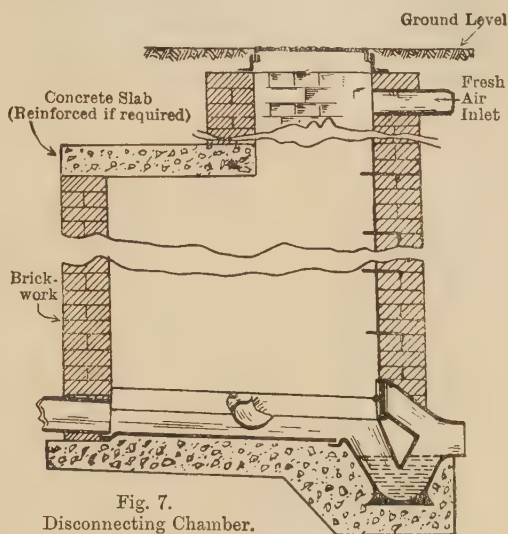


Fig. 7.
Disconnecting Chamber.

as 9 lb. per square inch, which is equivalent to about 20 feet of water. The necessary water pressure may be obtained without the use of a pump by attaching to the top end of the drain system a vertical pipe into which water can be poured up to the necessary depth to secure the required pressure. Instead of water, air may be pumped into the system, but it is not quite so easy in this case, if there are defects, to locate the leak or defect. To test the vertical waste and soil pipes, either the smoke or the smell test may be employed, as in such pipes a water test is liable to put undesirable strains upon the joints. To carry out the smoke test the ends of the pipe are closed, and by the use of a smoke-rocket or similar device volumes of thick smoke are forced into the pipe, any leak or defect at once becomes apparent by leakage of smoke from a pipe-joint into the air or from one of the fittings, and the exact spot at which the escape takes place is apparent at once. In the case of the smell test, a chemical such as oil of peppermint, which gives off a powerful odour, is introduced into the pipe, generally through one of the traps connected to the pipe system under test. It is difficult, however, with this method of testing to locate the position of the defect if there is one. All traps should be thoroughly tested by pouring a good stream of water through the fitting attached to the trap and observing whether unsealing by siphonage or other cause occurs in the trap or in any other trap in the system.

Dry Earth-closets.—The water-carriage system, though undoubtedly the best, is a costly one to instal with all the necessary pipes and traps. In country districts and in villages the water-closet may still be used, but with its discharge passing direct to closed-in cesspools, situated at some distance from the house, or preferably some form of earth-closet may be employed, though this latter system means that the closet should be

outside the house. The dry earth-closet system (fig. 8) was due to the Rev. H. Moule, who took out a patent for it in 1860; in this closet the faecal matters are deodorised by the application of dry earth or ashes; it is essential that the earth employed should be of a loamy character, perfectly dry and finely sifted. There are many forms of the earth-closet in which the earth is automatically thrown into the receptacle after every use of the closet, but on the whole it is better to apply the earth by hand by means of a scoop from a box of suitable earth kept in the closet. Under this system the contents of the receptacle are removed at regular intervals and dug into the ground. The dry earth-closet only provides for the removal in a

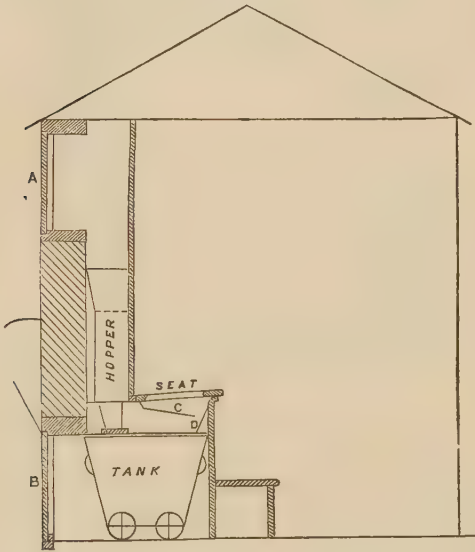


Fig. 8.

A, door-opening for filling hopper; B, door for emptying tank; C, shield; D, slide.

sanitary manner of faecal matter, all other sewage waste has to be disposed of by other means, and the use of this system in any adequately sewered district is therefore undesirable.

Sewers.—The pipes into which the private drains of all the houses and other buildings discharge their contents are known as sewers, and are the property of the local authority; all connections with the public sewers are made under regulations laid down by the local authority, whose duty it is to provide and maintain an adequate sewer system capable of carrying off all the dry-weather sewage-flow from houses and factories, and, in general, also of a larger or smaller quantity of the rainfall over the district the authority controls. The sewers may be designed on the combined system, in which case they must have a capacity large enough to convey not only the dry-weather sewage flow, but also quite a considerable proportion of the water due to the rainfall over the district; or they may be designed on what is termed the separate system. In this method there are two sets of independent sewers—one which has to deal with all the dry-weather sewage flow plus a small proportion of the rainfall, namely, that which falls on the backyards of houses and similar places; the other, which deals with rain-water only, carrying off a considerable part of the rainfall upon the whole of the rest of the area of the district. There is a considerable difference of opinion on the part of sanitary engineers as to the respective advantages

and disadvantages of these two systems, though it is indisputable that it is a distinct advantage to exclude as much as possible of the rainfall from the ordinary sewer, especially when consideration is paid to the question of purification works, when these are necessary. In the case of towns and villages situated directly on the open coast, this question of the exclusion of rainfall from the sewers is not a matter of such importance, except in so far as it may affect the first cost of the works by making it necessary to adopt larger cross-sectional dimensions for all the sewers.

Street sewers, when of moderate capacity, are usually circular pipes of glazed stoneware or cast-iron, varying in diameter from about 6 inches to 24 inches. The methods of jointing are similar to those already described for house drains—that is, for stoneware pipes, cement or some form of patent jointing; for cast-iron pipes, the ordinary melted lead joint. The same precautions have to be adopted as in house drains to maintain the necessary gradient to ensure a velocity of not less than $2\frac{1}{2}$ feet per second, in order that solid matters may be carried forward and not allowed to remain in the sewer to undergo putrefaction; further, the sewers should be laid, as far as possible, in straight lines, every necessary change of direction being made gradually, with suitable bends. Manholes must be provided at all junctions and changes of direction, and adequate arrangements must be made for thorough ventilation.

When the quantity of sewage to be conveyed is greater than can be dealt with by a 24-inch diameter circular pipe with the velocity of flow given above, built-up brick or concrete sewers must be employed. These built-up sewers are sometimes circular in section, especially when reinforced concrete is employed in their construction, but more usually they are egg-shaped, the invert of the sewer being of a much smaller radius than that of the upper portion. The egg-shaped form is of advantage when it is remembered that the volume of flow through any sewer is subject to wide variations due in part to the influence of occasional rainstorms, and also due to the fact that a considerable portion of the whole dry-weather flow has to be dealt with in the 12 hours from 7 A.M. to 7 P.M. The Chezy formula for the velocity of flow in any pipe or channel, $V = C\sqrt{mi}$, indicates, other things being the same, that a good value of m (the hydraulic mean depth) means a higher velocity of flow, and, in an egg-shaped sewer, a larger mean depth is secured when the quantity of liquid passing down the sewer is smaller than would be obtained for the same volume of liquid with a true circular cross section. The egg-shaped section (fig. 9) has usually a ratio of depth to width of section of 3 to 2.

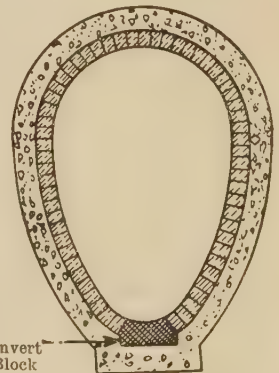


Fig. 9.—Egg-shaped Sewer.

These built-up sewers can be constructed entirely of brick-work, the inverts being separate blocks of glazed stoneware or similar material, the mortar used being Portland cement. In wet ground, to keep out subsoil-water, the brick-work may be coated on the outside with neat Portland cement mortar, or some bituminous composition. The thickness of brick-work employed will

depend partly upon the cross-sectional dimensions of the sewer and partly upon the depth of the trench in which the sewer is laid—that is, upon the depth of earth covering. If the sewer is less than about 3 feet in diameter, laid in a trench with a depth not exceeding about 20 feet, a thickness of $4\frac{1}{2}$ inches is sufficient if it is well backed with concrete; for larger sized sewers and deeper trenches it is well to use a thickness of 9 inches. Concrete is another material largely used for sewer-work, generally in conjunction with brick-work, but frequently alone; but in this case it is most desirable to use what is termed reinforced concrete—that is, concrete in mass, with steel bars embedded in the concrete in such positions as to make it certain that these steel bars will take up all tensile stresses.

If the materials used in constructing a sewer decay, or if the sewer joints begin to leak, there is danger of the ground upon which houses are built being fouled; hence comes pollution of the ground-water and the outbreak of various diseases. The bricks used in the construction of all sewer-work should be as impervious as possible, and, as a rule, no bricks should be allowed to be used in sewer-work in which the absorptive capacity for water exceeds 12 per cent. of their dry weight. The materials used in the jointing of brick sewers should also be of the most permanent character, and no better material than Portland cement mortar has yet been discovered which will resist the chemical action of sewage upon it. The materials used and the design adopted must be such as will allow of contraction and expansion by change of temperature. In the case of house drains the changes of temperature are much more considerable than in the case of sewers, as often in house drains water almost at the boiling-temperature may at one time be passing through the drain, and at another melted snow. These changes of temperature affect the stability of all sewer-work, and tend to pull it to pieces. The joints, therefore, should be of such a character, if possible, as not to present too much resistance to slight movements, and should be parallel, so that if the pipes move by contraction or expansion the joints will not open more at one point than at another. For this reason the ordinary socket-joint, when properly made, is found to be one of the best joints for either sewers or drains.

The size of sewers must be determined from consideration of the population of the district, the volume of dry-weather sewage per head of population, the fluctuation in the daily flow from hour to hour, the amount of the rainfall which is carried off by the sewers, and the fall which can be given to the sewers. The volume of the dry-weather flow may be assumed to be equal to the water-supply, though in certain cases this may be considerably increased by the fouled water of manufactories in the district deriving their water-supply from independent artesian or sub-artesian wells. The water-supply per diem per head of the population varies greatly in different towns—even in the case of towns having populations engaged in similar industrial occupations; while in small towns the daily allowance may be as low as 20 gallons, in large cities it often exceeds 45 gallons, though a greater daily supply than this last figure is hardly necessary for hygienic purposes in temperate climates. For approximate calculations, 30 gallons per head per diem may be taken as an average figure in this country.

The allowance for surface-water due to the rainfall is much more difficult to determine with accuracy, and sanitary engineers differ widely in their estimates of the allowance which should be made for water passing into sewers from the rain-

fall. While the actual rainfall is usually known very accurately, and its distribution throughout the year, and also the rate at which rain falls in short-lived storms of exceptional violence, the difficulty is to decide how much of this rainfall will find its way into the sewers. When the Metropolitan (London) sewers were originally designed, they were built to carry off a dry-weather flow of 5 cubic feet per head per diem and a rainfall of 0.01 inch per hour in urban and 0.005 inch per hour in suburban districts. This estimate of the rainfall sewage was worked out on the assumption that five-eighths of the total rainfall in urban districts would reach the sewers; it allowed, therefore, for a rainfall of 0.4 inch per diem. Under these conditions the maximum discharge allowed for was about four times as great as the dry-weather flow. In the city of Berlin the estimate was that the maximum rainfall in an hour was $\frac{1}{4}$ inch, and that one-third of this would pass into the sewers. These two examples show the wide variation in the allowance for rainfall sewage.

In determining the size of the sewers it must be remembered that considerable relief can be given to the sewers from the effects of sudden heavy rainstorms by the use of storm-water overflows. In the case of London, already referred to, the estimate at that time was that on from fourteen to twenty-one days in each year the sewers would be incapable of dealing with the rainfall water which would reach them, but this was met by providing a series of storm-water overflows discharging direct into the Thames. Under the Ministry of Health regulations, storm-water overflows are not allowed to come into operation until the total flow of storm-water and sewage equals six times the average dry-weather flow. To avoid all risk of the flooding of sewers, the engineer must consider each street in which there is a sewer independently, and calculate for that street as exactly as possible the probable amounts of rain-water due to the average and to exceptional rainfalls which would pass into the sewer, determining accurately beforehand the area of paved and unpaved surfaces the rainfall upon which must pass into that particular sewer. The whole calculation is a laborious and troublesome piece of work, but it may be stated at once that upon the thoroughness with which this work is done will depend the future success of the sewerage system as a whole. The effect of rainfall upon the volume of sewage flowing in the sewers may be more severe in the several district sewers than in the main outfall sewer, owing to the fact that in a large district the additional volume due to the rainfall in the more outlying areas has to traverse a considerable length of sewer before it reaches the main outfall sewer.

There is a daily fluctuation in the dry-weather flow, and this has to be allowed for in designing sewers; gaugings of the flow in sewers in various towns show that about 60 per cent. of the twenty-four hours' flow may pass into the sewers in the twelve hours from 7 A.M. to 7 P.M., and that between 6 and 7 per cent. may pass into the sewer in one hour.

When the volume of sewage to be dealt with, making allowance for all the factors mentioned above, has been determined, the mean velocity of flow in the sewer must be decided upon; in order that solid matters may be carried forward by the flow of the liquid in which they are suspended, in other words in order that a sewer shall be self-cleansing, a mean velocity of at least 2 feet per second must be secured, and, better still, $2\frac{1}{2}$ feet per second. To maintain the velocity selected, the sewer must be given sufficient fall or gradient, and the simplest formula upon which the

necessary calculations can be based is the well-known Chezy formula, $V = C\sqrt{mi}$, where V is the required velocity of flow in feet per second; m is the hydraulic mean depth of the stream in the sewer, or the ratio of the area of the cross-section of the stream to its wetted perimeter, which, in the case of a sewer circular in cross-section, is $\frac{d}{4}$, when

the stream fills the sewer or when it is half-full; i is the gradient or fall in feet for a given length of sewer; and C is a coefficient, which depends upon the material out of which the sewer is constructed and the roughness of its interior surface. Valuable tables have been published to facilitate these calculations for various ratios of C and i . It sometimes happens that the contour of the ground is such that a sufficient gradient cannot be obtained to maintain the mean velocity required for a self-cleansing sewer, in which case pumping must be resorted to to lift the sewage from a low level to a higher level. It may be necessary to divide a town into a number of sections; smaller sewers with rapid falls convey the sewage quickly from the various sections to a number of different points, and from these points it is pumped into one main delivery sewer. There are several automatic systems for carrying out this pumping work, such as the hydraulic system, the electrical system, and the Shone system.

In the hydraulic system, at some convenient centre in each section, an automatic hydraulic pumping station is established to which the sewers of the section gravitate. A central power station is established, at which by steam or some other source of power high-pressure water is obtained by pumping low-pressure water into an accumulator. From the accumulator pipes are laid to the various automatic pumping stations in the districts into which the town has been divided. The automatic hydraulic engines at the various local stations are simply direct-acting pumping engines, in which the high-pressure water gives motion to a piston within a cylinder, and this in turn works a pump directly attached to it. The automatic engines are controlled by a float in such a way that when there is sewage to pump it is pumped just as fast as it flows in from the sewer, and when the flow of the sewage from the sewer declines, the hydraulic engine stops until the supply of sewage is replenished. The water used to transmit the power from the power station is usually under a pressure of 700 lb. per square inch, and the advantage of this system is that the loss of power during distribution is very small—in this respect water compares very favourably with air as a means of power transmission. Another advantage in this system is that, by varying the diameters of the hydraulic engines, sewage can be lifted to variable heights at the various sections, although all the plants are supplied with water at the same pressure; it is also easy to store up reserve power in the accumulator, ready for any sudden demand for additional pumping without in any way increasing the water pressure. The water that has been used for transmitting power, after it has done its work, may be used for flushing the sewers, as it may be delivered from the cylinder exhaust to automatic flush tanks, thus saving the cost of purchasing water for flushing purposes. This system is possibly more economical than any other system, when all its advantages are taken into account—it occupies a small space at the automatic station, a plant big enough to deal with $1\frac{1}{2}$ million gallons of sewage per day can be accommodated in a cylindrical chamber 9 feet in diameter, which can be constructed below a public roadway. The system has been adopted in a number of towns.

The electrical system differs from the hydraulic

system in two important details—power is conveyed from the central power station to the automatic pumping station by electric cables, and electric motors take the place of the hydraulic engines. The motors are started and stopped, as in the case of the hydraulic engine, by means of floats, and the plant is even more compact than the hydraulic. Most of the pumping of sewage has to be done in daylight hours, a time when an electric power station is usually prepared to sell its electric energy for power purposes at a specially low rate per unit.

The Shone system is a pneumatic one, air above atmospheric pressure is applied directly to the liquid sewage contained in an iron vessel called an ejector, and the direct pressure of the air forces

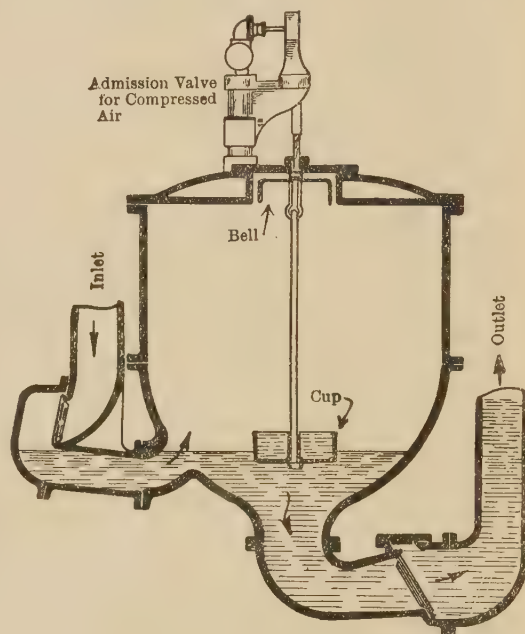


Fig. 10.—Shone's Pneumatic Ejector.

the sewage out of the ejector (fig. 10) to the required altitude. The air under compression is admitted to and cut off from the ejector automatically, so it is self-acting, like the two other systems already described. This system requires, like the hydraulic system, a central power station where the air is compressed into receivers, from which it is distributed by pipes to the various points at which the ejectors are set up.

Ventilation of Sewers.—Sewer-gas, as it is called, is caused by the fouling of the air by its admixture with the various gases which are given off during the decomposition of the sewage flowing through the sewer; to reduce the dangerous character of sewer-gas, it is necessary to mix it with an abundance of good fresh air, and, therefore, adequate ventilation must be provided in every system of sewers. Ventilation may be provided by means of open pipes carried up well above the level of the tops of the neighbouring houses; where there is no intercepting trap on the main drain from a house, the soil pipe of the house serves as a sewer ventilator. Another simple method is by building vertical shafts from the sewers to the level of the road-surface, and covering these shafts with metal gratings, the shafts themselves being built of brick-work set in cement. Under each grating is a trap or other device for catching dirt that may pass through the grating, and sometimes trays of charcoal, over which the gases have to pass before

escaping into the street. The dry charcoal decomposes the H_2S and ammonia, and renders the gases quite harmless and odourless.

The Disposal of Sewage.—This is one of the most important points for consideration, as it is no longer permitted to allow the sewage to flow in its crude state into the fresh-water rivers and water courses of the country, as was done when the systematic sewerage of towns was first undertaken. Application of the sewage to land came into prominence about the middle of the 19th century. At first its advocates laid much stress upon the prospect of securing financial profit from this method of purification, and little attention was paid to the possibility of such a process being detrimental to public health. Various Royal Commissions recommended this method of dealing with sewage; and Sir Edward Frankland carried out for the 1868 Commission a series of valuable experiments, using 6-foot high glass cylinders, 10 inches in diameter, filled with various soils, which were dosed with crude sewage twice every 24 hours at various rates—he termed this method ‘intermittent downward filtration.’ This method of applying the sewage to the land was adopted by a number of towns, but due to inattention to important details of the process the results which were obtained were not on the whole very satisfactory. Simultaneously with the development of land purification of sewage, the chemical treatment process of preliminary partial purification was developed and eventually used on an extensive scale. The chemical treatment requires the construction and maintenance of a series of settlement tanks with a total capacity of about 50 per cent. of the normal dry-weather flow, and suitable arrangements for adding the requisite doses of the chemicals employed to the crude sewage before it enters the settlement tanks. In these tanks precipitation occurs of the matters separated from the sewage, and this precipitant, or sludge, as it is termed has to be removed at regular intervals. The chemicals which have been most generally employed are milk of lime—an average dose being about 15 grains of lime per gallon of crude sewage—or milk of lime in a smaller dose followed by either a dose of sulphate of alumina or a dose of proto-sulphate of iron; the latter process was that adopted for the preliminary treatment of London sewage before the effluent was allowed to pass into the Thames at the two outfall points, Barking and Crossness. In the case of inland towns the effluent from the settlement tanks had to be passed over or through land, or through artificial filters, before it was in a fit state to be allowed to flow into any stream or water course. It is now generally recognised that the main result of the application of chemicals is the removal of the suspended matter in the crude sewage, while the substances in solution are only slightly reduced in quantity.

The chemical treatment of sewage produces a considerable volume of a semi-liquid sludge, and the disposal of this sludge is an extremely difficult problem. Various methods of dealing with it have been employed. In the case of London, Glasgow, and a few other cities situated on an estuary, the sludge is conveyed out to sea in specially designed steamers fitted with large internal tanks. When the steamer has reached a suitable place—in the case of London, the Barrow Deep in the North Sea—the sludge is allowed to flow out of these tanks into the sea by opening valves below the water-line; quite a fleet of steamers is required to deal with the sludge obtained from the vast population of London. Ordinary sludge consists of about 90 per cent. of water and 10 per cent. of solids, the quantity of sludge per 1,000,000 gallons of sewage treated when lime alone is used as a precipi-

tant is about 40 tons, and when sulphate of alumina is used in addition to lime, about 60 tons; these figures will show what a serious problem the disposal of the sludge is in the case of inland towns, where the shipment of it to sea is impracticable. Another method of disposal was to run it into trenches previously prepared on suitable land, but this method was liable to become an intolerable nuisance to people living anywhere in the neighbourhood, owing to the foul smells given off by the sludge before the trenches could be covered over with earth after they were filled with the stuff.

By far the most effectual way of disposing of the sludge in the case of inland towns is to pump it into filter-presses, the pumping being done by compressed air. In this way it is rendered dry enough to be handled and easily transported, and at the same time it becomes free from nuisance, as sufficient water does not remain in it to render it offensive and liable to decomposition. As a result of the process of pressing, the weight of the dried residue is only about one-fifth of that of the original sludge, in other words, out of every 5 tons of sludge forced into the filter-presses 4 tons of liquor are forced out, this liquor being allowed to flow back eventually into the settlement tanks. This reduction of the weight is in itself an important advantage of this process, the pressed sludge has about the same manurial value as ordinary farm-yard manure, and in some instances its sale for manure purposes in part defrays the somewhat heavy cost of pressing.

Most towns situated on the coast discharge their sewage untreated into the sea; this is done at Edinburgh—the old irrigation system utilising the Craighentenny meadows has now been entirely abandoned, and a new outfall sewer, discharging the untreated sewage directly into the Forth, has been constructed. The dispersion of raw sewage into a large volume of sea-water has a marked purifying effect, and, provided that the outfalls have been so arranged that the tidal currents tend to carry the sewage away from the foreshore, no nuisance is likely to be caused. Sewage has a density less than that of sea-water, and the sewage therefore after it leaves the mouth of the outfall sewer tends to rise to the surface, hence the outfall sewer should terminate, if possible, in fairly deep water. The sewage should, if it can be arranged, be discharged only at ebb-tide; in the case of Portsmouth this was secured by constructing large storage tanks in which the sewage could be collected during the flood-tide and then suddenly discharged in large volumes as soon as the ebb-tide had fairly set in.

Bacterial Methods of Purification.—The modern tendency is to employ this method to the exclusion of all other processes, and an immense amount of research has been carried out during the present century to ascertain the nature and character of the micro-organisms which are capable of breaking down the highly complex constituents of sewage and converting them into harmless substances, thereby producing an effluent which can be discharged with safety to public health into fresh-water rivers and streams. Certain experiments carried out by the Massachusetts State Board of Health in 1889–90 first directed attention to the possibility of adopting entirely new methods of purification of sewage. Lowcock constructed an experimental artificial filter at Wolverhampton about 1893: the filtering material was coke-breeze, the total depth of the filter was about 6 feet, and air was blown into the interior of the filter under a pressure equal to a head of about 45 inches of water. Lowcock found that he obtained a very satisfactory effluent when the dose of sewage was at the rate of about 264,000 gallons per acre of surface per diem.

Between 1892 and 1896 Dr Dibdin carried out a series of experiments at the outfall works of the London sewage system at Barking; he used artificial filter-beds of about 3 feet in depth, with coke-breeze as the filtering material; the beds were worked in the following manner: the bed was slowly filled in one hour, it then stood full and quiescent for two hours, and was then slowly emptied in one hour. The beds were then allowed to stand quite empty for about three hours, hence every bed was filled and emptied three times every 24 hours, and on every seventh day the beds were left standing empty. Under this system, when the rate of filtration was about 1,000,000 gallons per day per acre of filter surface, a purification of from 75 to 83 per cent. was obtained; it was found that the filter remained free of putrescent matter, and when standing empty, the only smell was that of fresh garden mould. In the early experiments the sewage distributed to the filters had already undergone chemical treatment, but as a result of his experiments, Dr Dibdin recommended that the chemical treatment should be omitted, that grosser particles should be screened out, and that, thereafter, the sewage should be passed through two sets of filter beds, the first set of beds, or coarse beds, to be filled with breeze of about $\frac{1}{2}$ -inch mesh, and the second set of beds, or fine beds, to be filled with breeze of a much finer mesh. In consequence of the successful results he obtained in these experiments, Dr Dibdin in 1896 advised the authorities of Sutton, who had constructed in 1890-93 sewage treatment works on the chemical system, using lime and proto-sulphate of iron with further treatment of the effluent from the settlement tanks on a sewage farm, to change over this system, which had failed to produce a satisfactory effluent, to the bacterial-bed method. The works were laid out with screens to intercept floating material, coarse and fine beds, and the method of working was precisely that evolved in the Barking experiments, the filling and emptying of the beds being entirely controlled by simple automatic devices; the results were quite satisfactory and the installation of this system at Sutton may be said to have been the beginning of the radical changes in the methods adopted in the purification both of domestic and of trade sewage, which have been such a marked feature of the schemes for sewage treatment designed and brought into use during the present century.

Quite early in the experimental researches on bacterial activities in sewage purification it was discovered that there were two distinct groups of such organisms, namely, those which carry on their work without the need of oxygen, called anaerobic organisms, and those which can most actively carry out their function in the presence of a plentiful supply of oxygen, aerobic organisms. There are, moreover, bacteria which are indifferent to the absence or presence of oxygen. The addition of chemicals to the sewage tends to hinder the work of these organisms, hence the advisability of abandoning the addition of any chemical if the bacterial treatment of sewage is to be successful. Most of the treatment works designed since these early experiments have adopted either the method of continuous application of the sewage to the beds, usually by some form of automatic sprinkler, or the method of filling the bed and allowing it to stand quiescent for a definite period before emptying, as employed by Dr Dibdin, commonly called the 'contact bed' system.

Another important addition to the plant employed was the use of the so-called septic tank, into which the sewage was run after passing through screens to separate off floating impurities and through detritus or grit chambers in which the gritty inorganic matter, largely the result of road washings,

settled out of the sewage. These septic tanks were constructed much on the same lines as the settlement tanks in the chemical treatment, and were either covered or open tanks, generally the latter. It is in these septic tanks that the main work of the anaerobic organisms is carried out, hence the idea that it was necessary to cover the tanks in order to exclude the air and light, but a thick heavy scum rapidly forms on the surface of the liquid, which effectually excludes all light and air from the great mass of the sewage; and if the entry of the sewage into the tank and the escape of the effluent are so arranged that both take place without disturbing this scum coating, no other cover of the tank is really necessary, except where, under exceptional climatic conditions, it may be necessary to protect the contents against the action of severe frosts. It is highly undesirable to allow the liquid to remain too long in the septic tanks—about twenty-four hours is the maximum time necessary for the strongest sewage, and with sewage diluted by rain-water this may be reduced to eight hours. The septic tank system was first used on a practical scale at Exeter, where a plant on this system was designed by Cameron in 1895.

While in all methods of sewage purification some system of 'screening' is essential, it plays a very little part in the purification process, nor do the detritus tanks, into which the sewage flows after passing through the screens, have much effect; the sewage is only allowed to remain long enough in the detritus tanks to secure the settlement of the gritty inorganic matter—that is, for a period of a few minutes up to a maximum of one hour, or long enough for about 10 to 25 per cent. of the suspended matter to settle out. Mechanical cleansing devices must be arranged both for the screens and for the detritus tanks. In many installations plain sedimentation tanks are employed instead of septic tanks, the sewage only remaining in such tanks about six hours, and the deposited sludge is removed at frequent intervals in order to prevent any very active bacterial action. The chief merit of the septic tank is the fact that the sludge it produces is drier, more easily handled, and has a less offensive smell than that produced by chemical treatment. In the Imhoff type of sedimentation tank, by making the tank a two-story one, the septic action is confined in great part to the sludge which settles in the lower chamber from the upper sedimentation chamber, the sewage flowing through this latter without disturbing the sludge in the lower chamber. In this tank provision is made for drawing off the sludge without hindering or influencing in any way the flow of the sewage through the tank, and by the device of separate gas-vents the gases produced by the decomposition of the sludge are drawn off, and may by suitable arrangements be utilised for the generation of power; about three-tenths of a cubic foot of gas is obtained per diem per head of population. The sludge from these tanks is easily dried, and is free from offensive odour. Where the contact-bed arrangement is adopted, the usual plan is to employ two sets of beds, the depth of the beds varying from 2 to 6 feet. In the first set, or primary beds, a coarse material, 2 or 3 inch mesh, is used, and in the second set, or secondary beds, a finer material of $\frac{1}{2}$ to 1 inch mesh; the material may be broken stone, clinker, coke, slag, &c. The efficiency of these contact-beds depends not so much on the depth as on the volume of the filtering material; in dealing with ordinary domestic sewage, about 1 acre of surface-beds is needed for 5000 persons if the beds are 5 feet deep. All contact-beds suffer a gradual reduction of air-space between the pieces of the filtering material, owing to the deposition of sus-

pendent matter in the sewage and to other causes, hence after periods varying from two to twelve years they must be cleaned, the filtering material being removed and washed—this cleaning is required at shorter intervals of time in the case of the primary beds. The filling and emptying is controlled in large installations by hand, but in the case of smaller plants more usually these operations are automatically controlled by siphons.

Sprinkling filter-beds are, on the whole, more commonly employed than contact-beds; where the sewage is fairly free from suspended matter, the sprinkling is of the intermittent type, the sprinklers being rotary in the case of circular beds, or a rectilinear traveller in the case of beds rectangular

with a definite amount of activated sludge which has been aerated, the amount of this being determined by the nature of the effluent it is desired to produce. The mixture now passes into the aeration channels, in which the purification process is carried out; these channels are of considerable length, generally consisting of a number of channels side by side, the mixture passing slowly through all the channels in succession; all along these channels there are air-diffusers, through which air is blown into the liquid; to prevent any danger of the sewage not passing steadily along the channels, there are cross baffle walls in them with small openings in the walls just above the porous diffusers through which air passes into the liquid. The

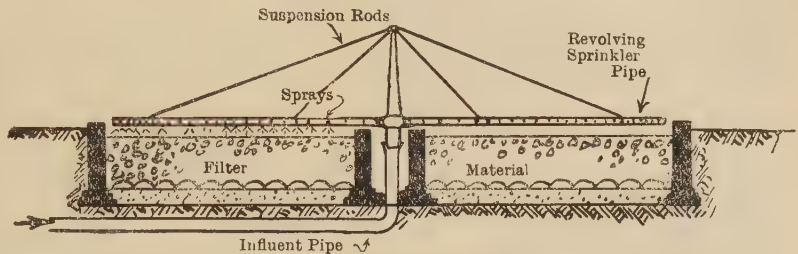


Fig. 11—Sprinkling Filter.

The material used in the sprinkler-beds is similar in character to, and broken to about the same gauge as, that employed with contact-beds. The sprinkler-beds are from 6 to 8 feet in depth, and the rate of filtration for raw sewage varies from 200 to 250 gallons per square yard of surface per diem; this means about 1 acre of filter surface per 10,000 persons for a 5 foot deep filter. It is essential in these beds thoroughly to underdrain them in order to make good provision for the entry of air into and its escape from the bed; this is usually provided for by laying all over the bottom of the bed a series of half-tile drains.

The principle of purification of sewage by any system of filters—land, contact, or sprinkling—is the same. The material of the filter is coated with a gelatinous film of organic matter undergoing oxidation, and the organic matter in the sewage is absorbed by this stuff, with the result of a purified effluent. With percolating filters some of the partially oxidised matter passes away with the effluent; this matter, called 'humus', should be allowed to settle out of the effluent in tanks before the effluent is finally discharged into a stream, since the humus is liable to secondary decomposition if it passed into a stream and settled on its bed.

During recent years there has been a tendency to make less use of anaerobic methods, and to develop more the aerobic action, and several systems of sewage purification have been developed for supplying large volumes of air to the raw sewage in the presence of an inoculating media, activated sludge; most of these systems are still to a certain extent in the experimental stage, but some of them have been designed on a big scale, as, for example, at Sheffield, where the Haworth bio-aeration process is now under construction for dealing with a daily dry-weather flow of 15,000,000 gallons of sewage containing a large proportion of trade waste liquor from the iron and steel industries.

In the diffused air system the sewage is first screened and passed through detritus tanks; it then passes into a circular disintegrating tank, where, by the diffusion of air through the liquid, all friable matter is broken into small particles; it then flows into a grease-collecting chamber, from this chamber the liquid, freed from grease, passes into a mixing chamber, where it is mixed

with a definite amount of activated sludge which has been aerated, the amount of this being determined by the nature of the effluent it is desired to produce. The mixture now passes into the aeration channels, in which the purification process is carried out; these channels are of considerable length, generally consisting of a number of channels side by side, the mixture passing slowly through all the channels in succession; all along these channels there are air-diffusers, through which air is blown into the liquid; to prevent any danger of the sewage not passing steadily along the channels, there are cross baffle walls in them with small openings in the walls just above the porous diffusers through which air passes into the liquid. The diffused air keeps the sewage in constant agitation; it assists the coagulation process, and supplies the air for the active bacterial organisms. The air-pressure needed is from 5 to 10 lb. above the atmospheric pressure, the volume of air being at times as much as 10 cubic feet per square foot of tank area per hour. The sewage now purified passes to the settlement tanks, where the sludge is deposited, and the clear effluent drawn off from the surface of this tank can now pass to an outfall, no further purification being necessary. The sludge is continuously forced out of the settlement tank by the pressure of the liquid above it and passes into a channel where it is rendered still further active by diffusing more air in it, and from this channel it passes into the mixing chamber, where it mixes with a fresh supply of incoming raw sewage, any surplus sludge being withdrawn when necessary from this channel. This process produces more sludge than any of the ordinary septic tank methods, and one of the difficulties of this method is the disposal in an economical and satisfactory method of the large volume of sludge; in its favour is the fact that it produces a superior effluent and the system works without giving off troublesome bad odours. The air-diffusers are apt to clog up, and, though the plant needed is fairly simple in construction, the air-compressing plant cannot in the circumstances of the case be very efficient, owing to the fact that only a moderate air-pressure is needed to force the air through the porous walls of the diffusers.

In the bio-aeration and other similar processes the aeration and oxidation are brought about by the use of mechanical appliances. In the Sheffield scheme, after the preliminary action of screens and detritus tanks and also continuous flow settlement tanks, the sewage is compelled to traverse a long length of aeration tank, the time of travel being from 6 to 8 hours; the aeration tanks are 265 feet long by 4 feet 5 inches in depth, of rectangular cross-section, and are built up of a series of parallel channels placed side by side, connected at their ends, so that the sewage traverses a length of rather over a mile in its passage from the point of entry until it passes into the settling tanks at the end of the channels. In each channel a 10-foot

diameter paddle-wheel rotates at about 15 revolutions per minute; these are driven by an electric motor through suitable gearing; the wheels have a semi-circular cover, and by their rotation they set up short waves, which keep the sewage in a continual state of agitation. The settling tanks are of the well-known Dortmund type, of a pyramidal shape, each about 25 feet by 25 feet square at the top and 22 feet 6 inches deep. It is estimated that the power needed, including that required for pumping the sludge, will be from 20 to 25 h.p. for each million gallons of sewage dealt with. The power required is rather greater in this scheme, owing to the large volume of trade refuse which has to be dealt with, than it would be in a plant dealing only with domestic sewage. So far the results obtained have been quite satisfactory in regard to the effluent, and also in regard to the quality of the sludge produced.

There are several other systems adopting mechanical processes for the necessary agitation and aeration of the sewage; in the Simplex system, which has proved very satisfactory for dealing with trade waste, the tank used in the process has a conical bottom, and standing in the centre is a vertical pipe, open at its top and bottom, up which a stream of activated sludge and sewage passes and streams out on to a revolving cone fitted with suitable vanes; the mixture is flung off this revolving cone in a film, and this film striking the liquid in the upper part of the tank sets up such a disturbance in the mass that the liquid is thoroughly aerated and a spiral motion is set up in the tank. The tank is fitted with a thin inner shell-wall, which divides the tank into a large central compartment, in which the aeration occurs, and a narrow outer compartment, up which the liquid passes away to an overflow sill. Excess sludge is drawn off by a pipe which extends down almost to the bottom of the tank.

In conclusion, it may be pointed out that the solution of this difficult problem of sewage purification is not attained merely by the production of a stable, clear effluent not liable to after putrefaction, but must also secure the economical and satisfactory disposal of the resultant sludge.

See Santo Crimp, *Sewage Disposal Works*; W. J. Dibdin, *The Purification of Sewage and Water, Recent Improvements in Methods for the Bacterial Treatment of Sewage*; R. Rideal, *Sewage and the Bacterial Purification of Sewage*; H. P. Raikes, *Sewage Disposal Works*; F. Wallis Stoddart, *Best Methods of Sewage Disposal*; G. M. Flood, *Sewage Treatment and Disposal*; E. C. S. Moore, *Sanitary Engineering*; F. Noel Taylor, *The Main Drainage of Towns*; F. W. Raynes, *Domestic Sanitary Engineering and Plumbing*; A. Herring Shaw, *Domestic Sanitation and Plumbing*. The various Reports of the Royal Commission of 1898 on Sewage Disposal—nine volumes in all—were issued between 1901 and 1915. Numerous papers describing sewage works carried out at home and abroad will be found in volumes 140 and onwards of the *Proceedings of the Institution of Civil Engineers*.

Sewing-machine, a machine for sewing and stitching upon cloth, leather, and other materials. It has reduced the labour of family sewing to a minimum, created a new and profitable article of merchandise, to wit, 'ready-made clothing,' and revolutionised the manufacture of shoes.

There are many kinds of sewing-machine, each adapted to the kind of work it is intended to perform, as machines for general domestic or family purposes; for manufacturing purposes; for the vamping of shoes, stitching of water-hose, water-buckets, mail and travelling bags and satchels, and gloves; for carpets, buttons, button-holes, and for bookbinding.

Sewing-machines may be divided into classes, according to the stitch made, as the 'chain-stitch,' the 'double-loop stitch,' the 'lock-stitch,' and the 'button-hole stitch' machines.

The 'chain-stitch' machine uses but one thread, looped upon itself, by means of a curved needle or hook, beneath the cloth, which catches the thread as it is carried through the cloth in the eye of the vertical needle, and holds it until the second descent of the needle, this time through the loop thus made, which is drawn up upon the under side of the cloth as the vertical needle again rises, and so on—thus making a chain of stitches which is easily unravelled. Machines of this class are of limited application,



Fig. 1.

being better adapted for embroidering and basting than for manufacturing purposes or for general domestic use. Fig. 1 represents this stitch.

The 'double-loop stitch' is a machine using two threads, one upon each side of the fabric—the upper thread in the eye of the vertical needle above the cloth, the other in the circular needle which vibrates immediately beneath the cloth. By the descent of the vertical needle the upper thread is carried down through the cloth, where it becomes looped and interlooped with the under thread, forming a stitch which, being interlooped with the adjacent stitch, presents the appearance of three threads interlooped upon the under side of the cloth, and upon the upper side the single thread, as in the 'single chain-stitch.' This 'Grover and Baker stitch' makes a strong and durable seam, but consumes a large quantity of thread, and is easily unravelled.

The 'lock-stitch' class of machines, sometimes called the 'double lock-stitch' machines, comprises most of the machines now in use, and is admirably adapted for domestic and manufacturing purposes. Like the 'double-loop stitch,' the 'lock-stitch' machine is a double-threaded machine, having one thread upon either side of the fabric. The upper thread of the lock-stitch machine is carried by the descent of the needle bar downward through the cloth and the loop of the under thread, and by the upward motion of the needle is again brought back through the cloth, drawing the under thread upward to the centre of the fabric, where, by a proper adjustment of the tension of the two threads, they are locked, making a perfect stitch, exactly the same upon both sides of the cloth.



Fig. 2.

Fig. 2 represents the 'lock-stitch,' than which nothing better is required for sewing. By this stitch an elastic and durable seam is made, which even the skilled operator finds difficulty in ripping. It will not unravel. Of this class of machines there is also a large variety, which may be subdivided into two classes—those using the vibratory, oscillatory, or shuttle motions, and those constructed entirely upon the rotary motion principle, the loop being caught by the beak of the shuttle or by a rotating hook.

The button-hole machine makes the 'whip-stitch' of the button-hole and also the 'pearl-edge stitch.' It is a wonderful piece of mechanism.

Machines have been invented for taking the 'back-stitch,' the 'basting or running' stitch, the through-and-through stitch known as the 'cord-wainer's' stitch, the over-and-over stitch; indeed every stitch used in plain and fancy needlework except the 'blind' or 'hemming' stitch.

The hemming stitch must not be confounded with 'hem-stitching,' a well-known process by which certain threads of the 'filling' of cloth are drawn, and the warp artistically wrought into clusters or groups of threads by the use of the needle. The hem-stitching effect is produced upon the sewing-machine by the weaving of the thread alternately through the edges of adjacent pieces of cloth, then by the lock-stitch, sewing the threads through the centre, by stitches lengthened for the purpose of producing the effect desired. By a similar process, the skilled operator can readily produce lace in beautiful and artistic designs; and the effects of old tapestry may even be produced by the use of the sewing-machine.

History.—The idea of the sewing-machine originated in England during the 18th century, but as an invention of practical utility it is a product of the 19th century, and of the United States of America. In June of 1755 Charles F. Weisenthal patented a needle in England, having an eye in the centre, and being pointed at both ends. It was intended for hand embroidery, but was subsequently used in some of the earlier sewing-machines. Robert Alsop in 1770 patented in England a device for embroidering with one, two, or more shuttles. This was followed in 1804 by a machine, invented and patented by John Duncan, for embroidering, consisting of a large number of barbed or hooked needles set in a horizontal bar, and supplied with thread by a feeding needle. By a forward motion of this bar the needles were simultaneously carried through the fabric, and by the reverse motion were again brought back, passing through the loop of thread made by the previous stitch, thus making a 'loop-stitch.' This machine was subsequently improved by Mr Heilman, and extensively used for embroidery purposes.

Meanwhile, in 1790, a patent was taken out in England by Thomas Saint 'for quilting, stitching, and making shoes, boots, spatterdashes, clogs, and other articles.' This machine used a single thread, made a loop-stitch, the loops being upon the outer side of the fabric, had a perforated awl by which the hole for the needle was made, and was worked by a combination of 'cogs,' 'prongs,' 'wheels,' and 'spindles.'

In 1834 M. Thimonnier, a Frenchman, secured a patent in England for a crocheting-machine for sewing purposes, which made a loop-stitch by means of a hooked needle that had to be passed through the cloth backward and forward twice in order to make one perfect stitch. This machine improved was subsequently patented in France, and in 1851 in the United States. In 1871 Archbold and Newton secured a patent for sewing or stitching the

thread. In 1842 J. Greenough of Washington secured a patent in the United States for a machine for sewing shoes. This machine made the 'through-and-through' stitch, or 'shoemaker's stitch,' represented in fig. 3, using a single thread in the eye of Weisenthal's needle, *a*, the needle being drawn through backward and forward by means of pincers upon each side of the material. There was neither 'chain,' 'loop,' nor 'lock' by which the firmness and durability of the 'hand-sewed' shoe or of the ordinary 'back-stitch' for garments was secured, and hence this machine could not be adapted for general sewing. In 1843 B. W. Bean of New York patented a machine making the 'running' or 'basting' stitch, a stitch similar to the 'through-and-through' stitch, but by quite a different device (see figs. 3 and 4, and compare) and designed for a different class of fabric. Fig. 4 represents the device used in the machine for the making of the

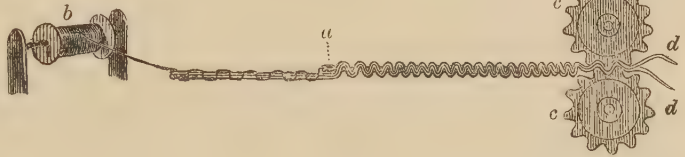


Fig. 4.

running stitch. The needle, *a*, is long and stationary, with the eye and point at opposite ends, as in the ordinary needle for hand-sewing, and receiving a continuous supply of thread from the reel, *b*; the two small toothed wheels, *c*, are so arranged that their teeth pressing into one another crimp the two pieces of cloth, *d*, and push them forward against the needle-point, the operator drawing off the cloth from the needle at the eye end as rapidly as it is filled. This machine was extensively introduced into England, and used by bleachers, printers, and dyers for temporary basting, and for loose tacking of pieces of stuff.

The machine destined to revolutionise the sewing world and play a most important part in future industries was not yet conceived. The thought of the inventor had been centred apparently upon facilitating the embroidery of various articles of household and dress ornamentation, excepting the effort to lessen the labour of making shoes. Walter Hunt of New York is said to have constructed a machine for taking the lock-stitch in 1832 or 1834. However, to Elias Howe (1819-67), of Cambridge, Massachusetts, belongs the credit of constructing and patenting the first lock-stitch sewing-machine. Compared with the almost perfect machines of to-day, this machine was indeed a crude effort; it however formed the basis of the present lock-stitch sewing-machine, and comprised its essential features. It was patented in 1846, although possibly constructed earlier. Mr Howe combined a needle having the eye near the point vibrating in the direction of its length, though horizontally, with a shuttle device vibrating horizontally, yet so as to pass through the loop made by the thread in the needle eye being carried through the cloth, then drawn backward in the opposite direction; together with the 'sawmill carriage' 'feed motion,' and a baster-plate and projecting pins holding the cloth as in metal clamps in a vertical position while being stitched. The needle of the Howe machine was a great invention, without which no sewing-machine is possible; improvements were, however, soon made in the 'setting' of the needle, substituting the vertical motion of the needle for

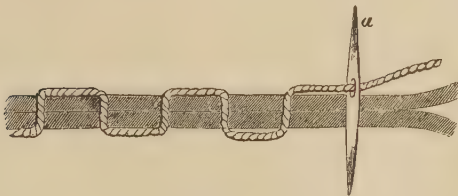


Fig. 3.

backs of gloves, with the ornamental or tambour stitch, the tension being regulated by passing the thread over a roller covered with cloth, and by the alternate rising and falling of a bar across the

the horizontal motion of the original machine, thus passing the cloth upon the table of the machine horizontally under the needle, together with a 'wheel feed motion' beneath the baster-plate, by which the cloth was moved horizontally from left to right. Subsequently the shuttle was made to describe an entire circuit instead of the former oscillating or vibrating motion. This latter improvement was made and patented by Blodgett and Heron of Boston in 1849; but while it effectively economised power, it was soon found impractical because of the untwisting of the thread as the shuttle rotated. In 1850 Allen B. Wilson of Pittsfield patented a 'double-beak shuttle,' by which a complete stitch was made at each forward and backward motion of the shuttle, which also economised power. About the same time Robinson of Boston patented a machine having two needles curved, which being threaded with short threads, one upon each side of the cloth, were passed alternately through the cloth, and the thread drawn each way, making the cordwainer's stitch. By this machine the back stitch and the basting stitch could be made.

In 1851 Mr Wilson invented and patented the 'rotating hook' device, a device new in machinery and an effective substitute for the shuttle. Mr Wilson also made a most substantial improvement in his lock-stitch rotary motion machine, known as the 'four-motioned feed' or 'rough surface feed with yielding pressure.' It consists of a horizontal slotted bar placed between the standards which support the cloth plate, with a 'feed-tongue,' which fills the slot, and is pivoted at one end, but free at the other end for an up-and-down motion. The four motions are an upward or lifting motion by which the teeth are fixed in the cloth, a forward motion by which the cloth is moved forward, a downward motion by which the teeth loose their hold upon the cloth, and a backward motion effected by a spiral spring at the other extremity of the feed-bar. The length of the stitch is determined by the play of the feed-bar. By the successive motions of this rough surface feed, the only hold upon the cloth while the needle is passing down through the cloth is the needle itself; hence the cloth may be turned in any direction by the operator without stopping the machine, an advantage which will be readily appreciated, making it possible to turn corners while sewing. In 1849 a 'chain-stitch' machine was patented by Morey and Johnson, in which the cloth was suspended from a circular baster-plate, the thread being carried through the cloth by the horizontal play of the needle. This machine was subsequently improved by J. E. A. Gibbs of Virginia, and as improved is known as the Wilcox & Gibbs machine. The double loop-stitch machine before described was invented and patented by W. C. Grover and W. E. Baker of Boston in 1852. Immediately after the Singer machine, bearing the name of the inventor, was patented. It was an improvement upon the original Howe machine, and it in turn has been improved from time to time with various patents. In 1856 Chapin secured a patent for the 'hemmer,' a device of steel consisting of a 'scroll' or 'gauge' set in a steel 'presser-foot,' by which the hem or fell is turned. It is an attachment adapted to any sewing-machine. Various patents have been secured for the various attachments and improvements from time to time, and also for new machines adapted to special classes of work. The button-hole machine was invented and patented in 1882 by Ostrom, and almost at once materially improved by Horace Doggett, a young man under twenty, by the addition of an 'automatic cutter.' This device was subsequently purchased by the Wheeler and

Wilson Company. Attachments for the working of button-holes were adapted for use upon any sewing-machine, and there are various kinds of button sewing-machines.

Immediately after the invention of the Singer machine litigation arose between the various inventors, and terminated in 1854 in a sewing-machine combination, by which all companies united in the use of the Howe needle and the Wilson four-motioned feed, paying their inventors a royalty. The last of the important original patents ran out in 1878, and immediately sewing-machines were reduced in price fifty per cent. Since then there have been many improvements, but the principles remain.

Sex. In all the many-celled animals, and in most of the many-celled plants, the continuance of life from generation to generation is secured by special reproductive cells which form new lives, being sooner or later separated from the body of the parent. In this specialisation of reproductive cells lies the great difference between sexual and asexual reproduction. But in the great majority of organisms the special reproductive cells are of two kinds—there are relatively large and passive ova, and relatively small and often very active spermatozoa. These two kinds of reproductive cells are mutually dependent; in most cases they die unless they unite with one another. When this union or fertilisation takes place a new life begins. But in most organisms the ova are formed in one organ, the spermatozoa in another, while in most animals, and in all the higher forms, the ova are formed by one individual (a female) and the spermatozoa by another (the male)—there being, in other words, two distinct sexes. Moreover, the males and females differ not only in their essential characteristics of producing spermatozoa and ova respectively, but they often differ very markedly in external appearance, constitution, and habits. Further, they are instinctively attracted to one another in such a way that the union of the complementary reproductive cells is secured.

It is evident then that the fact of sexual reproduction involves many distinct biological problems: (a) the formation of specialised reproductive cells; (b) the origin of two different kinds of reproductive cells—ova and spermatozoa; (c) the differentiation of distinct organs or of two distinct types of individual for the production of these two kinds of elements; (d) the divergence between the sexes in secondary as well as in essential characteristics; and (e) the evolution of the sexual instincts which find their highest expression in the love and courtship of many of the higher animals. As the general problem of sexual reproduction is discussed in the article REPRODUCTION, and as the divergent modes of sexual reproduction are discussed in special articles, such as HERMAPHRODITISM and GENERATIONS (ALTERNATION OF), we shall confine ourselves here to the problems immediately connected with the evolution of sex.

What is the meaning of the existence of two distinct sexes? The problem may be approached in several different ways. We may, for instance, inquire whether this normal divergence of individuals into two types has any analogue among other cases of divergent variation among organisms. To some the analogy seems not far to seek. For throughout organic nature a great contrast may be read, between plant and animal, Gregarine and Infusorian, coral and jellyfish, barnacle and shrimp, coccus-insect and fly, slug and Pteropod, tortoise and lizard, reptile and bird, and even more clearly between related genera or even related species; a contrast between predominant passivity and activity, between a storing and constructive physiological habit and one which is prone to expen-

diture and disruption; a contrast expressible in technical language as an antithesis between a relative anabolic and a relative katabolic preponderance in the protoplasmic life of the creature. Now it may be that the difference between the sexes, between the relatively passive female and the more energetic male, is an expression of what is really a fundamental alternative in variation.

Or we may take a survey of the contrasts between the sexes, and endeavour, after making allowance for the special conditions of each case, to reach some average truth. Then we find that females tend to be larger, more sluggish, less brightly coloured and decorative, that they often have a longer life and sometimes a higher temperature; and that males, on the other hand, tend to be smaller, more energetic, more brightly coloured and decorative, and so on. Now, these characteristics, when physiologically analysed, tend to corroborate the theory that the females and males are individuals of relatively anabolic and relatively katabolic constitutions.

Again, we may approach the problem by inquiring into the physiological conditions which tend in each birth to determine whether the individual will be a male or a female. While the progress of research is confirming the view that in the higher animals at least the sex of the future offspring is irreversibly predetermined at a very early stage in the history of the germ-cells, there are some interesting facts which go to show that the nutritive and other environmental conditions of the parents may influence the proportions of male-producing and female-producing germ-cells. Thus markedly anabolic conditions favour the production and survival of female-producing ova, and conversely. There is no doubt that changes of nutrition may make various normally hermaphrodite organisms, such as hydra, into pure males or pure females. Or again, we may fix our attention on the characteristic products of the sexes—on the ova and spermatozoa. Here the difference between female and male has its fundamental and most concentrated expression. For the ova are relatively large cells, very passive, and usually rich in reserve-products, while the spermatozoa are very minute cells, usually very active, rarely with any reserve-products. In short, the ova (like the females) are relatively anabolic, and the spermatozoa (like the males) are relatively katabolic.

Recent researches have emphasised the importance of hormones produced by endocrinal tissue in the reproductive organs. These sex-hormones, distributed throughout the body by the blood, serve to activate the development of secondary sex-characters, or to inhibit the development of those of the opposite sex. They also have a profound influence on the nervous system.

We should also inquire into the beginnings of sexual differentiation among the simpler forms of life. Among the unicellular Protozoa, in which sexual reproduction in the strict sense cannot occur, there are already the analogues of males and females, as we see for instance in *Vorticella*, when a small free-swimming individual unites with a stalked cell of normal size. Very gradual among the simple plants also are the steps of sexual differentiation. But of especial importance is the genus *Volvox*—a colony of loosely united cells—in many ways related to the Flagellate Infusorians. In this globular colony division of labour is at a minimum, and individuals often occur which are quite asexual, forming daughter-colonies, without specialised reproductive cells. Others have, among the other units of the colony, special reproductive cells, which are, however, parthenogenetic, able of themselves to form new colonies. Others have special reproductive cells—ova and spermatozoa—formed within

the same colony, but usually maturing at different times. Then there are colonies in which only ova are formed, and others in which only spermatozoa are formed, cross fertilisation taking place as usual. And besides these various sexual conditions other combinations often occur in the same species of *Volvox*, in which we can indeed read, and with increasing physiological knowledge will more fully understand, almost the whole story of the evolution of sex.

Finally, it must be observed that the origin of two kinds of reproductive cells which combine in fertilisation, and the specialisation of two types of individual as the bearers of ova and spermatozoa respectively, must have been of advantage in the general evolution of organisms. For, as almost every life begins in the mingling of two distinct reproductive units produced by two distinct types of individual, there is here one of the most important sources of variation and one of the most important means of securing the average stability of the species.

But we must also recognise the psychical expression of sex—the love of mates. This also has its history. Among crustaceans and insects first, in fishes and amphibians, in reptiles too, but most markedly among birds and mammals, the males are attracted to the females, and enter into relations of helpfulness with them. The relations and attractions may be crude enough to begin with, but to mere physical fondness are added subtler attractions of sight and hearing, and these are sublimed in birds and mammals to what we call love. This love of mates broadens out; it laps the family in its folds; it diffuses itself as a saturating influence through the societies of animals and of men.

See REPRODUCTION, SEXUAL SELECTION; *The Evolution of Sex*, by Prof. Geddes and J. Arthur Thomson (1889; revised ed. 1901); by the same authors, *Sex* (Home University Library, 1914); J. T. Cunningham, *Sexual Dimorphism* (1909); Marshall, *Physiology of Reproduction* (1910); Julian Huxley, *Essays of a Biologist* (1923).

Sexagesima Sunday (Lat. *sexagesima*, 'sixtieth'). See QUINQUAGESIMA.

Sextant, an instrument for measuring the angular distance of objects by means of reflection. The principle of its construction depends upon the theorem that, *if a ray of light suffer double reflection, the angle between the original ray and its direction after the second reflection is double of the angle made by the reflecting surfaces*. Thus, let A and B (fig. 1) be two mirrors perpendicular to the same plane, and inclined to each other, and let SA be a ray of light, which falling upon A is reflected on B, and re-reflected in the direction BC, then ACB is the angle between the original and finally reflected rays, and ADB is the angle between the mirrors. Now, as the angle of reflection is equal to the angle of incidence, $\angle SAF = \angle BAD$, and $\angle GBA = \angle DBC$; but $\angle EBC = \angle BAC + \angle BCA = (\angle BAD + \angle DAC) + \angle BCA = (\angle BAD + \angle SAF) + \angle BCA = 2 \angle BAD + \angle BCA$; and $\angle EBC$ also $= \angle EBD + \angle DBC = \angle EBD + \angle GBA = 2 \angle EBD = 2 \angle BAD + 2 \angle BDA$; therefore $\angle BCA = 2 \angle BDA$, which proves the truth of the theorem. The instrument of which this theorem is the principle is a brass sector of a circle in outline; the sector being the sixth part of a complete circle, for which reason the instrument is called a *sextant*. Fig. 2 shows the essentials of its construction; AMN is the sector whose curved side, MIN, is the sixth part of a circle; A is one mirror wholly silvered, placed perpendicular to the plane of the sector, and on, and in line with, the limb AI, which is movable round a joint at or near A; B is the other mirror, also perpendicular to the

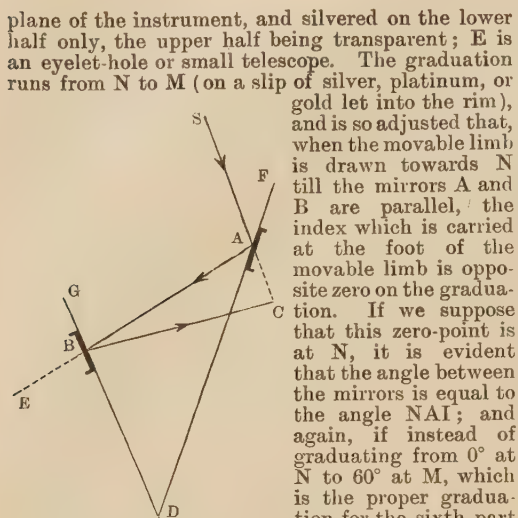


Fig. 1.

to 120°—i.e. each half-degree being marked as a degree, and similarly of its aliquot parts—then the angle NAI, read off by the index at I, will show at once the angle between the incident and finally reflected rays. The mode of using the sextant consists in placing the eye to the telescope or eyelet-hole, and observing one object directly through the unsilvered part of B, and then moving the index till the image of the other object, reflected from A upon the silvered part of B, coincides with or is opposite to the first object; then the angle, read off at I, gives the angle between the objects. For additional accuracy a vernier is attached to the foot of the movable limb.

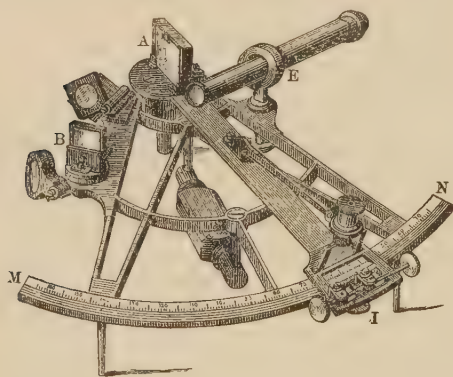


Fig. 2.

The sextant is capable of very general application, but its chief use is on board ship to observe the altitude of the sun, the lunar distances, &c., in order to determine the latitude and longitude. For this purpose it is necessary to have stained glasses interposed between the mirrors A and B, to reduce the sun's brightness. These glasses (generally three in number) are hinged on the side AM, so that they may be interposed or not at pleasure. B is the glass through which the horizon is perceived, and has hence received the name of the *horizon-glass*; while the other mirror, from its being attached to the index-limb, is called the *index-glass*.

The sextant is liable to three chief errors of adjustment: 1° if the index-glass be not perpendicular to the plane of the instrument; 2° if the horizon-glass be not perpendicular to the plane of the instrument; and 3° if, when the mirrors are parallel (which is the case when a very distant body, such as the sun or moon, is observed directly through B, and found to coincide with its image in the lower part of B), the index does not point accurately to 0°; this last is called the *index-error*, and is either allowed for, or is remedied by means of a screw, which moves the index in the limb AI, the latter being stationary. The first two errors are also frequently remedied by means of screws working against a spring, but in the best instruments the maker himself fixes the glasses in their proper position.—The *quadrant* differs from the sextant only in having its arc the fourth part of a circle, and being consequently graduated from 0° to 180°; the *octant* contains 45°, and is graduated from 0° to 90°; while the *repeating-circle*, which is a complete circle, is graduated from 0° to 720°. A common form of the sextant is the 'snuff-box' sextant, which is circular in shape, and, as it can be conveniently carried in the pocket, is the form most frequently used by land-surveyors.

The idea of a reflecting instrument, on the principle of the sextant, was first given by Hooke about 1666; but the first instrument deserving the name was invented by John Hadley (q.v.) early in the summer of 1730, and a second, and much improved form of it, was made by him a short time afterwards. Halley, at a meeting of the Royal Society, claimed for Newton the priority of invention, and in October 1730 a Philadelphian, named Godfrey, also asserted his claim as the original inventor; but that learned body decided that Newton's claim was unsupported by even probable evidence, and that Hadley's and Godfrey's inventions were both original, but that the second form (which is almost the same as the common sextant now employed) of Hadley's instrument was far superior to his first form and to Godfrey's. See works by H. W. Clarke (1885) and C. W. Thompson (1887).

Sexton (corrupted from *Sacristan*, q.v.) is a parochial officer in England, whose duty is to take care of the things belonging to divine worship. He is usually chosen by the inhabitants, but often also by the clergyman or the churchwardens, the mode of appointment being regulated by the custom of each parish. He sometimes also holds the office of parish-clerk. Women have occasionally been appointed sextons (e.g. at Kingston-upon-Thames, 1731; Donnybrook, near Dublin, 1845-56; and the adjoining parish of Booterstown, 1856-74). The office is a freehold office for life, except in the new parishes under Church-building Acts; the duty is to keep the church clean, swept, and adorned, to open the pews, to make and fill up the graves, and to prevent any disturbance in church. The salary is usually paid by the churchwardens, and as to amount depends on custom. In Scotland he may also be beadle or 'church-officer,' although the latter's duties are usually connected with attendance on the minister.

Sextus Empiricus, physician and philosopher, lived at Alexandria and Athens about 200-250 A.D. As physician he was a representative of the Empirics (hence his second name; see *MEDICINE*); as philosopher he was the chief exponent of the later Scepticism (q.v.) of the Old World, which was professedly a continuation of Pyrrhonism. In his two works still extant—the *Hypotyposes* and *Adversus Mathematicos*—he has left a prodigious battery of arguments and exceptions against dogmatism in grammar, rhetoric, geo-

metry, arithmetic, music, astrology, logic, physics, ethics. There are monographs by Jourdain (Paris, 1858) and Pappenheim (Berlin, 1875).

Sexual Selection is a term applied by Darwin to the process of favouring and eliminating which to some extent occurs in the mating of many animals. It is a special case of natural selection, depending upon a competition between rival males, in which a premium is set upon those qualities which favour their possessors in securing mates. This competition takes two forms: on the one hand, rival males, for instance stags and gamecocks, fight with one another, and the conquerors have naturally the preference in mating; on the other hand, rival males sometimes seem to vie with one another in displaying their attractive qualities before their desired mates, who, according to Darwin, choose those that please them best.

Darwin gives the following summary of his theory: 'It has been shown that the largest number of vigorous offspring will be reared from the pairing of the strongest and best-formed males, victorious in contests over other males, with the most vigorous and best-nourished females, which are the first to breed in the spring. If such females select the more attractive and, at the same time, vigorous males, they will rear a larger number of offspring than the retarded females, which must pair with the less vigorous and less attractive males. So it will be if the more vigorous males select the more attractive and, at the same time, healthy and vigorous females; and this will especially hold good if the male defends the female, and aids in providing food for the young. The advantage thus gained by the more vigorous pairs in rearing a larger number of offspring has apparently sufficed to render sexual selection efficient.'

Where there is direct competition between males, the weakest will tend to be eliminated, either directly by death or injury in the struggle, or indirectly by diminished success in reproduction. In the same way, if a male be lacking in the qualities necessary to find a mate—e.g. in senses acute enough to find out her whereabouts—that male may remain unproductive. But there is not enough of evidence to enable us to compute how many males do remain unmated in consequence of non-success in competition.

In regard to the second aspect of sexual selection, in which the females are believed to exercise some choice, giving the preference to those suitors which have brighter colours, more graceful forms, sweeter voices, or greater charms of some kind, there is no little difference of opinion. Darwin indeed believed strongly in the female's choice, and referred to this process of selection many of the qualities which distinguish male animals. The females 'have by a long selection of the more attractive males added to their beauty or other attractive qualities.' 'If any man can in a short time give elegant carriage and beauty to his bantams, according to his standard of beauty, I can see no reason to doubt that female birds, by selecting during thousands of generations the most melodious or beautiful males, according to their standard of beauty, might produce a marked effect.' On the other hand, Alfred Russel Wallace maintains a very different position. 'There is,' he says, 'a total absence of any evidence that the females admire or even notice the display of the males. Among butterflies there is literally not one particle of evidence that the female is influenced by colour or even that she has any power of choice, while there is much direct evidence to the contrary.' Against this, G. W. and E. G. Peckham, in their careful essay on sexual selection in spiders, state that they have in the *Attidæ* 'conclusive evidence that the females pay close attention to the love dances of the males, and

also that they have not only the power, but the will, to exercise a choice among the suitors for their favour.' Some observers of birds are also confident that the females choose the more musical or otherwise attractive males. But again Wallace maintains that the fact that every male bird finds a mate 'would almost or quite neutralise any effect of sexual selection of colour or ornament; since the less highly coloured birds would be at no disadvantage as regards leaving healthy offspring.' In spiders, however, it seems that the more brilliant males may be selected again and again while the mating season lasts.

The theory of sexual selection is of considerable importance in a general theory of evolution. This may be illustrated in reference to the bright plumage of many birds. If we postulate successive crops of variations (which cannot at present be completely rationalised), if we acknowledge that there is really 'preferential mating' among birds (which is not readily proved or disproved), if we believe that the females are sensitive to the slight excellences which distinguish one suitor from another and that their choice of mates is determined by these excellences (which Wallace emphatically denies), then we may say that the greater brightness of male birds may have been evolved by sexual selection. This was Darwin's opinion. The brighter males succeeded better than their rivals in the art of courtship; the variations which gave them success were transmitted to the offspring; gradually the qualities were established and enhanced as secondary sexual characters of the species. But Wallace interpreted the facts quite otherwise. The relatively plain plumage of the female birds was due to natural selection, eliminating those whose conspicuousness during incubation was fatal, fostering those whose colouring was protective. Just as Daines Barrington, a naturalist still remembered as the correspondent of Gilbert White, suggested (1773) that singing-birds were small and hen-birds mute for safety's sake, so Wallace maintained that female birds had forfeited brightness as a ransom for life.

But, leaving the birds, let us take a case which seems to afford better illustration of Darwin's theory of sexual selection—that of spiders. The courtship of these animals has been observed and described by G. W. and E. G. Peckham in a manner so careful that their paper ranks as one of the most important contributions yet made to the theory of sexual selection. 'The fact that in the *Attidæ* the males vie with each other in making an elaborate display, not only of their grace and agility but also of their beauty, before the females, and that the females, after attentively watching the dances and tournaments which have been executed for their gratification, select for their mates the males that they find most pleasing, points strongly to the conclusion that the great differences in colour and in ornament between the males and females of these spiders are the result of sexual selection.' It may be that the American observers have, especially in their psychological language, mingled a little imagination with their induction, but they state a strong case for sexual selection.

The conclusions drawn from the courtship of spiders are not affected by Wallace's criticism so seriously as are those which Darwin drew from the courtship of birds, and this suggests that the wisest position is one of compromise, which recognises that in some cases—e.g. spiders—the external divergence of the sexes may depend upon sexual selection, and that in other cases—e.g. birds—it may depend rather upon natural selection.

But even with this compromise it is difficult to rest satisfied. For before we can believe that attractively bright ornaments could become char-

acteristic of males by sexual selection, or that protectively plain colouring could become characteristic of females by natural selection, we must assume that the qualities of brightness can be entailed in inheritance on the males only, and the qualities of plainness on the females only. But this fundamental assumption has not yet been justified by a sufficiently strong body of facts.

This difficulty arouses scepticism as to the thoroughness of the explanations of secondary sexual characters suggested either by Darwin or by Wallace. We are not surprised, therefore, to find Mivart's explanation of the beauty of males as the direct expression of an internal force, or Mantegazza's hints as to a physiological explanation of the sexual divergence, or Brooks's reference to 'something within the animal which determines that the male should lead and the female follow in the evolution of new breeds.' Geddes advanced further, endeavouring to interpret the secondary sexual characters as outcrops of the relative preponderance of anabolism and katabolism characteristic of females and males respectively. Gay colouring—sometimes at least due to pigmented waste products—is regarded as a characteristic expression of the predominantly katabolic or male sex, and quiet plainness is equally natural to the more anabolic females. But this theory, which seeks to rationalise the variations which Darwin simply postulated, is by no means inconsistent with a recognition of sexual selection as an accelerant directive process in the evolution of male brightness, or of natural selection as a retardative directive process eliminating disadvantageously conspicuous females.

Wallace has also in his work on *Darwinism* (1889) worked towards a rational interpretation of the variations which he was previously content to postulate as facts. For he says that 'ornament is the natural outcome and direct product of superabundant health and vigour,' and is 'due to the general laws of growth and development.' It seems to some that this mode of interpreting characters is of far-reaching importance, and that it affects not only the theory of sexual selection but that of natural selection as well.

The Peckhams do indeed deny that male spiders possess greater vital activity than the females, and they find no relation in either sex between activity and development of colour. But it must be noted that a predominant katabolic diathesis—which is, according to Geddes, the fundamental characteristic of maleness—may be true of male spiders though not expressed in greater vital activity.

We must of course be careful to distinguish that the suggestions made by Geddes, Wallace, and others as to the physiological meaning of sexual characters have to do with primary factors in evolution—i.e. with those which originate variations—while the explanation of the differences in plumage between male and female birds, either by the theory of sexual selection (according to Darwin) or by natural selection (according to Wallace), have to do with secondary factors in evolution—i.e. with those which foster or eliminate variations. Apart from the problem of the origin of the sexual variations the central question with regard to sexual selection by preferential mating is, as Lloyd Morgan says, what guides the variation along special lines leading to heightened beauty. 'Sexual selection by preferential mating involves a standard of taste; that standard has advanced from what we consider a lower to what we consider a higher æsthetic level, not along one line but along many lines. What has guided it along these lines?'

To sum up, the problems involved in sexual selection are (1) what physiological conditions explain the secondary sexual characters which so

often distinguish males and females; (2) to what extent and in what degrees of refinement does preferential mating occur; and (3) to what extent has sexual selection guided the differentiation of the sexes alike in distinctive qualities and in æsthetic sensitiveness? Before these problems can be adequately solved many more facts must be accumulated.

See SEX, DARWINIAN THEORY, EVOLUTION; Darwin, *The Descent of Man and Selection in Relation to Sex* (1871); A. R. Wallace, *Contributions to the Theory of Natural Selection* (1871), and *Darwinism* (1889); St George Mivart, *Lessons from Nature* (1876); W. K. Brooks, *The Law of Heredity* (Baltimore, 1883); P. Geddes, article 'Sex,' *Encyclo. Brit.*; P. Geddes and J. A. Thomson, *The Evolution of Sex* (1889); G. W. and E. G. Peckham, *Observations on Sexual Selection in Spiders of the family Attidae*, *Occas. Papers, Nat. Hist. Soc. Wisconsin* (Milwaukee, 1889); C. Lloyd Morgan, *Animal Life and Intelligence* (1890-91); T. H. Morgan, *Evolution and Adaptation* (1903); J. Arthur Thomson, *System of Animate Nature* (1920); Julian Huxley, *Essays of a Biologist* (1923).

Seychelles, a group of islands belonging to Great Britain, near the middle of the Indian Ocean, 600 miles NE. of Madagascar. Formerly under Mauritius, from 1888 they had a resident administrator, who in 1897 acquired governor's powers, and since 1903 they have had a separate governor. There are thirty larger islands and numerous smaller ones, their total area being 156 sq. m., of which 55 belong to Mahé, the largest (17 miles broad by 7 long) and most important of them. Next in size and importance come Praslin, Silhouette, La Digue, Curieuse, Bird, Frigate, and Denis. They get their French names from having been first colonised by the French in 1742, though they were known to the early Portuguese navigators. The islands were captured from the French by a British ship in 1794, and formally ceded by treaty in 1815. The islands are mountainous, and in Mahé reach close upon 3000 feet. Coral-reefs grow round most of them and the coral is used for house-building. The climate, though tropical (range of thermometer 70° to 93° F.), is tempered by the proximity of the sea, and is very healthy. The soil is fertile and vegetation luxuriant. The principal products and exports are the fibres, nuts, and oil of the coconut palm; but maize, manioc, vanilla, cloves, cinnamon, and other spices are grown and exported to some extent. The Coco de Mer (q.v.) is peculiar to Praslin and one or two more of these islands. Gigantic tortoises, and the edible black tortoise, resort to certain islands of the group, and tortoiseshell is exported. Victoria, the chief town on Mahé, is an imperial naval coaling station, and has a good harbour. Pop. of islands (1881) 14,081; (1921) 24,523—chiefly descendants of the French, Indian coolies, negroes, and British officials.

Seymour, an historic family, originally settled in Normandy at St Maur—whence the name. Coming over to England, they obtained lands in Monmouthshire as early as the 13th century, and in the 14th at Hatch Beauchamp, Somersetshire, by marriage with an heiress of the Beauchamps. In 1497 Sir John Seymour helped to suppress the insurrection of Lord Audley and the Cornish rebels, and subsequently he accompanied Henry VIII. to his wars in France, and to the Field of the Cloth of Gold. His daughter, Jane Seymour (c. 1509-37), became the wife of Henry VIII. and mother of Edward VI.; and his second son, Thomas, created Lord Seymour of Sudeley, became Lord High Admiral of England and the second husband of Henry's widow (Catharine Parr), but ended his life on the scaffold (1549). Sir John's eldest son, Edward, was successively created Viscount Beauchamp,

Earl of Hertford, and Duke of Somerset, and as Protector played the leading part in the first half of the reign of Edward VI. (q.v.). The Protector's eldest son by his second marriage, being created by Elizabeth Earl of Hertford, married the Lady Catharine Grey, a grand-niece of Henry VIII., and sister of the unfortunate Lady Jane Grey—a marriage which entailed on him a nine years' imprisonment and a fine of £15,000. His grandson, who in 1621 succeeded him in the earldom of Hertford, also fell into disgrace for attempting to marry the Lady Arabella Stuart, cousin of James I.; but subsequently, playing a conspicuous part in the royalist cause in the Great Rebellion, obtained a reversal of the Protector's attainder, and in 1660 took his seat in the House of Peers as third Duke of Somerset, although the descendants of the first duke, by his first marriage, were then in existence. He died unmarried in 1671, and the ducal title ultimately passed to a cousin, on whose death it was inherited by Charles Seymour (1661–1748), known in history as the 'Proud Duke of Somerset,' a nobleman whose style of living was ostentatious and haughty in the extreme, and who filled several high posts in the courts of Charles II., William III., and Anne. He married the heiress of the Percies, by whom he had a son, Algernon, seventh duke, who in 1749 was created Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, the ancestor of the present Percy line. On the death of this duke in 1750 a curious peerage case arose, the title being claimed by the descendants of the first duke by his first marriage; and the attorney-general having reported in favour of the claim, Sir Edward Seymour took his seat in the House of Peers as eighth duke. The earldom of Hertford, which became extinct in 1750, was in that same year conferred on this eighth duke's first cousin, Francis, who in 1793 was advanced to the dignity of Marquis, and one of whose great-grandsons, Sir Frederick Beauchamp Paget Seymour, admiral R.N., was in 1882 created Baron Alcester for his services at the bombardment of Alexandria. See Locke, *The Seymour Family* (1911).

Seyne-sur-Mer, LA, a seaport of France (dept. Var), on the Mediterranean, 3 miles SW. of Toulon. Here are fine shipbuilding-yards and a spacious harbour. Pop. 23,000.

Sezze (anc. *Setia*), a city of Italy, situated in a position of great natural strength, on the edge of the Volscian mountains, immediately north of the Pontine marshes and 40 miles SE. of Rome, has a Gothic cathedral and ruins of city walls, terrace walls, &c. (one miscalled a temple of Saturn). At the foot of the hill, near the railway station, are considerable remains of Roman villas. Its wine was preferred to Falernian by Augustus. Pop. (1921) 12,931.

Sfax, a port of Tunis, on the Gulf of Cades, 150 miles S. by E. of the town of Tunis, is surrounded by gardens and suburban villas. The Mohammedans, the Europeans, and the Jews each live in separate quarters; the French camp forms a fourth division. There is an active trade in dates, olive-oil, esparto grass, wool, fruits, sponges, &c. Large quantities of fruit are grown, and cottons, woollens, and silks are manufactured. Pop. 28,000. The town was bombarded by the French in 1881, the opposition here being fierce and fanatical.

Sforza, a celebrated Italian family during the 15th and 16th centuries, the founder of which was a peasant of Cotignola, in the Romagna, by name Muzio Attendolo (1369–1424), who from a wood-cutter became a great *condottiere* and received from Count Alberigo de Barbiano the name of Sforza

('Stormer'—i.e. of cities). He speedily found himself the independent leader of a band of *condottieri*, and as constable to Queen Joanna II. was one of the main supports of the kingdom of Naples. His natural son, FRANCESCO SFORZA, then twenty-three, succeeded, and, as was the custom of the time, sold his sword to the highest bidder, fighting without the slightest scruple for or against the pope, Milan, Venice, and Florence. He invented an improved system of tactics, and it soon came to be taken for granted that victory was certain for the party which he supported. It was thus no great act of condescension in the Duke of Milan, the haughty Visconti, to confer upon him the hand of his only child Bianca and the succession to the duchy. Meantime Sforza took the march of Ancona from the pope (1434), added to it Pesaro (1443), and by a judicious combination of force and stratagem obtained his elevation to the dukedom of Milan (1450) after the decease of his father-in-law. He firmly established his authority over all Lombardy and several districts south of the Po, acquired the esteem of Louis XI., who gave up to him Savona and Genoa, and, after gaining the universal love of his subjects, died 8th March 1466. Though uninstructed he loved and protected letters. Unhappily his successors possessed neither his virtues nor his talents. His son, GALEAZZO-MARIA SFORZA (1466–76), was a tyrant and a monster of debauchery, prodigality, and ferocity, without a single redeeming feature in his character. He was assassinated at the porch of the cathedral of Milan. His son GIOVANNI-GALEAZZO SFORZA (1476–94) succeeded, under the regency of his mother, Bona of Savoy, who held the reins of government with a firm hand. But she was forced to give up (1480) her able coadjutor Simonetta to the vengeance of her brother-in-law, Lodovico Maria, surnamed 'the Moor' from his dark complexion; and three days after Simonetta's execution the ambitious Lodovico banished her, and assumed the regency. Finding the young duke in his way, Lodovico put him and his wife, Isabella of Calabria, in prison, and was immediately threatened with attack by the king of Naples, a danger which he attempted to ward off by giving his daughter Bianca, with a dowry of 400,000 ducats, to the Emperor Maximilian I. and by stirring up Charles VIII. of France to assert his claims to Naples. Soon afterwards Duke Giovanni-Galeazzo died, poisoned, as some believe, by his uncle, 20th October 1494. LODOVICO-MARIA (1494–1500) obtained his investiture as duke, and becoming alarmed at the rapid progress of the French in Italy he joined the league against them, and was rewarded for his perfidy by being driven from his duchy, which was seized by the troops of Louis XII. (1499). The following year he made an ineffectual attempt to regain possession, was made prisoner, and carried to France, where he died in 1510. Of great talents, but low morality, he valued astuteness more than everything else; yet his encouragement of letters and of the fine arts has preserved his name to posterity. His eldest son, MASSIMILIANO SFORZA (1512–15), regained the duchy of Milan after the reverses suffered by Louis XII., and with the aid of the Swiss steadily repulsed the various energetic attempts of the French to recover it; but after the battle of Marignano (1515) he abandoned his rights to the French for a pension of 30,000 ducats, glad to be free from the insolence and exactions of his allies and the attacks of his enemies. His brother FRANCESCO-MARIA SFORZA succeeded nominally to the Milanese after the battle of Pavia, but he was a mere puppet in the hands of Charles V., and on his death, 24th October 1535, and the extinction of the main line of the House of Sforza, the duchy

was quietly swallowed up by Austria. The Dukes of Sforza-Cesarini descend from collateral branches of the family. See Magenta, *Gli Visconti e gli Sforza* (Milan, 1883).

Sgambati, GIOVANNI (1841–1914), Italian pianist and composer, was born in Rome (his mother being British), began the study of music at an early age, and became a protégé of Liszt. He was one of the founders of the *Liceo Musicale* at Rome in 1877, made many brilliant European tours as pianist, but latterly confined himself to teaching in Rome. Sgambati was remarkable for his refusal to bow down to the national operatic tradition, and for his championship of classical instrumental music. His compositions include two symphonies, a requiem, and chamber and piano music.

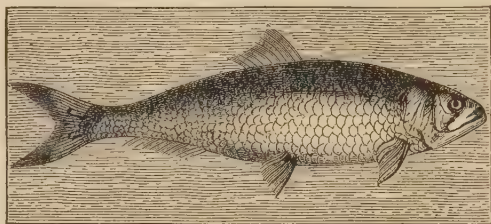
Sgraffito, or SCRATCHED WORK, is the name given to a mode of external wall-decoration practised in Italy, of which examples have been found in Pozzuoli near Naples, of the date of about 200 B.C. The process is accomplished by means of superimposed layers of plaster applied and operated upon in the following manner. First, the wall having been thoroughly moistened to ensure adhesion, a $\frac{3}{4}$ -inch coat of plaster is floated on, and before it is perfectly dry a $\frac{1}{4}$ -inch skin of black, red, or any other coloured plaster that will not fade is applied; when this is set and while it is still wet, a finishing coat of white plaster is added. A full-sized drawing of the design that is to be realised is then transferred to this outer coating, and the outline cut through to the second coat with a sharp instrument, and made broad or narrow according to the effect desired, and where necessary these incisions are enforced by additional lines as shading. The process is an economical mode of obtaining effect, but like 'fresco' requires to be executed while the material is moist, and therefore no more should be prepared than can be immediately operated upon. Examples of the system are to be found in the choir boys' school of St Paul's Cathedral, the inner court of the Science Schools at South Kensington, some private residences, and the interiors of some churches in England. The application of this principle of decoration is not confined to plaster, but extends also to superimposed metals and to pottery. There are 15th-century specimens of sgraffito pottery in the South Kensington Museum. The examples of house-decoration in Italy are of the 15th, 16th, and 17th centuries.

Shabat. See ŠABAC.

Shackleton, SIR ERNEST HENRY, Antarctic explorer, was born 15th February 1874 at Kilkee, County Kildare, was educated at Dulwich College, and at sixteen went to sea. In 1901 he was a member of Scott's expedition. In 1904 he became secretary to the Scottish Geographical Society. His own first expedition of 1907–9 reached 88° 23' S. lat., and pointed the way for Scott's attainment of the pole; his second (1914–16) aimed at the crossing of the Antarctic Continent, but the *Endurance* had to be abandoned in the Weddell Sea. The crew succeeded in reaching Elephant Island, while Shackleton went to South Georgia, crossed its unexplored mountains (with two others), and after several failures brought off the Elephant Island party. He set off again for the Antarctic in 1921, but on 5th January 1922 died off South Georgia. Besides his own works, *The Heart of the Antarctic* (1909) and *South* (1919), see Life by H. R. Mill (1923); Wild, *Shackleton's Last Voyage* (1923); and the article POLAR EXPLORATION.

Shad, a name applied to various fishes in the same genus, *Clupea*, as the herring. To some British species the fishermen apply the name *King of the Herrings*, and very large herring sometimes

turn out to be shad, which may be distinguished by a characteristic notch at the extremity of the upper jaw. Shads are what is called 'anadromous,' that is to say, they go up rivers to spawn. The eggs are numerous, small, heavy, and non-adhesive; they lie free, not buried in the gravel like those of salmon. The Common Shad or Allis Shad (*Clupea alosa*) is found on the British coasts and in the



Common Shad (*Clupea alosa*).

lower part of some of the large rivers, more abundantly in the Severn than in any other British river. It attains a length of two or even three feet and a weight of from four to eight pounds. It has no teeth. There is a single black spot behind the gills. Its flesh is of good flavour. The Twaite Shad (*C. finta*) is more plentiful on the British coasts, and is the common shad of the Thames, but the foul state of the river has now made it of very rare occurrence above London. It is smaller than the Allis Shad, seldom exceeding 16 inches in length; there are small teeth in both jaws, and a row of dusky spots along each side of the body. The flesh is coarser and less esteemed than that of the Allis Shad, but much used for food wherever the fish is plentiful. This species spawns later in the year than the last, and in order to permit it to deposit its spawn its capture in the Thames is prohibited after the end of June. It abounds in many of the rivers of France and other parts of Europe. A species of shad (*Clupea sapidissima*), generally weighing about four or five pounds, but sometimes twelve pounds, is very abundant during some months of the year in some of the North American rivers, as the Hudson, Delaware, Susquehanna, and St Lawrence, and is now bred successfully and in immense numbers in the United States piscicultural establishments. See Regan, *Freshwater Fishes* (1911).

Shaddock (*Citrus decumanus*; see CITRUS), a tree which, like the other species of the same genus, is a native of the East Indies, and which has long been cultivated in the south of Europe. It is said to derive its English name from a Captain Shaddock, by whom it was introduced from China into the West Indies. It is readily distinguished from most of its congeners by its large leaves and broad-winged leaf-stalk; it has very large white flowers, and the fruit is also very large, sometimes weighing ten or even fourteen pounds, roundish, pale yellow; the rind thick, white and spongy within, bitter; the pulp greenish and watery, sub-acid, and subaromatic. It is a pleasant, cooling fruit, and much used for preserves. The tree is rather more tender than the orange, but with proper care is often made to produce fine fruit in orangeries in Britain. Finer and smaller than the Shaddock proper is the Pomelo (also called Pummelo, Pomelmoose, and Grape-fruit), a variety rather larger than an orange which has sometimes a grape-like taste. Both varieties are grown in Florida.

Shadows, as ordinarily understood, are the result of the interception of rays of light by opaque or semi-opaque substances. Close inspection of

any shadow cast by light from a source of finite size, say the sun or a candle-flame, shows that its margin is not clear cut. The size of the source being finite, there must exist certain regions from which the source of light appears to be only partially screened. In these regions the shadow is partial (a 'Penumbra'); whereas in regions from which the source of light is wholly screened by the intercepting substance, the shadow is complete. If the source of light had no appreciable breadth the penumbra would vanish, and the margin of the shadow would be approximately sharp and clear cut, were it not for Diffraction (q.v.). Again, other forms of radiant energy may be intercepted, and corresponding shadows cast. Take, for example, sound. To appreciate the existence of sound shadows we must ourselves get within the shadow, that is, we must set ourselves so that a large obstacle intervenes between us and the source of sound. In such circumstances the intensity of the sound becomes very much diminished. It does not become wholly absent, for, the wave-length of the waves of sound being relatively great, the waves spread by diffraction into the shadowed region, and sound can come round a corner, though with reduced intensity, in a way light, with its short wave-lengths, cannot do. Still, in order that we may hear sound most effectively, the source of sound should be in sight. In electrical radiations shadows also may exist, and may be made evident by suitable means. In the kathode-tube shadows may be cast by obstacles placed so as partially to intercept the stream of 'kathode rays' on their way to form a phosphorescent patch. One and the same substance will not necessarily cast a shadow under all kinds of radiation; it may be opaque to some, not opaque to others of these. A stone wall is opaque to light, but is not opaque to electrical radiations of the relatively great wave-lengths used in Wireless Telegraphy and Telephony (q.v.). Again, rock-salt and glass cast no very apparent light shadows; but with radiant heat glass casts a distinct shadow, while rock-salt casts little or none. See HEAT, and LIGHT; also ECLIPSES.

Shadwell, THOMAS, a dramatic writer of some note in his day, though now only remembered as the 'MacFlecknoe' of Dryden's satire, was born in 1642 in Norfolk. He was educated for the law, but not finding it a pursuit to his mind he deserted it, and after an interval of foreign travel betook himself seriously to literature. His first comedy of *The Sullen Lovers* (1668) had great success, and he continued from year to year to entertain the town with a succession of similar pieces, a complete edition of which was published in four volumes (1720). The immortality which these must have failed to achieve for him he was fated to attain in another way. With Dryden he seems at first to have been on terms of friendly intimacy, and indeed the great poet contributed the prologue to his *True Widow*; but when Dryden flung his *Absalom and Achitophel* and *The Medal* into the cause of the court Shadwell was rash enough to make a gross attack upon him in the *Medal of John Bayes*. Dryden heaped deathless ridicule upon his antagonist in the stinging satire of *MacFlecknoe* and as 'Og' in the second part of *Absalom and Achitophel*. Though his works, hasty and careless as they are, exhibit lively talent and considerable comic force, all that the reading world now knows of Shadwell is that 'Shadwell never deviates into sense.' It was some consolation in 1689 to succeed his enemy in the laureateship, which it became necessary for Dryden to resign. He did not survive long to enjoy it, however, as in 1692 he died—of an overdose of laudanum, it is said. See FLECKNOE.

Shafites, the name of one of the four principal sects of the Sunnites (q.v.), or 'orthodox' Muslims. Its name is received from its founder, Abu Abdallah Mohammed Ibn Idris, called Al-Shāfi, from one of his ancestors who descended from Mohammed's grandfather, Abdul Muttalib.

Shaft. See COLUMN.

Shaftesbury (locally *Shaston*—as in *Jude the Obscure*), a very ancient municipal borough in Dorsetshire, 3 miles SSW. of Semley station and 22 WSW. of Salisbury. It stands on a narrow chalk ridge, and commands magnificent views over Dorset, Somerset, and Wilts. The *Caer Palladur* of the Britons, it was made by King Alfred the seat of a famous abbey of Benedictine nuns (880), whither Edward the Martyr's body was translated in 980, and where Cnut died, 1035. At the date of Domesday Shaftesbury had three mints and twelve churches, but four only remain—St Peter's (Norman) the most interesting. Till 1832 Shaftesbury returned two members, and then till 1885 one.

Shaftesbury, ANTHONY ASHLEY COOPER, EARL OF, was born on 22d July 1621, at Wimborne St Giles in Dorsetshire, the seat of his mother's father, Sir Anthony Ashley (1551–1628), a clerk of the Privy-council. He was the elder son of John Cooper of Rockborne in Hampshire, who next year was created a baronet. His mother died in 1628, his father in 1631; and though he ultimately came into over £6000 a year, his estate was then torn and rent from him by unjust kinsmen to the tune, he tells us, of £20,000. His boyhood was mostly spent at Cashiobury in Herts, Southwick in Hampshire, and Maddington in Wilts, till at sixteen, having had three tutors, he went up as a gentleman commoner to Exeter College, Oxford, where he 'not only obtained the good-will of the wiser and elder sort, but became the leader even of all the rough young men.' He left without a degree, and in February 1639 married Margaret, daughter of the Lord Keeper Coventry. She died, sore lamented by him, in 1649; and nine months later he married Lady Frances Cecil, the Earl of Exeter's sister, who also dying in 1654, in 1655 he married pious Margaret Spencer, the Earl of Sunderland's sister, who survived him till 1693. Only two sons were born to him, both by his second wife, and one of them died in childhood; but by all three marriages he largely strengthened his family connections.

Meanwhile in 1640 he had entered the Short Parliament for Tewkesbury, but he had not a seat in the Long. A royalist colonel (1643), after ten months' service he went over to the parliament, either from pique or from 'the dictates of a good conscience,' and for nine months more commanded their forces in Dorsetshire, then from 1645 to 1652 lived as a great country gentleman. In 1653 he entered Barebone's parliament, and was appointed one of Cromwell's council of state, but from 1655 he was in opposition, and in 1677 we find him claiming to have 'had the honour to have a principal hand in the Restoration.' He was one of the twelve commissioners sent to Breda to invite Charles II. home, and a carriage accident on the way thither caused him a lifelong internal abscess, which in 1666 secured him a lifelong friend in an Oxford student of medicine, afterwards the famous philosopher, John Locke.

For his services he was made a privy-councillor (1660), and next year Baron Ashley and Chancellor of the Exchequer. He served on the trial of the Regicides; proved a diligent minister; supported the war with Holland; and after Clarendon's fall (1667), in which he had no direct share, sided with Buckingham, with whom he formed one of the in-

famous Cabal, and like whom he was fooled as to the Catholic clauses in the secret treaty of Dover (1669-70). He seems to have opposed the 'stop of the exchequer' (1672), which yet he justified; that same year was made Earl of Shaftesbury and Lord Chancellor (he proved a most upright judge); but in 1673, suddenly espousing the popular Protestantism, supported the Test Bill, which broke up the Cabal.

On 9th October, the Great Seal being demanded of him, he uttered one of his memorable sayings, 'It is only laying down my gown, and putting on my sword'; and, the bribe and the dukedom rejected that were designed to purchase his submission, he ranged himself against Danby as a champion of toleration, but for Dissenters only, and figured thenceforth as a defender of national liberties, or rather, it may be, as an unscrupulous demagogue. He opposed Danby's non-resistance Test Bill (1675), and in February 1677, for his daring protest against a fifteen months' prorogation, was sent to the Tower, whence he was only released a year later on making a full submission. As early as 1674 he had feigned apprehensions of a popish massacre; and though the 'Popish Plot' was not of his forging, but Oates's, he it was that passed the base coin, using that two years' terror (1678-80) against his opponents with a ruthless dexterity that must stamp him for ever with infamy. Not even the Habeas Corpus Act (q.v.), long known as Shaftesbury's Act, is a set off against the judicial murder of Lord Stafford, his personal enemy. Still, for a while he seemed to have completely triumphed. The fall of his rival Danby was followed by his own appointment as president of Temple's new Privy-council of thirty members (April 1679), and James's dismissal to Holland by an attempt to exclude him from the succession, in favour, not of William and Mary, but of Shaftesbury's puppet, the bastard Monmouth. That monstrous proposal gave Charles II. his chance, and in October 'Little Sincerity' (as he had nicknamed Shaftesbury) received his congé; and Shaftesbury from that time onward was driven into extremer opposition, indicting James as a recusant (1680), and bringing armed followers to the Oxford parliament (1681). In the July of that year he was again sent to the Tower, on a charge this time of high-treason, and though the Middlesex Whig grand jury threw out the bill in November, and he was consequently released, arrest was again impending, with no such chance of escape. Monmouth and Russell hung back from the open rebellion to which he promised to furnish 'ten thousand brisk City boys,' and, after some weeks' hiding, he fled to Holland early in December 1682. 'Delenda est Carthago' he had quoted against the republic ten years before; 'Carthago nondum deleta' greeted him now when he landed. On 22d January 1683 the 'fiery spirit' passed away at Amsterdam, whence the 'pigny body' was borne home for burial in the place that had given him birth.

Transcendently clever, eloquent, and winning, fairly void too of lust and venality when most men were lustful and venal, Shaftesbury yet stands condemned by the many talents committed to him. He, who might have done so much good, did so little but what was evil. Whether for or against monarchy, for or against republicanism, for or against France, for or against Holland, he was always for himself—self the dominant principle to which alone he was true. At least, if that count for praise, he was the author of party government, ever ready to make capital out of religious animosities, 'atrocities,' perjuries, forgeries, anything. After all that has been written, men seem in doubt still whether Shaftesbury was the 'pure,'

'high-minded,' and 'great statesman' that Mr Christie would make him, or, what Charles pronounced him, 'the wickedest dog in England.' ('I believe, Sir, I am, of a subject—one remembers his witty rejoinder.) Whether, again, was he a deist; and here again we have the well-known story, how one day he said to a friend, 'Men of sense are all of one religion.' 'And what religion is that?' a lady broke in; to whom, turning and bowing, he answered, 'That, madam, men of sense never tell.'

See Dryden's *Absalom and Achitophel* and *Medal* (1681); part iii. of Butler's *Hudibras* (1678); the hostile *History* of Burnet, who is the chief authority for Shaftesbury's 'dotage of astrology'; the able apologetic *Life* by W. D. Christie (2 vols. 1871); the shorter, less partial study by Mr H. D. Traill in the 'English Worthies' series (1886); the article by Mr Osmond Airy in vol. xii. of the *Dictionary of National Biography* (1887); and other works cited at LOCKE and CHARLES II.

ANTHONY ASHLEY COOPER, third Earl of Shaftesbury, philosopher, was born at Exeter House, London, February 26, 1671, the grandson of the above, and son of that 'shapeless lump,' the second earl (1652-99), by Lady Dorothy Manners, daughter of the Earl of Rutland. Locke superintended his education at Clapham under a learned governess, Mistress Elizabeth Birch, who taught him to speak Greek and Latin fluently; three years at Winchester (1683-86) were not happy ones, for his schoolfellows visited on him the sins of his grandfather. With a tutor and two other lads he then travelled for three years more in Italy, Germany, and France, and on his return applied himself to study. A zealous Whig, he sat for Poole (1695-98), but ill-health compelled him to turn from politics to literature; and there is little to record in his life beyond two visits of a twelve-month each to Holland (1698-99, 1703-4), where he lived with the Quaker, Benjamin Furly, and formed friendships with Bayle and Le Clerc; his accession to the earldom (1699); his marriage (1709) to Miss Jane Ewer of Lee, for 'the satisfaction of his friends,' but to his own subsequent contentment; his removal to Naples (1711); and his death there on February 15 (4 o.s.), 1713.

His somewhat superfine writings (Lamb hits off their style as 'genteel') were all, with a single exception, published after 1708, and were mostly collected as *Characteristics of Men, Manners, Opinions, Times* (3 vols. 1711; 2d enlarged ed. 1714) and *Second Characters* (ed. B. Rand, 1914). Here the 'moral realist' expounds his system, which Pope has immortalised in the *Essay on Man*, and which Hunt reduces to the three main contentions, that ridicule is the test of truth, that man possesses a moral sense, and that everything in the world is for the best. An opponent of Locke, and a disciple of the 'Cambridge Platonists,' Shaftesbury found a follower in Hutcheson (q.v.), the founder of the Scottish school of philosophy. Still, like most prophets, he has had least honour in his own country, for, while there he was more attacked as a deist than praised as a philosopher, on the Continent he has attracted the attention, and generally the admiring attention, of thinkers like Leibniz, Voltaire (who, however, ridicules his optimism in *Candide*), Lessing, Diderot, Mendelssohn, and Herder.

See Fowler's *Shaftesbury and Hutcheson* (1882), the *Life* by Rand (1900), J. M. Robertson's edition of the *Characteristics* (1900), Hunt's *Religious Thought in England* (new ed. 1884), Leslie Stephen's *English Thought in the Eighteenth Century* (1876), and monographs by Spicker (Freiburg, 1872) and Gizycki (Leip. 1875).

ANTHONY ASHLEY COOPER, seventh Earl of Shaftesbury, was born in London, 28th April 1801. From the early training of a faithful old servant,

Maria Millis, the future philanthropist received his earliest and deepest religious impressions. He went to Harrow in his twelfth year, and to Christ Church, Oxford, in 1819, and took a first-class in classics in 1822, his M.A. degree in 1832; and he was made D.C.L. in 1841. As Lord Ashley he represented Woodstock in parliament from 1826 to 1830; and joining the Conservatives, then led by Lord Liverpool and Canning, he formed a close friendship with the Duke of Wellington, under whom he obtained the post of Commissioner of the India Board of Control (1828). Under Peel he was made a Lord of the Admiralty in 1834. In 1830 he married Emily, daughter of the fifth Earl Cowper (so that he was thus a connection by marriage of Lord Palmerston); by her he had six sons and four daughters. He represented Dorchester (1830-31), Dorset (1833-46), and Bath from 1847 to 1851, when he succeeded his father as earl. Among his earliest efforts at philanthropic reform was the promotion of two bills for the Regulation of Lunatic Asylums and for the better Treatment of Lunatics (1845), which have been called the Magna Charta of the liberties of the insane. He acted as chairman of the Lunacy Commission from 1828 till his death, a period of fifty-seven years. He took much interest in the passing of an act (1840) to prevent the employment of boy chimney-sweeps. He worked unweariedly for fourteen years on behalf of a bill limiting the hours of labour of women and young persons to ten hours a day, but it was 1847 ere a Ten Hours' Bill was passed, when it so happened he was out of parliament. He would not join Sir R. Peel's administration in 1841, because that statesman refused to countenance the Ten Hours' Bill; but in 1846 he supported Peel in his proposal to repeal the Corn Laws, an action which cost him his seat for Dorsetshire. A speech in connection with his Mines and Collieries Bill (1842) was considered his greatest effort. In 1842 was passed an act for abolishing the apprenticeship in mines, and excluding women and boys under thirteen from working underground; a Printworks Act was passed in 1845; and he was chairman of the Commission of Inquiry which resulted in the passing of the Factory Acts Extension Act (1867) and the Workshop Regulation Act (1867; consolidated 1878). In 1843 he joined the Ragged School movement. Relinquishing society and all amusements, he gave the remainder of his life to other beneficent schemes, and his time and strength were exhausted by letters, interviews, chairmanships, and speeches. Peabody's scheme for bettering the house accommodation of industrial London sprang from Shaftesbury's efforts in the same direction. He was the adviser of Lord Palmerston in many important church appointments. Active and vigorous to the last, he died at Folkestone, 1st October 1885. Although not a great orator, he spoke with neatness, force, and precision. In religious matters he was an out-and-out evangelical, and strenuously opposed ritualism, rationalism, and socialism when divorced from Christianity.

See his *Speeches*, with introduction by himself (1868); Hodder's *Life and Work of the Earl of Shaftesbury* (3 vols. 1886); *Life* by J. L. and B. Hammond (1923) and the *Study* (from the Evangelical point of view) by J. Wesley Brady (1926).

Shag. See CORMORANT.

Shagreen, a term applied to the skins of sharks, rays, and other fish included in the order Selachia, whether they are artificially prepared or not. These skins are furnished with a covering of small nodules or grains of dentine, which is of a hard nature and resists wear of the surface better than ordinary leather. In the shagreen used by

cabinet-makers for smoothing wood, the grains or papillæ are sharp-pointed and closely set, but in the case of the skins of allied species these grains are comparatively flat and of different outlines. Such skins, when prepared like parchment, dyed and smoothed, present an attractive appearance, and are used for covering small caskets, boxes, cigar cases, spectacle cases, and similar articles. Shagreen was formerly a good deal employed for covering also watch cases, instrument cases, &c. The name shagreen (Persian *sâghri*, meaning the back of a beast of burden) is also, and perhaps was originally, applied to the skins or to portions of the skins of horses, asses, and other animals prepared by unhairing and scraping them. Each piece is then stretched on a frame, and while they are still moist the seeds of a species of *Chenopodium* are sprinkled on the surface and forced in by means of the feet or of a press. The skin is then left to dry, and when the seeds are beaten out it has a pitted appearance. It is next pared down with a knife nearly to the bottom of these depressions, after which it is macerated in water till the pits swell and give the skin a pimpled appearance resembling that of a shark. A steeping in a warm solution of soda and afterwards in brine completes the dressing, and it can then be dyed. The covers of old Persian manuscripts are made of this shagreen, which is also used for horse-trappings and shoes in the East. Wood has been embossed by a process somewhat similar to the way leather shagreen is made. See EMBOSSED.

Shâh (Persian, 'king,' 'monarch,' 'prince'), the general title of the supreme ruler in Persia, Afghanistan, and other countries of southern and central Asia. The sovereign, however, may, and outside of Persia frequently does, decline the title, assuming in its place that of Khân (q.v.), an inferior and more common appellation. The same title can also be assumed by the shah's sons, and upon all the princes of the blood the cognomen Shâh-zâda ('king's son') is bestowed. The words *check*, *cheque*, *chess*, *exchequer*, are derivatives.—For Shahpur, see PERSIA; for Shah Shuja, see AFGHANISTAN.

Shahabad, a town of Oudh, 80 miles NW. of Lucknow by rail, with a pop. (1921) of 18,696—less than a third of what it was in the 16th century. In 1868 there was a savage riot here between Hindus and Mussulmans at the Moharram festival.

Shahjahanpur, a town of British India, in the United Provinces, stands 100 miles by rail NW. from Lucknow. It takes its name from Shah-Jehan, in whose reign it was founded in 1647. It was a hot-bed of rebellion during the Mutiny of 1857-58. Sugar is made and exported. Pop. (1921) 72,616.—The *district* has an area of 1726 sq. m. and a pop. (1921) of 839,115.

Shah-Jehan, the fifth of the Mogul emperors of Delhi, was during his father's reign employed in military expeditions against the Rajputs, the independent Mohammedan states of the Deccan, and the Afghan tribes around Kandahar. From 1623 he was in revolt against the Emperor Jahangir, his father, and was still unreconciled at the latter's death in 1627, when he was at once saluted as emperor by the nobles. The chief events of his reign were the war against the Deccan sovereigns, which resulted in the complete destruction of the kingdom of Ahmadnagar (1636), and the subjugation (1636) of those of Bijapur and Golconda; an indecisive contest against the Uzbeks of Balkh (1645-47); attempts to recover Kandahar from the Persians (1637, 1647-53), which, however, was finally lost; and a second successful war, conducted by his son Aurungzebe, against the Deccan princes (1655). But in 1658 the emperor fell

dangerously ill, and his sons commenced to dispute regarding the succession. Ultimately Shah-Jehan was taken prisoner by Aurungzebe, and confined in the citadel of Agra till his death, December 1666. This emperor administered strict justice, and was an able and capable ruler, and a clever financier. The magnificence of his court was unequalled; the splendid 'peacock throne' was constructed by his orders at a cost of nearly £7,000,000. Many magnificent public buildings executed under his direction remain as monuments of his greatness. Chief of these are the superb Taj Mahal, and the lovely 'pearl mosque' at Agra (q.v.), and the palace and great mosque at Delhi (q.v.).

Shah Nameh. See FIRDAUSI.

Shaikh-Othman. See ADEN.

Shairp, JOHN CAMPBELL, one of the Shairps of Houston, Linlithgowshire, was born 30th July 1819. He was educated at the Edinburgh Academy and Glasgow University, whence he went as Snell Exhibitioner to Oxford. There he gained the Newdigate prize for an English poem upon Charles XII., and graduated with second-class honours in 1844. From 1846 to 1857 he was a master at Rugby. From Rugby he went to St Andrews as deputy-professor of Latin. In 1861 he succeeded to the Latin chair, and in 1868, upon the death of Forbes, to the principalship of the United College. In 1877 he was appointed professor of Poetry at Oxford, and reappointed in 1882. He died 18th September 1885.

Shairp was an ideal Scotsman, but with a strong appreciation of English life and thought. His patriotism was almost phenomenal. A summer spent out of Scotland he considered wasted. He explored its loneliest spots and revelled in all its historical associations. The haunts of Jacobites and of Covenanters alike fascinated him, and there are few better companions in the Borderland and the Highlands than his sketches and poems.

His character and thought were moulded by home surroundings, by love of nature and of Wordsworth (his favourite author), by life at Oxford, and by Coleridge, Scott, Keble, Newman, and Erskine of Linlathen. He found the routine work of teaching somewhat irksome, but as a professor he was suggestive, stimulating, and sympathetic. Few have enjoyed the friendship and esteem of so many distinguished men. His prose is clear, simple, and vigorous; his poetry fresh and natural, with a true ring in lowland Scots.

His principal works are *Kilmahoe* (1864), *Studies in Poetry and Philosophy* (1868), *Culture and Religion* (1870), *The Poetic Interpretation of Nature* (1877), *Burns* (1879), *Aspects of Poetry* (1881), *Glen Desseray* (1886), and *Sketches in History and Poetry* (1887). See Prof. Knight's *Principal Shairp and his Friends* (1888).

Shakers, the popular name first applied in derision to 'The United Society of Believers in Christ's Second Appearing,' a sect first heard of in England about 1750. The first leaders of this sect were James Wardley or Wardlaw, a tailor, and Jane, his wife, seceders from Quakerism, who had come under the influence of the 'French Prophets' (q.v.). Jane, especially, claimed to have special spiritual illumination, and to have 'received a call' to go forth and testify for the truth; she proclaimed that the end of all things was at hand, that Christ was coming to reign upon the earth, and that his second appearance would be in the form of a woman, as prefigured in the Psalms. She still adhered to many of the tenets of the Society of Friends, of which she and her husband were members, and preached against war, slavery, profane swearing, and the taking of the legal oath. Among her followers was one Ann Lee, an

uneducated girl of poor parentage, of a highly nervous organisation, a strong will, and ambitiously fond of power, who, professing to have received a spiritual baptism, with a command to go forth and preach this new gospel, began to preach in Toad Lane and the adjacent streets of Manchester. She acquired great power over her hearers, who believed in her as one filled with the Holy Ghost, and speaking with the voice of God. The preaching in the streets, accompanied with shouting, speaking of tongues, and other physical manifestations, excited much public hostility, in consequence of which James and Jane Wardlaw, Ann Lee, and her parents were fined and imprisoned in the Old Bailey Prison in Manchester upon a charge of obstructing the streets and violating the Sabbath. A professed experience of Ann Lee while in prison, in which the Lord Jesus appeared before her and became one with her in form and person, led her to be recognised by Jane Wardlaw and her followers as the female Christ—the Bride of the Lamb—in whose person Christ had come to reign upon the earth. She was henceforth styled 'Mother Ann,' and has since been recognised as the 'Head' of this new order. Her claim to be the female Christ excited only ridicule among her neighbours; hence another special revelation—that the foundations of Christ's kingdom were to be laid in America. In the following year, accompanied by her husband and five of the most prominent members of the society—four men and one woman—she emigrated to America, and settled at Niskayuna, 7 miles from Albany, New York, now Watervliet, distinguished as the parent Shaker settlement in America. Here, in their wilderness home, 'Mother Ann' established absolute community of property, the sacred duty of labour, and enforced upon her followers celibacy, which she had previously taught as becoming to 'Believers,' teaching them that no form of love could be allowed in the Redeemer's kingdom, and that men called into grace must live as the angels, with whom 'there is no marrying nor giving in marriage.' Her husband, Mr Stanley, a blacksmith, to whom she had been married in early life, and by whom she had had four children, all of whom had died in infancy, now left her; but believing herself the 'Bride of the Lamb,' she was not daunted either in purpose or faith.

Early in 1780 Joseph Meacham, a Baptist preacher, and Lucy Wright were sent from New Lebanon to Niskayuna, to seek new light as to the way of salvation. They had both been greatly exercised in the religious revival, accompanied by physical manifestations not understood by the clergy, which had occurred the previous year in Albany and adjacent districts, and now, satisfied that in this new order they had found the key to their religious experiences, became believers in Ann Lee. The first converts to Shakerism in America, they returned home and founded a Shaker settlement at New Lebanon which still exists. The denunciations of Ann Lee against war, and her refusal to take the colonial oath, caused her to be suspected as a British spy, and as such she was for several months imprisoned at Poughkeepsie. In the spring of 1781 she started upon a missionary tour throughout the colonies, which she continued until the autumn of 1783, making a goodly number of converts and laying the foundation of future Shaker settlements. In the autumn of 1784 she died at Watervliet, having previously made over the 'headship' of the society to Joseph Meacham and Lucy Wright as representatives of the dual rule of God, through the male and female Christ, conferring upon Lucy Wright the title of 'Mother Lucy.' Her death was a great shock to her followers, many

of whom believed that she was to live in the physical form for ever upon the earth among her people. Her successors, however, taught them that like the male Christ she had cast off her dress of flesh, and withdrawn from worldly sight, but still lived among her people, visible to eyes exalted by the gift of spiritual sight. So all the saints would remain after death near and be in 'union' with the visible body of Believers, becoming their spiritual teachers. This was accepted as a new and divine revelation, and still is a vital part of the Shaker religion. Under the ministrations of Joseph Meacham and Lucy Wright ten Shaker settlements were formed and an organisation of these settlements effected, bound together by a covenant, recognising the duality of God, the divine mission of Ann Lee as the female Christ, the sacred duty of celibacy, labour, and community of property, and appointing elders and deacons of both sexes for the government of their temporal and spiritual affairs. Joseph Meacham died in 1796, after which for twenty-five years, and until her death, 'Mother Lucy' ruled as the sole head of this new order, discontinuing the title of 'Mother' for the female head of the order at her death, and appointing a successor with the title of 'Elderess,' which title is still given to the female head of the church.

Economically the Shakers were prosperous, and their communistic property at the end of the 19th century was valued at about \$10,000,000. They have now almost disappeared. They are the oldest communistic order in the United States, and by their success demonstrate the possibility—for a time at least—of communistic life. They have two classes of members—the 'Probationers' and 'Covenantors'; the former practically adopt the Shaker doctrines, but retain control over their own property, or, if they have given it to the community, may at any time resume control of it without interest; the latter consecrate themselves and their property to the society, never to be reclaimed by them or their legal heirs. All full members have equal rights in the community, without regard to the property consecrated, only that it is their all. Each Shaker settlement is divided into families, each family consisting of brothers and sisters, who live in the same house, sit upon opposite sides of the same table, and are presided over by an elder and elderess, their temporalities being superintended by a deacon and deaconess. They take their meals in silence, are scrupulously neat, live well but simply, employ no doctors, take no drugs, and are noted for their good gardens, flower-seeds, and medicinal herbs which they cultivate for the market. Their numbers are recruited mostly by young men and women, although occasionally married people with their children join the order. Believing that education is the right of all, they provide liberally for the education of the children left in their care. Their worship consists of vocal and instrumental music, 'dancing and making merry' followed by silent communion, and sermons which in point of devoutness, logic, and rhetorical form may fairly be compared with the sermons of the ordinary Christian churches. Their societies are united in one organisation presided over by the head elderess, assisted by the chief elder. They repudiate a priesthood, monarchy, and paid ministry, and teach that it is not Christ or Ann Lee, but the principles of Christ which must be accepted, and that all may become Christ's by death of the generative nature and an infusion of the Christ spirit. They repudiate the atonement by blood and the resurrection of the body as 'a horrid idea,' anti-Christian and anti-scientific. They have no creed, but depend upon divine revelation, which they claim is progressive according to the needs and

development of humanity. They believe that God is dual—the Eternal Father and the Eternal Mother—the heavenly parents of all beings angelic and human: that the first revelation of God to humanity was as a Great Spirit pervading all things, hence pantheistic worship; that the second revelation of God was as Jehovah; the third through Jesus, a divinely inspired man, representing God as a father; and that in 1770, the beginning of the last cycle, God was revealed in the character of the Eternal Mother—the bearing spirit of all the creation of God in divine love and tenderness—in the person of Ann Lee as the female Christ. Salvation, they teach, can only come by the death of the Adamic or generative life, by which man becomes a new order of being, able to comprehend 'the mysteries of God.' The earthly procreative relation for the purposes of reproduction is fit only for the children of this world, and carnal sexual indulgence is denounced as 'the unfruitful works of darkness.' Labour is 'a sacred and priestly duty,' and the work of the saints is by loving labour bestowed upon the earth to redeem it from the Adamic curse, which was lifted by the coming of Christ; each child born has a title-deed from God for land sufficient for its existence, and in the present advanced stage of civilisation this right is best recognised by a community of interest in the rent obtained for advantages of location, fertility, and mineral wealth. They denounce war, claiming that all disputes of individuals and nations should be settled by arbitration. They oppose the union of church and state, take no interest in governments as now constituted, loving their own country only as the favoured land of God, believing that in America the millennium is first to come when human governments, civil and ecclesiastical, will recognise the female element in harmony with the dual government of God. They make no effort to secure converts, it being a part of their religion that God will designate whom he has called to live in 'union,' and claim that instead of Shakers becoming extinct as is prophesied, and as they admit is prophetically indicated by their loss of membership, 'the first heavens and earth are passing away, and that a new heavens and new earth will be evolved out of the chaotic elements which exist in church and state humanity by the inspiration of revelation from the Christ heavens'—in other words, that the general principles of Shakerism will be established throughout the world.

ENGLISH SHAKERS was the name commonly given to a community calling themselves 'Children of God,' founded by Mary Anne Girling (born 1827), who about 1864 came to believe that she was a new and final incarnation of God, and insisting on celibacy. Founded in London, the communion grew to about 150 members, and in 1872 settled on a property purchased for them, New Forest Lodge, in the New Forest, Hampshire. Though industrious and blameless, they sank into poverty; and, unable to pay their debts, were evicted in December 1873, and subsequently, shrunk to twenty or thirty in number, lived a miserable existence in sheds and temporary shelters. Mrs Girling, who was confident she would never die, did die of cancer, 18th September 1886, and her sect collapsed.

See Elder F. W. Evans, *The Shakers* (New York, 1859), his *Autobiography of a Shaker* (1879), the Shaker magazine; also Eads, *Shaker Sermons* (1879).

Shakespeare, WILLIAM (1564-1616), dramatist, poet, and actor, was born at Stratford-on-Avon in April 1564. The details of his early life are somewhat meagre. This is not surprising, for in the 17th century there was little of that curiosity in the author's private life which plays so important a part in modern criticism. No attempt was made to write a life of Shakespeare

until at least two generations after his death, when most of the details had been forgotten. The chief sources of biography are: (a) Records (legal, financial, parochial, &c.), such as the entry in the registers of the parish church at Stratford-on-Avon of his baptism on 26th April 1564, and his burial on 25th April 1616; records of payments in the accounts of the Lord Chamberlain for performances of the players at Court in which Shakespeare's name is mentioned; the signed depositions dated 11th May 1612, in the case of *Bellott v. Montjoy*, when Shakespeare gave evidence; the agreement to purchase property in the Blackfriars (now in the Guildhall); his last will (in Somerset House), signed on 25th March 1616. Shakespeare's name occurs frequently in such documents; they are the most valuable records of fact, but they throw little light on his personality. (b) Jottings and biographies. A brief biographical notice is to be found in *The Worthies of England* (1662) of Thomas Fuller (q.v.). John Aubrey, friend of Antony à Wood, collected in his *Brief Lives* (ed. A. C. Clark), a few anecdotes from William Beeston, an old actor (died 1682), whose father Christopher was a member of Shakespeare's company. Other stories and traditions are recorded by the Rev. John Ward, vicar of Stratford 1662-68, the Rev. William Fulman, Archdeacon Davies, John Dowdall, who visited Stratford in 1693, William Oldys the antiquary (1696-1761), and others. The first formal biography was written by Nicholas Rowe, the dramatist, and prefixed to his edition of Shakespeare's works in 1709. Rowe was much indebted to William Betterton, the Restoration actor, who had made a journey to Stratford to collect such traditions as still survived. Anecdotes first written down fifty to a hundred years after Shakespeare's death are naturally to be received with caution; but it is to be noted that most of Rowe's statements are confirmed from independent sources, which were not accessible to him. (c) Contemporary notices. There are many references to and quotations from Shakespeare's works in the writings of his contemporaries from which it is possible to estimate his growing reputation. (d) Shakespeare's own works. These are a dangerous source for the biographer. Shakespeare is so many-sided, and his characters are so diverse, that any attempt to distil 'the real Shakespeare' is largely a waste of labour, though several writers have made the attempt.

Shakespeare's father, John Shakespeare, was a leading citizen of Stratford, who about 1557 married Mary Arden, the youngest daughter of Robert Arden, a farmer of Wilmcote, near Stratford, a man of some means. William was the third child and the eldest son of a family of eight. John Shakespeare is variously described as farmer, glover, dealer in wool, and butcher; there was nothing unusual in this combination of trades. At the time of the poet's birth he was a man of comfortable means; in 1565 he was made an alderman, in 1568 he became bailiff—the highest municipal officer—and in 1571 chief alderman. After 1578, however, he took less part in the affairs of the town, and his business seems to have failed.

Little is known of Shakespeare's early life from the records. Rowe states 'He was the son of Mr John Shakespeare, and was born at Stratford-upon-Avon, in Warwickshire, in April 1564. His family, as appears by the register and other public writings relating to that town, were of good figure and fashion there, and are mentioned as gentlemen. His father, who was a considerable dealer in wool, had so large a family, ten children in all, that, though he was his eldest son, he could give him no better education than his own employment. He

had bred him, 'tis true, for some time at a free-school, where, 'tis probable, he acquired that little Latin he was master of; but the narrowness of his circumstances, and the want of his assistance at home, forced his father to withdraw him from thence, and unhappily prevented his further proficiency in that language. Upon his leaving school he seems to have given entirely into that way of living which his father proposed to him; and, in order to settle in the world after a family manner, he thought fit to marry while he was yet very young. His wife was the daughter of one Hathaway, said to have been a substantial yeoman in the neighbourhood of Stratford.'

Shakespeare's marriage to Anne Hathaway was apparently a hasty affair, for on 28th November 1582 a special licence was issued to two friends of the Hathaway family to allow the marriage to take place upon once asking of the banns; Shakespeare was then aged eighteen, his wife twenty-six. On 26th May 1583 their first child, Susanna, was baptised in Stratford Church; and on 2nd February 1585 twins, Hamnet and Judith, were baptised. In 1589 Shakespeare's name is joined with those of his parents in some legal proceedings before the Queen's Bench. No other records of this period survive. Rowe continues: 'In this kind of settlement he continued for some time, till an extravagance that he was guilty of forced him both out of his country and that way of living which he had taken up. . . . He had, by a misfortune common enough to young fellows, fallen into ill company, and amongst them, some that made a practice of deer-stealing, engaged him more than once in the robbing a park that belonged to Sir Thomas Lucy of Charlecot, near Stratford. For this he was prosecuted by that gentleman, as he thought, somewhat too severely; and, in order to revenge that ill usage, he made a ballad upon him. And though this, probably the first essay of his poetry, be lost, yet it is said to have been so very bitter that it redoubled the prosecution against him to that degree that he was obliged to leave his business and family in Warwickshire for some time and shelter himself in London. It is at this time, and upon this accident, that he is said to have made his first acquaintance in the playhouse. He was received into the company then in being, at first in a very mean rank; but his admirable wit and the natural turn of it to the stage, soon distinguished him, if not as an extraordinary actor, yet as a very excellent writer. His name is printed, as the custom was in those times, amongst those of the other players, before some old plays, but without any particular account of what sort of parts he used to play; and, though I have inquired, I could never meet with any further account of him this way, than the top of his performance was the ghost in his own *Hamlet*.' Aubrey (who is usually unreliable) states, on the authority of Beeston, that 'he had been in his younger years a school-master in the country.' Dr Johnson tells the story that 'his first expedient [on coming to London] was to wait at the door of the playhouse and hold the horses of those who had no servants, that they might be ready again after the performance.' It is difficult to say how far these traditions are founded on fact. Sir Thomas Lucy did not keep deer at Charlecot, but as he certainly seems to be pilloried as Justice Shallow (in *The Merry Wives of Windsor*) who also bore 'lucres' (or 'louses' as Sir Hugh Evans calls them) in his coat of arms, there seems to have been some truth in the story. Apart from these traditions it is not known when or why Shakespeare came to London or what he was doing between 1585 and 1592 when the first reference to him occurs in Robert Greene's *Groatsworth of Wit bought with a million of repentance*.

Greene (q.v.), one of the most popular pamphleteers and dramatists of his time, had lived a life of alternate excess and repentance. In August 1592, as he was dying, he wrote a letter to 'Those Gentlemen his Quondam acquaintance that spend their wits in making plays' (identified with Marlowe, Nashe and Peele) in which he warns them against the ingratitude of the players whose fortunes the playwrights had made. 'Yes, trust them not; for there is an upstart Crow, beautified with our feathers, that with his *Tiger's heart wrapped in a Player's hide*, supposes he is as able to bumbast out a blank verse as the best of you; and being an absolute *Johannes fac totum*, is in his own conceit the onely Shake-scene in a country.' The line italicised is a parody of 'O tiger's heart, wrapt in a woman's hide,' from the third part of *Henry VI.* (I. iv. 137), and the natural inference is that Shakespeare had begun to make a name for himself by revising the work of other dramatists. When Greene died on 2nd September, some of his papers were hurriedly put together for the press by Henry Chettle and 'entered' for publication on 20th September. The book caused considerable stir, and Nashe was suspected by some of having been concerned in its issue, but he vigorously disclaimed any connection with this 'scald, trivial, lying pamphlet.' Apparently a protest was made on Shakespeare's behalf, for when Chettle published his own *Kind-heart's Dream* some weeks later, he remarks in the preface 'To the Gentlemen Readers' 'With neither of them that take offence was I acquainted, and with one of them I care not if I never be: the other, whom at that time I did not so much spare as since I wish I had, for that as I have moderated the heat of living writers, and might have used my own discretion, (especially in such a case)—the author being dead—that I did not, I am as sorry as if the original fault had been my fault, because myself have seen his demeanor no less civil than he excellent in the quality he professes. Besides, divers of worship have reported his uprightness of dealing which argues his honesty, and his facetious grace in writing that approves his art.'

Elizabethan drama was not regarded as literature. The players were concerned with the difficult task of making a living, and their relations with dramatists were strictly commercial. Plays were regarded as so much merchandise, and, more often than not, were written by two or more writers in collaboration. Once the manuscript was sold to the players, it became their absolute property, and they cut, revised, or added to it to suit their own convenience. Shakespeare began by refurbishing old plays, and afterwards he seems whenever possible to have used an old play as the basis of his own work. Nor did he hesitate to revise or rewrite his own plays. *Love's Labour's Lost* and *Troilus and Cressida*, for instance, contain signs of alteration at different periods, whilst in *Macbeth*, the second scene and other passages are probably revisions made to the play by some other dramatist after Shakespeare's retirement. These business methods cause much complication in estimating questions of date, style, and authorship. Generally speaking, however, there are certain tests which can be applied to determine the date of a play; they are—(1) external; (2) topical allusions (or 'gags') in the play itself which can be dated; and (3) the evidence of style.

(1) External evidence is of several kinds. A certain Francis Meres in 1598 wrote *Palladis Tamia* or *The Wits Treasury*, in which he tried to show that the writers of England were equal to the great writers of antiquity. 'As Plautus and Seneca are accounted the best for Comedy and Tragedy among the Latins, so Shakespeare among

the English is the most excellent in both kinds for the stage; for Comedy, witness his *Gentlemen of Verona*, his *Errors*, his *Love Labors Lost*, his *Love Labors Won*, his *Midsummers Night Dream*, and his *Merchant of Venice*; for Tragedy his *Richard the 2*, *Richard the 3*, *Henry the 4*, *King John*, *Titus Andronicus*, and his *Romeo and Juliet*.' This list fixes the latest date for the plays mentioned, and also establishes presumptive evidence that the other great plays, not in the list, are later. References and quotations in the works of other writers, which can be dated, also provide evidence. Entries in the *Stationers' Register* are most important. It was a regulation of the Stationers' Company (which included printers) that all books before publication should be entered in the hall-book of the Company. Many of Shakespeare's plays were thus entered during his lifetime, though not all the plays thus entered were printed immediately. As a general principle the players objected to the printing of their plays and sometimes they arranged that a play should be entered to prevent unauthorised publication; *As You Like It*, for instance, though entered on 4th August 1600 was not published until the First Folio 1623.

(2) The value of topical allusions varies. In the Prologue to *Henry V.*, reference is made to the departure of Essex for Ireland; in *Macbeth* (II. iii. 10) the remarks of the Porter, 'Faith, here's an equivocator, that could swear in both the scales against either scale, who committed treason enough for God's sake, yet could not equivocate to Heaven,' seem to be pointed at the famous plea of equivocation set up by Fr. Garnet the Jesuit, who was executed for complicity in the Gunpowder Plot. But topical allusions are not always reliable; a 'gag' must be kept up to date or it loses its point, and the players had no hesitation in making alterations in the text.

(3) The evidence of style is of considerable value. It is noticeable that in the early plays Shakespeare adheres rigidly to his metre, and his lines are 'end-stopped,' that is, the sense line corresponds with the verse line. As time went on, his use of metre became more and more free, until in the *Tempest*, his last play, it is almost rare to find an end-stopped line. In the early plays rhymed lines are frequent; they are used rarely in the later. Moreover, as time went on, the words became more densely charged with meaning. The change of style can be illustrated by brief quotations. In *Julius Caesar* (c. 1600) Caesar says:

Cowards die many times before their deaths;
The valiant never taste of death but once.
Of all the wonders that I yet have heard,
It seems to me most strange that men should fear;
Seeing that death, a necessary end,
Will come when it will come. (II. ii. 36.)

In *King Lear* (c. 1606), a similar thought is condensed to:

Men must endure
Their going hence, even as their coming hither:
Ripeness is all. (V. ii. 11.)

The style of a play is naturally only a rough indication of date, but where there is general agreement between the external, internal, and stylistic evidences, a play can be dated with some accuracy.

Elizabethan players had to cater for two very distinct types of audience, the popular in their public playhouses, and the courtly at the houses of great noblemen or the court. Most of Shakespeare's plays were written for the public stages, but a few (such as *A Midsummer Night's Dream* and *Love's Labour's Lost*) were certainly intended for private performance.

Shakespeare's first dramatic work was to make additions and alterations to the old plays. The

three parts of *Henry VI.* are included in the editions of his works, but few of the scenes in these plays are of his writing. Other plays of this early period are *The Two Gentlemen of Verona*, *The Comedy of Errors*, *Titus Andronicus*, *The Taming of the Shrew*, *King John*, and *Love's Labour's Lost*.

Love's Labour's Lost is the most interesting of the group. It is probably the first play completely Shakespeare's; it was written for a private audience, and satirises certain prominent persons—probably Sir Walter Raleigh and his coterie. Much of the satire is now inexplicable, but there are some very fine poetical speeches put into the mouth of Berowne, particularly the defence of 'Barbarism' and the praise of love. Shakespeare made alterations to the play about 1598, the new and the old versions of the recast speeches being clearly discernible in the text. The play was again revived for Queen Anne, wife of King James I., in 1604.

Shakespeare definitely came to the fore in the spring of 1593 with the publication of *Venus and Adonis*, which was 'entered' on 18th April. The poem tells the story of Venus's unrequited passion for Adonis; it was a great success, and went into seven editions in nine years. *Venus and Adonis* is dedicated to Henry Wriothesley, 3rd Earl of Southampton and Baron of Titchfield. Southampton was then aged nineteen; he was the ward of William Cecil, Lord Burleigh, and was regarded as a young man of great promise. During the next twelve months an intimacy, which must have been close, developed between Shakespeare and Southampton. *The Rape of Lucrece*, which Shakespeare brought out in the next year, is also dedicated to Southampton, but the difference in tone in the second dedication is very noticeable. The friendship between player and nobleman apparently caused much unfavourable comment. In a book entitled *Willobie His Aviso* (1594) considerable scandal is retailed concerning a certain young man 'H. W.' and his familiar friend 'W. S.' the 'old player'; there can be little doubt that Wriothesley and Shakespeare are intended.

It is probable that many of the *Sonnets* were written about this time, though they were not published until 1609, and then apparently without Shakespeare's knowledge or consent. Most of them are addressed to a young man, who is the poet's patron (probably, though not certainly, the Earl of Southampton), the last twenty-seven are concerned with a 'dark lady' who was the poet's mistress. Without some new discovery it is not possible, in spite of the ingenuity of many critics, to say how far the story which the *Sonnets* tell is autobiographical, symbolic, or simply poetic fiction. It must be remembered that sonneteering was a fashion in the 1590's, and that 'the truest poetry is the most feigning.'

The year 1593 very definitely marks the end of the first period of Elizabethan drama. In the summer a severe epidemic of the plague broke out, the theatres were shut, and the players forced to go on tour. The plague continued for many months, and not until the summer of 1594 did playing begin again in London. Many changes had taken place. The two great dramatists of Shakespeare's apprenticeship had died—Greene in 1592, Marlowe on 30th May 1593; a third, Thomas Kyd, died in December. Moreover, the players' companies had been so reduced by the troubles of these months that complete reorganisation was necessary. When the plague subsided, the company best known as The Lord Chamberlain's Men (including Shakespeare, Richard Burbage the tragedian, Will Kempe the clown, Heming and Condell, afterwards the editors of the first folio of Shakespeare's works) was reformed, and took up its headquarters at The Theatre

in Shoreditch, which was owned by Burbage's father. The Chamberlain's Men, thanks to the combination of Burbage's skill with Shakespeare's drama, prospered, and soon became recognised as the leading company. During the next three years (1594-97) Shakespeare wrote *Richard II.*, *A Midsummer Night's Dream*, *All's Well that Ends Well*, *The Taming of the Shrew*, *The Merchant of Venice*, and *Romeo and Juliet*.

Several facts connected with Shakespeare's private life at this period are known. His only son Hamnet died, and was buried at Stratford on 11th August 1596. About the same time John Shakespeare, his father, applied to the Herald's College for the right to assume a coat-of-arms as a gentleman. A draft was prepared, but certain difficulties were raised, and the grant was not finally made until three years later. The arms assigned were 'Gold on a bend sable, a spear of the first, the point steeled proper, and for his crest or cognisance a falcon, his wings displayed argent, standing on a wreath of his colours, supporting a spear gold steeled as aforesaid.' The motto chosen was 'Non sans droict.' This coat-of-arms is carved above the effigy of Shakespeare in Stratford Church.

On 4th May 1597 Shakespeare bought New Place, one of the largest houses in Stratford, for £60—a considerable sum at the time. In this year the town of Stratford was in financial difficulties, and one of the leading citizens, Richard Quyny, was despatched to London to plead for relief and help. A considerable body of correspondence relating to Quyny's mission survives at Stratford, in which Shakespeare is several times mentioned; it includes a letter written on 28th October 1598 by Quyny to Shakespeare, in which he asks for a loan of £30. It is clear from these records that Shakespeare was now a man of means, and highly regarded by his fellow-townsmen. In 1602 he purchased 107 acres of arable land at Stratford for £320; and in 1605 he paid £440 for a half-share of the Stratford tithes.

In April 1597 the lease of the ground on which The Theatre was built expired, and owing to disputes with the landlord the company was obliged to move to The Curtain, another playhouse in the Shoreditch neighbourhood. Here probably were first acted the two parts of *Henry IV.* and *Henry V.*

The two parts of *Henry IV.* and *Henry V.* form a trilogy; they are based on Holinshed's *Chronicles*, a favourite source for historical drama, and an old play, *The Famous Victories of Henry V.* In writing the first part, Shakespeare may be said for the first time to have reached perfection in his craftsmanship. The main story deals with the rebellion of Henry 'Hotspur' and his death at the hands of Prince Henry at the battle of Shrewsbury. The historical characters are admirably drawn and every scene lives, but all are dwarfed by the gigantic bulk of Sir John Falstaff, the greatest comic character in all literature. When first produced, the fat knight was called Sir John Oldcastle. The real Oldcastle was executed for Lollardy under Henry V., and his descendant Lord Cobham protested against this libellous representation of his ancestor. The name was then altered to Falstaff, from Sir John Fastolf, one of the English commanders in France during the reign of Henry VI. In the second part of *Henry IV.* more of Falstaff's disreputable friends are introduced, including Doll Tearsheet, a prostitute, and Ancient Pistol, whose peculiar vocabulary is made up of scraps of bombastic phrases misquoted from the plays of other companies. It is not surprising that the Admiral's Men—the chief rivals of the Chamberlain's—should have answered by

setting their playwrights at work on a 'true and honourable history of the life of Sir John Oldcastle, the good Lord Cobham.' Falstaff is shown as Prince Hal's companion in roguery in the first part; but in the second he has less to do with the prince. When King Henry IV. dies and the prince succeeds to the throne Falstaff is rejected, and, as we are told in *Henry V.*, dies of a broken heart. Falstaff is so lovable a rogue that it is difficult to forgive the king; but it must be granted that he brings his dismissal on himself by appearing at a most inopportune moment, and even Shakespeare could scarcely have found a suitable place for him in the Council of State.

Henry V. is sometimes called Shakespeare's ideal king, and rival critics attack or applaud his character according to their preference for the man of thought or the man of action. Shakespeare, however, had no illusions about the real nature either of Henry V. or of his father; he makes both of them, in moments of candour, acknowledge themselves to be usurpers, and he shows quite frankly that Henry V. accepted the advice of his dying father to make war on France in order that public opinion might be distracted from prying too closely into his crooked title to the throne.

Rowe records the tradition that Queen Elizabeth was so taken with Falstaff that she ordered Shakespeare to write another play showing him in love. The result was *The Merry Wives of Windsor*, written in fifteen days. Careful examination of the text confirms Rowe's story; the play was founded on an old comedy of intrigue which was rewritten in haste. Both *II. Henry IV.* and *The Merry Wives of Windsor* are full of references to Shakespeare's own home county.

The dispute between the Chamberlain's Men and their landlord over the tenancy of The Theatre still continued, and it became clear that unless something drastic was done, the valuable building material and fittings would be lost to the company. Accordingly, at the end of December 1598, they leased a piece of ground on the south side of the Thames near Southwark Cathedral. This done, they proceeded, with the aid of a builder and his men, to tear down the timber structure of The Theatre for use in the construction of a new playhouse—the famous Globe. The Globe was completed in the summer of 1599 and thither the Chamberlain's Men moved.

The usual financial arrangement at an Elizabethan theatre was for the receipts to be divided between the players and the owners of the building, technically known as the 'housekeepers.' The players' portion was then subdivided into shares among the individual members of the company. When the Globe Theatre was built it was necessary to raise new capital; the money was found by the players themselves, with the result that Shakespeare became a 'housekeeper' in the new theatre, and so drew shares both as actor and as owner.

Amongst the first plays to be staged in the new theatre were the three romantic comedies, *Twelfth Night*, *Much Ado About Nothing*, and *As You Like It*.

Of these *Twelfth Night* is the best constructed of all Shakespeare's comedies; the plot is complicated, and, as usual, there are several stories running side by side—the adventures of Viola and her twin brother Sebastian, the gulling of Malvolio and the misfortunes of Sir Andrew Aguecheek; but the various plots are so skilfully blended that they form a complete and integral whole. Viola is perhaps the deepest of all Shakespeare's heroines, and more than once the play verges on tragedy. The use of song is noteworthy, especially in Act II. scene iv., where the clown, by singing 'Come away,

come away, death,' creates the right emotional atmosphere for Viola's indirect, but moving, declaration of her love for Orsino.

Much Ado About Nothing, though a most successful play on the stage, is not so well constructed. The play begins with the return of Don Pedro and his officers, Benedick and Claudio, from the wars. Claudio, having fallen in love with Hero, the daughter of Leonato, governor of Messina, asks Don Pedro to woo the lady and her father for him. While he is waiting for the result, Don John, the prince's bastard brother, a thorough-paced villain, persuades Claudio that Don Pedro is wooing for himself. It appears as if the usual dramatic complications and misunderstandings are to follow, but, before Claudio has time to protest, everything is satisfactorily explained, and Claudio and Hero are betrothed. But a more serious problem is that, as the plot stands, the evidence offered to Claudio that Hero is unfaithful to him before marriage is so slight that his behaviour is incredible. The most probable explanation is that the play contains two *strata*, the Hero-Claudio plot being the original story. When rewritten about 1599, Shakespeare elaborated the characters of Benedick and Beatrice, and was thus obliged to compress the earlier plot to make room for the additions. This theory is supported by the fact that the Hero-Claudio scenes contain passages of verse written in Shakespeare's earlier manner, while the rest of the play is mainly in prose. It is, however dangerous to dogmatise on Shakespeare's use of prose and verse. When Beatrice has been persuaded that Benedick loves her, she breaks out into a soliloquy of ten-rhymed lines. The effect, doubtless not an accident, is to show Beatrice's character in an entirely new light; her 'maiden pride' and 'wild heart' were assumed, the real Beatrice is as romantic and maidenly as any.

As You Like It has often been acclaimed as a piece of wholly joyous pastoral comedy. More probably it is a subtle satire on pastoralism. Rosalind, disguised as a forester, Corin, Sylvius, and Phebe are conventional pastoralists, but two real yokels, William and Audrey, are introduced to show the difference between reality and romance. The whole question of the advantages of the shepherd's life is debated by Touchstone and Corin at some length; and Jaques is of opinion that life under the greenwood tree is only fit for the gross fools who suffer such discomforts as winter and rough weather 'a stubborn will to please.' There is, too, a genial cynicism about the play, especially in Rosalind's homilies on love, which suggests that both Shakespeare and the audience for whom he was writing were beginning to reject the conventional values of the romance writers.

At this time a notable change can be seen in Shakespeare's dramatic style and method. In the earlier plays he is interested chiefly in plot and story; in the period 1600 to 1607 he is more interested in character. There was indeed a very general interest in psychology in the first quarter of the 17th century, and on the stage a new era opens with Ben Jonson's play, *Every Man in His Humour*, first played at The Curtain in September 1598, in which Shakespeare took a part, probably that of Edward Knowell, senior. Other changes were taking place in theatrical conditions at this time. Two companies of boy actors, recruited from the choir boys of the Chapel Royal and St Paul's, were acting at the private theatres in Blackfriars and Whitefriars, where they were enthusiastically patronised by a fashionable and critical audience. The tone of these private playhouses, in contrast to the general rowdiness of the public theatres, introduced several new elements into English drama; criticism became keener,

taste improved, and gentlemen authors were attracted to turn dramatist. Accordingly, a new interest arises in 'problem plays,' which are usually tragedies, and comedies of 'humours,' wherein certain types of character are analysed, dissected, and satirised.

There is little trace of this new psychological interest in *Twelfth Night*; it is noticeable in the 'humours' of Beatrice and Benedick in *Much Ado About Nothing*; it becomes prominent in *As You Like It*, wherein the melancholy Jaques is a most important character, and yet has no place in the development of the plot. He exists simply as a most delightful study of the 'melancholic humour.' Shakespeare, however, reacted to the movements of taste and thought by instinct; unlike his great contemporary Ben Jonson, he was never a slave to critical theories.

About 1600 Shakespeare returned to tragedy, and in the next six years he wrote *Julius Caesar*, *Hamlet*, *Othello*, *Macbeth*, and *Lear*.

Julius Caesar and the other Roman plays (*Antony and Cleopatra* and *Coriolanus*) are founded on Plutarch's *Lives of the Noble Grecians and Romans*, nobly translated into English by Sir Thomas North, from the French version of Amyot. Plutarch (q.v.) was interested rather in character than in scientific history; and his 'Lives' are full of picturesque anecdotes, which provide admirable material for the dramatist. *Julius Caesar* is the tragedy rather of Brutus than of Caesar. Brutus is shown as an idealist and a patriot, but he lacks imagination and a practical knowledge of common things. He is led by the more practical Cassius into the plot against Caesar, but once he has joined the conspirators he takes the lead and is responsible for its ultimate failure. After Caesar's assassination, the play is concerned with the rise of Antony and the failure of the conspiracy in the deaths of Cassius and Brutus. Caesar is portrayed as a somewhat superstitious tyrant who is beginning to fail, physically and mentally. This treatment of the great dictator has been much criticised, but it is probably historically accurate and certainly dramatically true; had Caesar been represented otherwise, there could have been no justification for Brutus.

Hamlet is from nearly every point of view the most interesting of all Shakespeare's plays. It was founded on an old play (possibly by Kyd), and no less than three early versions exist. The first (known as the First Quarto, 1603) is a pirated text, either taken down in shorthand at a performance or else put together from memory. This version differs in many respects from the final version, and it preserves large passages written in an early style. Probably it represents a poor transcript of the play, made at a time when Shakespeare had partially rewritten the old drama but had still left many lines unrevised. The Second Quarto, 1604, was then published 'according to the true and perfect copy': it gives the play substantially as printed in a modern edition. It is now generally held that this quarto was set up direct from Shakespeare's own manuscript, and retains many of his spellings. The third version is that in the First Folio, 1623: it omits some passages and adds a few others. Modern editions of *Hamlet* are made up of a combination of the Second Quarto and the First Folio. The character of Hamlet has been much debated, and in every generation critics have held different views. Goethe declared that 'it is clear that Shakespeare sought to depict a great deed laid upon a soul unequal to the performance of it. . . . Here is an oak-tree planted in a costly vase, which should have received into its bosom only lovely flowers; the roots spread out, the vase is shivered.' The general impression formed by

critics of the 19th century was that Prince Hamlet, though endowed with every virtue, was unfortunately cursed with an oversensitive mind which betrayed him into reflection every time action was needed. It is doubtful whether such a character would have been understood in Elizabethan times. The 'problems' are much reduced when it is remembered that *Hamlet* belongs to a well-known type of Elizabethan drama—the Revenge Play. A Revenge Play had certain conventions which were quite familiar to playgoers who expected the venger to be faced with many obstacles before he finally reached his victim.

Macbeth (1603-6) is the tragedy of a conflict in a man's soul between imagination and ambition. Macbeth's ambitions are boundless, but until his wife urges him on they are checked by his finer feelings. He murders his king while a guest in his own castle, but he can never stifle his imagination, which betrays him again and again, until he envies the dead Duncan for being at peace. The play is somewhat uneven, and contains work which is not Shakespeare's, but the soliloquies, the 'atmosphere' of the murder-scene, and the dramatic irony, especially of the sleep-walking scene, are nowhere surpassed.

In *Othello* (performed at court on 1st November 1604) Shakespeare is concerned with the terrible results which follow when good but simple-minded men and women are unconsciously brought into conflict with an evil and subtle villain. Iago's apparent joy in villainy is not entirely motiveless, nor is it the malignity of one who has chosen evil to be his good: its source lies rather in disappointed vanity. At the beginning of the play he has been passed over in favour of Cassio, whom he despises, but he refuses to face the truth that Othello has chosen the better man. Instead, his vanity suggests that he has suffered impossible wrongs both from Cassio and Othello, and it urges him to blast the happiness of his adversaries in order that he may convince himself, cost what it may, that he is the real master of their fate.

King Lear is Shakespeare's sublimest tragedy, and in it man seems to be at the mercy of careless powers 'who kill us for their sport.' The story of the old king and his three daughters was well known in English literature, and had already been acted on the stage. In all the other versions the ending is happy, but in Shakespeare's play the passions roused are so stupendous that no happy ending is possible. In this play, too, the one character who clearly sees his own purpose is the evil Edmund, the bastard, whose mind has been warped by his crooked birth, and who from the first turns to Nature—the law of the wild beast—as his goddess. The play is so moving that it becomes almost intolerable when acted, the blinding of Gloucester being especially shocking to a modern audience. Shakespeare's audiences, more used to such scenes, seem not to have been excessively affected by the tragedy, for it was chosen as one of the plays to be acted as part of the Christmas festivities at court on 26th December 1606. After the Restoration, however, taste had changed, and from 1681 until the 19th century English audiences had to be content with the rewritten version of Nahum Tate, in which all ends happily with Cordelia married to Edgar, and Lear placed in comfortable retirement with Kent and Gloucester.

Two other plays, in their present form, probably belong to this period, *Troilus and Cressida* and *Measure for Measure*; each is full of problems for the scholar, and in each there seem to be many lines which are either early work or else not from Shakespeare's pen. *Troilus and Cressida* has never been a favourite, though Ulysses's words

to the Greek generals on 'Degree' and to Achilles on 'Ingratitude' are among Shakespeare's finest set speeches. It has offended critics because it refuses to fit into any critical category, and, too, because the Greek and Trojan heroes are represented as utterly degraded; their story is, in Thersites's words, 'nothing but lechery, all incontinent varlets.' Hector, the only fine character, is treacherously murdered by Achilles, and the play ends with the cynical comments of Pandarus on his trade of go-between. *Measure for Measure* begins as a problem play. Claudio, the brother of Isabella, who is about to enter the cloister, is condemned to death for incontinency. Isabella pleads for his life to Angelo, the austere deputy, but his usually cold nature is so stirred to lust by her beauty that he offers to save Claudio at the price of her chastity. She visits Claudio in prison, expecting that he will uphold her honour, but the thought of immediate death is too much for him, and, when he begs her to sacrifice herself to save his life, she turns from him with loathing. The question whether Isabella's chastity is worth more than Claudio's life is thus fully and frankly put. But instead of giving any answer Shakespeare sets in motion all the cumbrous machinery of disguised dukes and substituted lovers, and thus brings about a 'happy' ending.

Meanwhile the whole circumstances of the acting profession had changed for the better. On 24th March 1603 Queen Elizabeth died. Her successor, King James I., and his family encouraged men of letters, and within a few weeks of his accession he became patron of the Chamberlain's Company, who were henceforth known as the King's Men, their licence under royal letters patent being issued on 19th May. Nine members of the company are mentioned by name, Shakespeare coming second in the list. The players were now officially recognised as royal servants, and ranked as grooms of the chamber. Under the new king almost four times as many plays were performed at court as under Queen Elizabeth.

Before King James was able to make his royal progress through London the plague again broke out; the theatres were closed, and the King's Men were obliged to go on tour. In November they were summoned from Mortlake to the court, which was then at Wilton, the residence of William Herbert, Earl of Pembroke, and performed there on 2nd December. The court moved to Hampton Court for Christmas, and the King's Men acted six times. On 8th February a royal grant of £30 was made, 'by way of his Majesty's free gift,' to Burbage 'for the maintenance and relief of himself and the rest of his company being prohibited to present any plays publicly in or near London by reason of the great peril that might grow through the extraordinary concourse and assembly of people.'

The postponed royal progress was held on 15th March 1604. As royal servants the King's Men were granted 4½ yards of red cloth for a new livery at the charge of 'The Master of the Great Wardrobe' in honour of the occasion; there is, however, no evidence that they walked in the procession. In the list of the company receiving this grant Shakespeare's name stands first. In the following August the players, in their capacity as grooms of the chamber, were ordered to attend at Somerset House on the Constable of Castile, who had come to London at the head of the Spanish diplomatic mission to ratify the treaty of peace between England and Spain.

The great tragedies, as a group, are plays of character. They were followed by two Roman plays, *Antony and Cleopatra* and *Coriolanus*; both were based on North's Plutarch, and it is remarkable how closely Shakespeare kept to his source,

especially in the death of Cleopatra (V. ii.) and the speech of Volumnia to Coriolanus (V. iii. 94).

Antony and Cleopatra continues the story where *Julius Caesar* ended. Antony is shown as a tragic failure: he has become a 'strumpet's fool,' and he gradually loses his manhood and even his common sense. The play suffers somewhat from the great number of the scenes—there are seventy-one—but it contains some magnificent episodes, and, as always in the later plays, sublime poetry. A noteworthy feature is the subtle way in which Shakespeare uses the minor character of Enobarbus to comment on the action as it proceeds. To him is assigned the wonderful description of Antony's first meeting with Cleopatra, which is all the more striking because it is the tribute of a rough soldier who is usually very candid in his comments. In the end Enobarbus deserts his master, who sends after him all his treasure with bounty added. This nobility of Antony overwhelms Enobarbus, who dies of a broken heart.

Coriolanus is, again, a play of character, though the characterisation is less prominent. Coriolanus is a soldier, body and soul, who can only think and act in terms of war. He has neither sympathy nor understanding for the citizens of Rome, because he knows that they are inconstant in peace and unreliable in war. His natural pride is increased by the fierce mother Volumnia, who exults in his wounds and has the utmost scorn for his wife Virgilia, whose only thought is for the safety of her man. The crowd, as are all Shakespeare's crowds, is fickle and easily influenced by anyone who sets himself out to please it; but it is wrong to maintain, as do some critics, that Shakespeare's sympathies in this play are anti-democratic or aristocratic. Here as always he is impartial.

In 1608 the King's Men acquired the private theatre in the fashionable quarter of Blackfriars. This playhouse had originally been constructed by James Burbage in 1597, at the beginning of the dispute over The Theatre, but the neighbours, who were all people of influence, objected to the presence of common players, and so the playhouse was leased to the Children of the Chapel Royal, nominally as a rehearsal-room. The Children on several occasions offended by acting plays which openly satirised important persons, including the King himself, and more than once they had been restrained; but in 1608 they were finally suppressed for acting Chapman's *Tragedy of Charles, Duke of Byron* (a play dealing very frankly with life at the French Court), after formal prohibition. The old opposition to the professional players had now almost died down, and the King's Men occupied the theatre. Blackfriars was a small private playhouse in which plays were acted indoors by artificial light; the audience was select, and the prices charged for admission were high. Henceforward the King's Men acted at the Globe in the summer months and at Blackfriars in the winter. The new scheme was financed by seven of the company, of whom Shakespeare was one; it was a most prosperous venture.

Towards the end of his dramatic career (c. 1609–1611), Shakespeare reverted to his early method in the three plays, *Cymbeline*, *The Winter's Tale*, and *The Tempest*; the interest in plot and character being once more evenly balanced. In each the outlook is similar: wrongs committed by one generation are reconciled in the next. These plays belong to the type known as tragi-comedies: the theme is tragic but the ending happy. There can be little doubt that Shakespeare was influenced by the new dramatic methods of the two rising dramatists, Beaumont and Fletcher (q.v.).

The Tempest, probably his last play, shows Shakespeare's power at its highest; there is

neither the deep tragedy of *Lear* nor the pessimism of *Timon*, nor the light-heartedness of the romantic comedies; but, if indeed Shakespeare ever projects his inmost feelings into his dramas, it is in *The Tempest* that we find his maturest philosophy of life. Prospero has none of the Christian hope in immortality:

We are such stuff as
Dreams are made on, and our little life
Is rounded with a sleep.

He knows that Miranda's joy at the discovery of a brave new world is the enthusiasm of youth as yet inexperienced; but above all he has found that 'the rarer action is in virtue than in vengeance.' The play was performed at court in February 1613 as part of the wedding festivities of Princess Elizabeth and the Elector Frederick.

It is not known when Shakespeare retired from the stage and returned to live at Stratford. There are several lists of the King's Men compiled from various sources. In May 1605 one of the company, Augustine Philips, died and left bequests to his fellow-actors, including Shakespeare. This is the last time his name occurs in a list of the players; he did not, apparently, take a part in Jonson's play, *The Alchemist*, in 1610. The usual date given for his retirement is 1611; more probably he left the stage earlier, but to the end of his life he kept in close touch with his fellows. John Shakespeare, his father, had died in 1603. On 5th June 1607 his elder daughter Susanna married John Hall, of Stratford, a well-known physician. His mother died in September 1608. Several traditions are recorded of Shakespeare's last days at Stratford. Rowe says: 'The latter part of his life was spent, as all men of good sense will wish theirs may be, in ease, retirement, and the conversation of his friends. He had the good fortune to gather an estate equal to his occasion, and, in that, to his wish; and is said to have spent some years before his death at his native Stratford. His pleasurable wit and good nature engaged him in the acquaintance and entitled him to the friendship of the gentlemen of the neighbourhood.' The Rev. John Ward, vicar of Stratford in 1662, noted: 'I have heard that Mr Shakespeare was a natural wit without any art at all; he frequented the plays all his younger time, but in his elder days lived at Stratford and supplied the stage with two plays every year, and for that had an allowance so large that he spent at the rate of a thousand a year, as I have heard. Shakespeare, Drayton, and Ben Jonson had a merry meeting, and, it seems, drank too hard, for Shakespeare died of a fever there contracted.'

In March 1613 Shakespeare purchased a house in Blackfriars, near the playhouse which involved him in a lawsuit two years later to force the vendor to surrender the title-deeds. In June the Globe Theatre was burnt to the ground during a performance of *Henry VIII.*; a new and finer house was erected on the ruins. On 12th July 1614 John Combe, a wealthy Stratford man, died and left many bequests to his friends, mostly persons of considerable local standing; Shakespeare received £5. Combe's nephews succeeded to the property and proposed to enclose some of the common land belonging to the borough; both sides referred the dispute to Shakespeare, but he remained neutral.

On 25th January 1616 Shakespeare had caused a draft will to be prepared, but it was not signed at the time. On 20th February his younger daughter Judith married Thomas Quyny, son of Shakespeare's old friend Richard Quyny. Soon after, he became dangerously ill; the draft will was revised and signed on the 25th March. No mention is made of his wife, except that, by an addition made to the original draft, she was given his second-best bed with its furniture. She was legally entitled to a

third share of the freehold estates. Susanna Hall, the elder daughter, received New Place and the greater portion of the property; Judith the younger received his broad silver-and-gilt bowl and £150 in money, with a further £150 to be paid within three years. Various small bequests were made to Stratford friends, and to his fellows, Heminge, Burbage, and Condell, he left 28s. 6d. to buy memorial rings.

Shakespeare died on 23rd April 1616, and was buried in the chancel of Stratford on the 25th. It is said that the grave was dug seventeen feet deep to prevent disturbance. The crude inscription over the grave runs—

GOOD FRIEND FOR IESUS SAKE FORBEARE
TO DIGG THE DUST ENCLOSED HEARE:
BLESTE BE YE MAN YT SPARES THES STONES,
AND CURST BE HE YT MOVES MY BONES.

Shortly after Shakespeare's death a mural monument, which includes a half-length effigy, was made by Garratt Janssen, or Johnson, a tombmaker of Southwark, and set up on the north wall of the chancel of Stratford Church. This bust and the somewhat crude engraving in the First Folio are the only portraits of Shakespeare which can claim to be genuine. A painting (now in the art gallery of the Memorial Theatre at Stratford) is by some considered the original of the engraving, but more probably it is a copy.

Six signatures exist on documents, and it is now believed that three pages of a manuscript play called *The Book of Sir Thomas More* are in Shakespeare's hand. There is, however, nothing remarkable in the absence of manuscripts; no specimens at all remain of Shakespeare's contemporaries, Marlowe and Greene.

The Growth of Shakespeare's Fame.—At the time of his death sixteen of the plays had been separately published in quarto. Seven years later, in 1623, John Heminge and William Condell, two of Shakespeare's fellow-actors, with the help of the 'stationers' Blount, I. and W. Jaggard, Smethwicke and Aspley, produced a collected edition of the plays (with the exception of *Pericles*) in one folio volume—the First Folio. The First Folio marks the real beginning of Shakespeare's literary fame. It was dedicated to the Earls of Pembroke and Montgomery, and includes a notable elegy by Ben Jonson, memorial verses by various admirers, and a preface addressed 'To the Great Variety of Readers,' in which Heminge and Condell declare that 'his mind and hand went together; and what he thought, he uttered with that easiness, that we have scarce received from him a blot in his papers'—a remarkable tribute to Shakespeare's spontaneity.

The First Folio was reprinted in 1632 with some memorial poems, including one by J[ohn] M[ilton]. In 1640 acting was forbidden, and the theatres remained closed for twenty years during the troubles of the Civil Wars and the Commonwealth. After the Restoration the Folio was reprinted in 1665-66 with additional plays (not Shakespeare's work) and again in 1683. At this time Shakespeare's fame was in a transition stage; he was neither a modern nor a classic. Critics, obsessed with the rules of the classical school, condemned his lack of 'art,' yet they recognised his genius, and there was considerable controversy whether Beaumont and Fletcher, Jonson or Shakespeare were to be reckoned the greatest dramatist of the preceding age. The whole question is discussed in Dryden's admirable *Essay of Dramatic Poesy* (1668). Shakespeare's plays, usually much 'adapted,' were often played in the Restoration theatres, but, as literary men more and more ceased to be interested in the art of the theatre,

the plays became regarded rather as literature than drama. In 1709 Shakespeare definitely became a classic when Nicholas Rowe (q.v.) published the first edited collection of the works. In the earlier editions—the quartos and folios—the text is printed in a most haphazard manner. The acts are seldom divided into scenes, and in some instances there is no division even into acts. Nor are there, with very few exceptions, any place-headings to the scenes. Rowe was the first to reduce the text to consistency, and, until recent years, most editors have in the main followed his lead. Rowe's edition was reprinted in 1714. In the first half of the 18th century other editions were brought out by Pope (1723-25, 1728, 1731, 1735), Theobald (1733, 1740, 1752, 1762), and Hanmer (1740, 1743, 1744-46, 1745, 1747, 1748, 1750-51). Dr Johnson's edition was published in 1765.

Modern scholarship begins with Edmund Malone. Though not a first-class critic he was a great antiquary; he made a large collection of early plays and pamphlets (now in the Bodleian Library, Oxford), and he wrote an admirable account of the Elizabethan stage.

At the beginning of the 19th century Shakespearean criticism enters on a new era with the revival of the interest in romance. Lamb, in his notable essay on *The Tragedies of Shakespeare* (1811), boldly asserted that the tragedies were too great to be acted. In 1817 Coleridge delivered some lectures on Shakespeare, which mark the beginnings of the 'Bardolatry' of the 19th century. 'Assuredly,' he said, 'that criticism of Shakespeare will alone be genial, which is reverential. The Englishman, who without reverence, a proud and affectionate reverence, can utter the name of William Shakespeare, stands disqualified for the office of critic.' The most noticeable characteristic of the great volume of aesthetic criticism which followed during the Victorian era, both in England and Germany, is the tendency of critics to regard Shakespeare's characters as real persons, and to analyse and appraise their motives and characters accordingly.

Meanwhile scholars had been studying the work of Shakespeare's contemporaries. Editions of Jonson, Massinger, and Ford were produced by Gifford, and of Greene, Marlowe, Peele, Middleton, Beaumont and Fletcher, and Webster by Dyce, a most accurate scholar. In 1841 was founded the Shakespeare Society, which for some years published studies of Elizabethan life and reprints of the popular literature of Shakespeare's time. The director of the society was J. Payne Collier (q.v.), the most learned Shakespearean scholar of the century. Unfortunately Collier's enthusiasm outran his honesty; when evidence to support his theories was not forthcoming he forged or invented the necessary documents. With the exposure of Collier's practices the society collapsed. In 1874 a New Shakespeare Society was founded. Its chief work was the discovery and application of the metrical tests, which resulted in the establishment of the general order of Shakespeare plays. At the same time a notable work of aesthetic criticism was *Shakespeare: His Mind and His Art* (1874) by Edward Dowden, who combined considerable critical ability with a wide knowledge of Elizabethan literature. Dowden sets forth the somewhat debatable theory that Shakespeare's biography can be traced in the varying moods of his plays. The final and in many ways the best piece of criticism on Victorian lines is *Shakespearean Tragedy* (1904) by A. C. Bradley.

In the 20th century there have been great developments in Shakespearean scholarship. W. W. Greg, by his scholarly editions of the *Diary* and

Papers of Philip Henslowe (1904-7) gave a new stimulus to the study of Elizabethan stage conditions. Philip Henslowe owned the Rose and the Fortune Theatres, at which his son-in-law, Edward Alleyn, the leading actor of the Admiral's Men (the chief rivals of the Chamberlain's Men), acted. Henslowe financed the companies acting at his playhouses, and in his *Diary* are recorded the detailed accounts of the payments made on behalf of the players to their dramatists, tailors, and other purveyors of the theatre for the years 1591 to 1601. Knowledge of the dramatic conditions of Shakespeare's theatre was further advanced by Sir E. K. Chambers's great compilation, *The Elizabethan Stage* (1923).

In the present century the study of bibliography and palaeography has developed into a science. A renewed interest in the early texts of Shakespeare was awakened by Percy Simpson's discovery that the punctuation of the Folio was dramatic and not grammatical, and that in many instances the pointing in the early texts showed how the Elizabethan actor enunciated his lines. In 1916 Sir E. Maunde Thompson, in writing his article on 'Shakespeare's Handwriting' for the Tercentenary publication *Shakespeare's England*, was led to re-examine the manuscript play *The Book of Sir Thomas More*. The play is the work of several dramatists, and includes a crowd scene of three pages. It was suggested so early as 1871 that this scene was worthy of Shakespeare. Maunde Thompson now came to the conclusion, on palaeographical grounds, that the writing in these pages was Shakespeare's. The theory was further developed in *Shakespeare's Hand in Sir Thomas More* (1923), and is now widely though not unanimously accepted. A. W. Pollard's *Shakespeare's Fight with the Pirates* (1920) is perhaps the most important landmark in recent study. Pollard showed that the early quartos were, in all probability, set up direct from Shakespeare's own manuscripts, and that their mistakes were often due to the peculiarities of the printer's copy. The result of these investigations has been to establish new principles of textual criticism. At the present time a new text—*The New Shakespeare*—is being published, volume by volume, under the textual editorship of J. Dover Wilson.

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See also articles on Shakespeare's chief contemporaries and critics, and DRAMA, SONNET, THEATRE, ENGLISH LANGUAGE, &c.

Shale is any argillaceous rock which splits into thin laminae in the plane of sedimentation—a kind of lamination not to be confounded with the fissile structure seen in clay-slate (see SLATE). Shale is composed mainly of alumina and silica; but some shales are rich in carbonate of lime (calcareous shale), others contain much ferric oxide (ferruginous shale). Those shales which contain much quartz pass into shaly sandstone. When carbonaceous matter is abundantly present shale often passes into gas-coal, or, it may be, bituminous shale. When it is remembered that shale is of sedimentary origin, and was washed down in the form of fine silt from the land to be accumulated in lakes and quiet areas of the sea-bottom, as in estuaries and protected bays, its variable composition will be readily understood. Shales are frequently highly fossiliferous—the fossils, owing to the impermeable character of such argillaceous rocks, being generally well preserved. Decomposing shales, through which sulphide of iron is disseminated, are valuable for the manufacture of Alum (q.v.).

Bituminous shales—i.e. shales more or less rich in carbon and hydrogen—have for many years attracted much notice as sources of oil for illuminating purposes. Two manufacturing chemists, Butler in 1833 and Du Buisson in 1845, worked patents for the extraction of paraffin from coal-tar. The process introduced by the latter in France of distilling certain bituminous shales at a comparatively low temperature was afterwards tried in England, being used for a time in distilling a Dorsetshire bituminous shale, sometimes called 'Kimmeridge coal.' From this mineral a burning oil, a lubricating oil, and a naphtha for dissolving caoutchouc were obtained. But neither in France nor in England did the attempt to make a profitable manufacture succeed: in the former country the poverty of the shales was the chief drawback; in the latter the disagreeable smell of the oil, which could not be effectively removed, prevented it from obtaining favour in the market.

On account of these failures the process fell into abeyance, until it was revived again by the success of the well-known patent of James Young (see PARAFFIN), secured in 1850 for the production of paraffin and paraffin-oil from coal. With the exception of the solid paraffin, which Young was the first to obtain on the large scale, and the employment of cannel coal instead of shale, the processes of Du Buisson and Young are essentially the same.

After experimenting with many varieties of coal, Young found the 'Boghead or Torbanehill mineral' most suitable for his purpose. It yielded about 120 gallons of crude oil per ton. Twelve years of mining led to the exhaustion of the Boghead seam, and then attention was directed to the bituminous shales of the Lothians, usually called 'oil shales.'

A good oil shale can be distinguished from ordinary shale, or 'blaes,' by its dark-brown colour and streak, by its toughness, and by its resistance to the disintegrating action of the weather; it can be readily cut and curled up in thin shavings with the edge of a sharp knife. Oil

shales are finely laminated, the lamination being best seen in the 'spent shale' after distillation. There has been much discussion as to the nature of the bituminous material, termed *kerogen* by Crum Brown. Conacher's researches indicate that the oil substance is chiefly resin derived from wood.

The rich shales first used yielded 40–50 gallons of crude oil per ton; later the yield fell to 30–35 gallons. In addition to crude oil, the distillation of the shale gives gas, used as fuel, and ammoniacal liquor. The crude oil, after refinement by repeated distillation and by chemical treatment, gives the following products: Shale spirit or naphtha, lamp and power oils, gas oils and fuel oils, lubricating oils, solid paraffin used for candle-making, &c., coke, gases used for illuminating neighbouring towns and villages, &c. From the ammoniacal liquor is obtained a very valuable by-product, sulphate of ammonia, which finds a ready market not only in Britain, but also in Japan and the United States. The Scottish oil industry has had a long and increasingly intense struggle for existence against the competition of the world's oil-fields; yet, 2,857,104 tons of shale were mined in 1924.

Shaler, NATHANIEL SOUTHGATE (1841–1906), American geologist, graduated at Harvard University, where he was professor of palæontology 1868–87, and then professor of geology. He wrote *Nature and Man in America* and other scientific works.

Shalloon, a light worsted cloth, believed to have been first made at Châlons-sur-Marne.

Shallot, also ESCHALOT (*Allium Ascalonicum*), a species of Allium—Onion—(q.v.), a native of the East, introduced into Europe by the Crusaders—from Ascalon, it is said—and much cultivated for its bulbs, which are used like those of the onion, and sometimes for its leaves, which are used like those of the chive. The leaves grow in tufts like those of the chive, but are larger. The shallot is generally propagated by the cloves, which are planted just beneath the surface of the ground, or only partially beneath it, in spring, and the crop is ready for gathering in July or August. The flavour resembles that of garlic, but is much milder. In the vineyards of Italy the shallot is naturalised.

Shalmaneser, the name of four kings of Assyria (q.v.), three of whom are celebrated for their military exploits.

Shaloo. See DURRA.

Shama. See CAGE-BIRDS.

Shamanism, a name applied loosely to the religion of the Turanian races of Siberia and north-eastern Asia, based essentially on magic and sorcery. Their Heaven-God Ukko is but the chief among a host of nature-spirits capable of being influenced and even forced into obedience by the spells of *shamans* or sorcerers. 'The only trace of the influence of Buddhism,' says Max-Müller, 'among the Kudic races, the Finns, Lapps, &c., is found in the name of their priests, *Shaman* being supposed to be a corruption of *Sramana*, a name applied to Buddha and to Buddhist priests in general.' The Siberian Shaman works his cures by magic, and averts sickness and death by incantations. He works himself up into a frenzy of nervous excitement, beating loudly upon his magic drum, and doubtless is usually the dupe of his own powers. Nor is his superstition any less reasonable than that of the devout Protestant who opens his Bible expecting a divine answer in the first verse on which his eye shall fall; for the latter makes the same assumption that he can compel God to give him an answer, his own faith being the condition. See DIVINATION, MAGIC, and WITCHCRAFT.

Shammai, an eminent doctor of the Jewish law at the time of Herod, head of a most important

school, and supreme judge of the Sanhedrin during the presidency of Hillel (q.v.), along with whom he is, indeed, generally mentioned, and of whom he was, as it were, the complement. Very little is known of the history of his life; but he was probably born in Palestine, and he energetically participated in all the political and religious complications of the country. There was a rigidity in his character, which contrasts most strikingly with Hillel's proverbial patience. His religious views were strict, but his alleged 'harshness' is much exaggerated. His motto was 'receive all men with a cheerful countenance' (*Aboth* i. 15). The discussions of the two rival schools, of which that of Shammai preponderated long after the master's death, turned all upon points of positive law.

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Shammy, SHAMOY. See CHAMOIS LEATHER.

Shamo, or GOBI. See ASIA.

Shamo'kin, a borough of Pennsylvania, 188 miles by rail W. of New York, with rich mines of anthracite coal, and 21,000 inhabitants.

Shampooing. See BATH, MASSAGE.

Shamrock (Irish, *seamrog*), the national emblem of Ireland, a leaf with three leaflets, or plant having such leaves, sometimes supposed to be the Wood-sorrel (see OXALIDACEÆ), which unlike some of the rival claimants for the honour is certainly indigenous to Ireland. But the name is more frequently given to some species of Clover, or to some common plant of some of the nearly allied genera, as the Bird's-foot Trefoil (see BIRD'S-FOOT), or the Black Medick. It is not improbable that the name has a sort of general reference to plants with trifoliate leaves indigenous to Ireland; a perfectly satisfactory determination of the species is apparently as impossible as the attainment of botanical accuracy in regard to the emblematic thistle of Scotland. Lesser Yellow Trefoil (*Trifolium minus*) is the plant usually sold in Dublin on St Patrick's Day. The Common White Clover



Lesser Yellow Trefoil (*Trifolium minus*).

(q.v., *Trifolium repens*) has had a superstitious respect attached to it from early times, and is frequently treated as the Irish shamrock; though it is believed to have been but recently introduced into Ireland, where it is not so common as in England. According to the elder Pliny, no serpent will touch it; and the luck attached to the finding 'four-leaved clover'—a leaf with four leaflets instead of three (a not very uncommon monstrosity in clover, though very rare in wood-sorrel)—still causes many a futile search. The shamrock is said to have been first assumed as the badge of Ireland from the circumstance that St Patrick made use of it to illustrate the doctrine of the Trinity. But

the story is a late one, and is not found in any of the earlier lives of St Patrick; and so far as the theological argument is concerned, any plant with trifoliate leaves would answer the saint's purpose equally well.

Shamyl (i.e. Samuel), chief of the Lesghians and leader of the independent tribes in the Caucasus in their thirty years' struggle against all the might of Russia, was born at Aul-Hinry in northern Daghestan, became a priest or mollah, and was one of the foremost in the defence of Hinry against the Russians in 1831. In the end of 1834 he was elected 'Imam,' or head of the Lesghians, and soon made himself absolute temporal and spiritual chief of the tribes of Daghestan. He at the same time introduced a change of military tactics, abandoning open warfare for surprises, ambushes, &c., which brought numerous, and sometimes great, successes to the arms of the mountaineers. In 1839 the Russians succeeded in hemming Shamyl into Achulgo in Daghestan, took the fortress by storm, and put every one of the defenders to the sword in order to be quite certain that Shamyl should not escape. But by some mysterious means he did escape, and suddenly appeared preaching with more vigour than ever the 'holy war against the infidels.' Ten years later he again escaped from the same stronghold after the Russians had made themselves masters of it. During the Crimean war he was helped by the allies, who supplied him with money and arms; but after peace was signed the Russians resumed their attacks upon the Caucasian tribes with more energy, opened a road over the mountains, thus cutting off one portion of the patriots, and so compelled their submission. On April 12, 1859, Shamyl's chief stronghold, Weden, was taken after a seven weeks' siege, and his authority, except over a small band of personal followers, was wholly destroyed. For several months he was hunted from fastness to fastness, till at last (September 6, 1859) he was surprised on the plateau of Gounib, and after a desperate resistance, in which his 400 followers were reduced to 47, he was captured. He was assigned a residence at Kaluga in the middle of Russia, with a pension of £1000, and he died at Medina in Arabia in March 1871, having taken up his residence in Mecca the year previously. In faith he was a Sufi.

Shandon. See CORK.

Shandy Hall. See STERNE.

Shanghai, one of the original treaty ports of China, is situated on the left bank of the Hwang-pu, 12 miles from its entrance into the estuary of the Yang-tsze-kiang. The native city, about a mile in diameter, surrounded by walls, with narrow and dirty streets, had at one time a considerable cotton industry, but its importance has been entirely overshadowed by the foreign settlements outside its walls. In accordance with the treaty of Nanking (1842), it was chosen by Britain as one of the five ports to be opened to foreign trade, and in 1843 the British settlement was founded to the north of the native town, with a frontage to the Hwang-pu of three-fifths of a mile, and bounded by the Soochow tributary of the Hwang-pu. The narrow space between the settlement and the native town was in 1849 acquired by the French, and in 1862 the Americans established themselves north of the Soochow. The parts adjoining the river have now all the aspects of a modern European town, with well-made and electric-lighted streets, tramways, imposing public and commercial establishments, churches (including an English cathedral by Sir Gilbert Scott), hospitals, schools, theatres, and newspaper-offices. There is a large native population in the western parts. The Chinese Maritime

Customs' estimate in 1922 gave the population at 1,500,000. The British and American settlements have a joint, and the French a separate, municipal government, but there are no restrictions as to residence. Foreigners are only subject to their own laws, and each of the treaty powers has a separate court administering its own laws, both in civil and criminal matters. Shanghai is the seat of St John's Missionary University, Nanyang Government University, and Harvard Medical College. Formerly extremely unhealthy, the place has improved vastly through the healthier conditions of the settlements. Shanghai is the most important of the treaty ports of China, and it has grown enormously since it was thrown open to foreign trade in 1842. A great trading port and dockyard, it is rapidly becoming also a great manufacturing centre, with textile industries, including cotton and silk factories, large modern flour-mills, &c. It is an important railway centre, and a wireless telegraph station. At Pa-tung, opposite the British settlement, there are extensive shipbuilding and engineering establishments.

The chief exports are silk, tea, raw cotton and yarn, beans, wool, hides, rice, and other cereals; the imports being cotton yarn, cotton and woollen manufactures, kerosene oil, sugar, metals, and coal.

In 1853-55 a party of T'ai-ping rebels held the native city for a year and a half; but the foreign settlements were secured from harm by the presence of a British squadron, and became a refuge for the Chinese from all parts of the province of Kiang-su, which the T'ai-pings continued to desolate up to 1862. In 1860-61 the rebels again attacked the city, but were repulsed, and finally driven out by the British and French forces. By agreement, Shanghai was exempted from war operations during the Chino-Japanese contest. In the political confusion after the Great War, Shanghai was the scene of many disturbances, some of which were directed against the Europeans. Britain sent a 'Shanghai Defence Force' in 1927.

Shanklin, a watering-place on the south-east coast of the Isle of Wight, 8 miles by rail S. of Ryde. Pop. (1921) 7374.

Shanks, EDWARD, was born at London in 1892 and educated at Merchant Taylors' and at Trinity College, Cambridge. He won the Hawthornden Prize for Imaginative Literature in 1919, and published several volumes of poetry brought together, with the exception of *The Queen of China* (1919), in his *Collected Poems* (1926), also two volumes of *Essays in Literature* (1923, 1926). His style is eminently lyrical, restrained, and tinged with a grave melancholy that tends towards suggestion rather than dramatic effect.

Shannon, the largest river of Ireland, rises in the Cuilcagh Mountains, County Cavan, and falls after a course of 254 miles into the Atlantic Ocean between Loop Head and Kerry Head. Flowing south-westwards, it soon reaches Lough Allen in Leitrim; thence it proceeds through a succession of expansions—Loughs Boderg, Bofin, Forbes, Ree, and Derg—past the towns of Carrick, Athlone, and Killaloe, to Limerick. There it departs from the southerly direction it has hitherto pursued and turns westwards, forming a wide estuary some 70 miles long and 10 miles across at its seaward extremity. About 10 miles from the entrance the river narrows to about $1\frac{1}{2}$ mile in width. Outward navigation commences at Foynes, which is connected by railway with Limerick, and from which steamboats ply to Kilrush, Tarbert, and the intermediate stations. Vessels of 1000 tons can, however, get up to Limerick, and small steamers to Athlone; boats ascend the river to beyond Lough Allen. Several tributaries fall into the

Shannon, as the Suck and Fergus from the right, and the Inny, Brosna, Mulkear, Maigue, and Deel from the left. The main river is canalised for some distance below Athlone, and again between Killaloe and Limerick. This important system of navigation, which occupies a position almost midway between the east and west coasts of Ireland, is connected with Dublin by means of the Grand and Royal Canals.

Shannon, CHARLES, came into prominence as a portrait and figure painter about 1897, and in 1921 was elected R.A. His style refers back to that of the old Italian masters; he indulges in transparent pigments instead of opaque direct painting; and, further, even in literary subjects and portraiture, lays great importance also on producing decorative patterns of colour and line.

Shannon, SIR JAMES JEBUSA (1862-1923), an accomplished portrait-painter, was born of Irish parents in New York State, but studied at South Kensington Art School (1878-81). Thereafter, for some forty years, he produced an average of ten portraits a year, full of grace and charm. He was made R.A. in 1909, and knighted in 1922.

Shanny. See BLENNY.

Shans, a number of tribes of common origin, who live on the borders of Burma, Siam, Laos, and China. They are the descendants of an aboriginal race of China; their home generations ago was in the mountainous region on the borders of the Chinese provinces of Sze-chuen and Shensi. In the course of time they have been pushed southwards. They seem to have entered the valley of the Irawadi in the 6th century B.C. The Shans and the Laos are one and the same people, and both are closely akin to the Siamese. The country the Shans inhabit may be broadly described as a succession of wide river-valleys (of the Menam, Meping, Mekok, Mekhong, &c.) separated by high ridges; on the north it climbs up to the Yunnan plateau of southern China. There are extensive and valuable forests of teak; iron, rubies, and silver are extracted; and gold, copper, coal, and petroleum are known to exist. Rice, cotton, and tobacco are the crops most extensively grown. The people are noted for chased work in gold and silver. They are distributed amongst several states, of which the most important are Zimmé (Chieng-Mai), Kiang Hsen, Lapon, Nan, Lakhon, and Peh, tributary to Siam; Luang-Prabang, now French; Kiang Hung, Kiang Tung, Mone, Katchin, and others now incorporated in Burma. The Shans are an indolent, laughter-loving people, fond of gambling and cock-fighting, not unwarlike, though orderly and fairly trustworthy; the women have great influence, and enjoy equal freedom with the men. Slavery, however, exists, but in a mild form; and serfdom is general. The rule of the native chiefs is generally just and mild, and taxation is light. Buddhism is the dominant religion, though it is mingled with many superstitious practices. Zimmé and others of the principal towns are the seats of a very extensive transit trade between Yunnan, Tali, and the marts of southern China on the one side, and Bangkok and the ports of Burma on the other. There is also a large trade in the native commodities—horns and hides, ivory, cutch, gold-leaf, saltpetre, sapan wood, salt, lead, steel, betel-nuts, stick-lac, &c. A railway from Mandalay towards the Chinese border traverses the northern Shan states. The famous Gokteik viaduct (2260 feet long) carries it over the gorge of the Chunzoune River. Its steel trestle work rests on a remarkable natural bridge of limestone, 500 feet above the level of the water.

The first Shan state to reach historical importance was the Mau kingdom, the ruler of which in

the 13th century conquered all Burma, the upper part of Siam and the Malay Peninsula, and made his influence felt from Tali in China as far as Java and Cambodia. All the northern portions of this extensive empire, including Burma, were ruled by Mau princes down to 1554. Shortly after that date the tables were turned, and most of the Shan states became tributary to the emperor of Pegu. Other powerful states about the same period were Zimmé and Vien-chang. The former still exists, but subject to Siam; the latter, a Laos state, was destroyed in the 18th century. About 1774-77 Siam drove out the Burmese and Peguans, and made herself mistress of the southern Shan states, Zimmé and Vien-chang. Ruins of large cities exist in great numbers throughout the middle portions of the Shan country, relics of the ephemeral capitals of different Shan states.

See books by Hallett (1890), Colquhoun (1885), Cheek, Carl Bock (1884), Mrs Milne (1910); E. Aymonier in the *Revue de l'Histoire des Religions*, 1891; Nisbet, *Burma under British Rule* (1901); R. le May, *An Asian Arcady* (1926); and books quoted under SIAM.

Shan-si, a province of northern China, having the Hoang-ho on its western boundary. The southern part is a high plateau; the northern is occupied by great mountain-ranges, 10,000 or 12,000 feet high, dotted with Buddhist temples. The south is one of the richest coal and iron districts in the world. Salt and other minerals are also got. Communications, however, are bad. There is not much agriculture, though some parts are very fertile. Area, 80,000 sq. m.; pop. 10,000,000; capital, Tai-yuen Fu.

Shan-tung, a maritime province of north China, consists of an alluvial plain in the west, formed by the Hoang-ho delta, and a mountainous region in the east, running out in the great peninsula which, with the Liao-tung peninsula opposite, encloses the Gulf of Chih-li. Products are coal, iron, wheat and other cereals, fruits, silk, and wax. Area, 56,000 sq. m.; pop. 26,000,000; capital, Chi-nan Fu. On the coast are Wei-hai-wei (q.v.) and Kiao-chau (q.v.). The Great War gave Japan an opportunity of getting a footing in Shan-tung. By the treaty of Versailles Kiao-chau and all German rights over railways, &c., were transferred to Japan, and disputes over the question of their restoration to China continued till 1922.

Shanty. See CHANTY.

Shapira. See FORGERY.

Share-broker. See BROKER, STOCK-EXCHANGE.

Shareholder. See COMPANY.

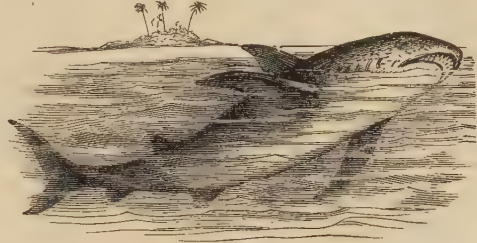
Shari, the principal feeder of Lake Tsad (q.v.).

Shark, a common name for most of the Elasmobranch fishes included in the sub-order Selachioidei. They are voracious fishes, with two or three exceptions carnivorous, the smaller forms often eating crustaceans and molluscs, as well as fishes, to which the larger forms almost exclusively restrict themselves. They sometimes attack men who swim incautiously in warm seas. Unlike the flattened rays, the sharks usually preserve the typical fish-like form, and the gill-slits are lateral, not ventral. In most the skin is covered with minute thickly-set skin-teeth, really like those of thornbacks, but much smaller and more numerous. The teeth on the jaws are very sharp, generally triangular, and are disposed in rows. In most cases only the row on the ridge of the jaw is in use, but as this is worn away it is replaced by the next row, which is gradually moved forward. Some of the sharks are viviparous, others are oviparous. In the latter each egg is enclosed in a horny 'mermaid's purse.'

As to their distribution, sharks, though most

numerous in the tropics, are represented in almost all seas, and many venture up estuaries and rivers. One species occurs in Lake Nicaragua. Many live in the open sea, and voyagers know how they follow the ships, hungrily swallowing—with little discrimination—what refuse is thrown overboard. Though few are like the Portuguese Shark (*Centroscyllium cololepis*) in living in deep water, not a few live a sluggish existence at the bottom of relatively shallow water near the shore. Many of the smaller forms are gregarious, and prey upon the shoals of herring and mackerel.

The classification of sharks has not yet been



White Shark (*Carcharias vulgaris*).

placed on a thoroughly firm basis. Günther recognises the following families. Carchariidae include the genus *Carcharias*, of which the Blue Shark (*Carcharias glaucus*), 12-15 feet in length, and the larger White Shark (*C. vulgaris*) are representative; the genus *Galeocerdo*, with several formidable species; the genus *Galeus*, of which the Tope (*Galeus canis*) occurs on British coasts; the genus *Zygæna*, notable for the large transverse eye-bearing lobes of the snout to which these voracious fishes owe their name Hammer-head (q.v.); the genus *Mustelus*, with small species known as 'Hounds.' In *Mustelus laevis* and *Carcharias glaucus* there is a peculiar placenta-like connection between the mother-fish and the yolk-sac of the unborn young.

Lamnidae include numerous large pelagic sharks, such as the Porbeagle (*Oxyrhina cornubica*), which frequents the North Atlantic, attains a length of 10 feet, and is said to swallow its prey whole; the Man-eater Shark (*Carcharodon rondeletii*), in all tropical and temperate seas, attaining a length of 36 feet; the Fox-shark or Thresher (*Alopias vulpes*), not uncommon around British coasts, attaining a length of 13 feet, notable for the enormously elongated upper lobe of its tail, and for its voracious attacks on herring and mackerel; the Basking-shark (*Selache maxima*), attaining a length of 30 feet, living on small fishes, often in the habit of lying passive, and like the thresher harmless to man unless attacked. The *Challenger* explorers dredged numerous large teeth belonging to some shark of the genus *Carcharodon*; as these measured 5 inches along the side and 4 across the base, there must be some larger species than *Carcharodon rondeletii* either still alive or not long since extinct.

Notidanidae form a small family including a few tropical or subtropical sharks, sometimes called cow-sharks, and referable to the genus *Notidanus*, from which, however, some distinguish two other genera, *Hexanchus* with six gill-slits, and *Heptanchus* with seven.

Scylliidae form a family of small sharks, usually called dog-fishes, including *Scyllium caniculum* and *S. catulus*, the common dog-fishes of British shores; *Stegostoma tigrinum*, a beautiful striped shark frequenting the Indian Ocean; and the Indo-Pacific ground-shark (*Crossorhinus*), which lurks on the bottom, and is protectively coloured.

Cestraciontidae, a family now somewhat decadent, twenty-two of the twenty-five genera being extinct. The living forms—e.g. *Cestracion* or *Heterodontus galeatus*—are called Port Jackson sharks. The front teeth are small and sharp, those behind are flat and arranged in pavement-like rows.

Spinacidae form a family including the small spiny dog-fishes—e.g. *Acanthias vulgaris* and *A. blainvillii* on British coasts; the voracious Greenland Shark (*Læmargus borealis*), which attains a length of about 15 feet; the Black Dog-fish (*Centroscyllium fabricii*) of Arctic seas; *Centroscyllium caeleolepis*, which is caught off the coasts of Portugal from a depth of 400-500 fathoms; the Spinous Shark (*Echinorhinus spinosus*), a Mediterranean form, which seems also to live in deep water.

Rhinidae form a family represented solely by the almost cosmopolitan, somewhat ray-like, Angel-fish or Monk-fish (*Echina squatinata*).

Pristiophoridae form a family parallel to the Pristiuridae among the rays, for the genus Pristiophorus has its snout prolonged into a saw as in the much larger genus Pristis.

It seems necessary furthermore to establish a family for a remarkable Japanese shark, *Chlamydoselachus anguineus*, a somewhat eel-like animal, 6 feet long, less than 4 inches in diameter, suggestive of a sea-serpent, but more important since it seems as if it were a direct descendant of forms which flourished in Devonian times (see FISHES).

Sharks are destructive to food-fishes and to fishermen's nets, and sometimes attack man himself. On the other hand, many of the smaller forms are eaten by man; the gristly fin-rays are used in China in the making of gelatine; the livers are sometimes utilised as sources of oil; the skin of those which are thickly beset with skin-teeth was formerly much used by cabinet-makers for polishing purposes, serving, under the name of shagreen, instead of sandpaper.

Sharon, the name of an extensive tract of plain and corn-land (partly under cultivation) in Palestine, lying between the sand-dunes of the coast and the foot-hills of the interior, and extending from the neighbourhood of Carmel on the north to near Joppa. The so-called Rose of Sharon is the subject of an article.

Sharon, a borough of Pennsylvania, on the Shenango River, 71 miles by rail NNW. of Pittsburgh. Its manufactures include rolling-mills and foundries, steel and boiler works, a chain-factory, planing and flour mills, a soap-factory, and machine-shops; and coal is largely mined near by. Pop. (1920) 21,747.

Sharp, a sign $\sharp$ in Music, which, when prefixed to a note, elevates it by a semitone in the scale; see MUSIC. A double sharp $\times$ raises a note another semitone.

Sharp, ABRAHAM, a meritorious mechanist and astronomer, who, born at Little Horton near Bradford in 1653, and apprenticed to a tradesman, became a schoolmaster, and acquired a thorough knowledge of mathematics and the cognate sciences. He also acted as exciseman and bookkeeper in a London office. In 1684-91 he assisted Flamsteed at Greenwich Royal Observatory. There he did admirable work on the instruments, perfecting hand-graduation and other processes, and making many very valuable observations; and after retiring to Horton (1694), he continued to assist Flamsteed by his extraordinary powers as a calculator. He published tables of logarithms and a treatise, *Geometry Improved* (1717), and made observations in a small observatory fitted up by himself. He died 18th July 1742. See his *Life and Correspondence*, edited by Cudworth (1889).

Sharp, CECIL (1859-1924), folk-song collector, was born in London, and educated at Uppingham and Clare College, Cambridge. In 1883 he was appointed Associate to the Chief Justice of South Australia, and at Adelaide founded a school of music. In 1893 he became Principal of the Hampstead Conservatoire, in 1911 founded the English Folk Dance Society, and later visited the Appalachian Mountains to collect older forms of the English folk-songs. He published many volumes of English folk-music (songs, morris dances, &c.), which influenced strongly the work of Bax, Delius, Holst, Vaughan-Williams, and other contemporary English composers.

Sharp, GRANVILLE, abolitionist, was the son of the archdeacon of Northumberland, and was born at Durham in 1735. He came to London, and, after studying law, obtained a post in the Ordnance Office; but this he resigned in 1776 on the outbreak of the war with America, of which he disapproved. He was the author of upwards of sixty-one publications—mainly pamphlets—on philological, legal, political, and theological subjects (the English tongue, hundreds and tithings, the definite article in the Greek Testament, Hebrew syntax and pronunciation, Melchisedek, Armageddon); but his principal writings and the main labours of his life were in defence of the negro, and for the abolition of the slave-trade and slavery. He defended the cause of the negro Somerset, securing the decision of the twelve judges (1772) that as soon as a slave touches English soil he becomes free. He was with Clarkson one of the founders of the Association for the Abolition of Negro Slavery, and assisted in the establishment of the colony of Sierra Leone for freedmen. He died in London, 6th July 1813. There is a *Life* by Hoare (1820), and a smaller one by Stuart (New York, 1836). See also SLAVERY.

Sharp, JAMES, Archbishop of St Andrews, was born at the castle of Banff on 4th May 1618, the son of the sheriff-clerk of Banffshire. Educated for the church at King's College, Aberdeen (1633-37), he afterwards visited England, and became acquainted with several eminent English divines, as Hammond, Sanderson, and Taylor. In 1643 he was appointed a 'regent' of philosophy at St Andrews, and in 1648 minister of Crail, an office which he held throughout Cromwell's ascendancy. In 1651, however, when Monk was reducing Scotland to obedience, Sharp was carried off to England with several other ministers; but he quickly regained his liberty, and for some years enjoyed the confidence of the 'Resolutioners,' or more moderate party in the church. In 1656 he was chosen by them to plead their cause in London before the Protector against the 'Protesters;' and Baillie speaks of him on this occasion as 'that very worthy, pious, wise, and diligent young man.' On the eve of the Restoration he was sent up again to London to use his utmost endeavours with Monk in favour of the Kirk of Scotland, and at Monk's suggestion he crossed over to Breda, and had several interviews with Charles II. His correspondence for some months after his return from Holland is full of apprehensions of Prelacy, 'cassock-men,' and the Service-book; but its perfidy stands revealed in his letter of 21st May 1661 to Middleton, which proves that he was then (as probably before) in confidential communication and hearty co-operation with Clarendon and the English bishops for the immediate re-establishment of Episcopacy in Scotland. The bribe was a great one, for on 16th December he was consecrated Archbishop of St Andrews, having first received Episcopal re-ordination. The supple and dexterous tool of Middleton or Lauderdale, as either gained the ascendancy, a liar and coward, and a vindictive oppressor of

those he had betrayed, he soon became an object of detestation to the populace and of contempt to his employers. When in 1668 Robert Mitchell, a conventicle preacher, fired a pistol at him in the streets of Edinburgh, the bystanders suffered the fanatic to escape—only, however, to be executed ten years later on his own confession, enticed from him by an assurance of his life. At last, on 3d May 1679, on Magnus Muir, twelve Fife Covenanters—Hackston of Rathillet, John Balfour of Kinloch, the rest peasants or artisans—fell in with him as he was driving with his daughter to St Andrews, and, dragging him from his coach, hacked him clumsily to death in spite of his frantic prayers. Even his apologists can plead little for him but that he was not licentious, that his portrait is not that of a monster of cruelty, and that he was simply an ambitious ecclesiastic of plausible and courtly manners, who may have thought that, if there must be an archbishop of St Andrews, there was no great reason why he should not be the man.

See his *Life and Times* by Stephen (1839); Hill Burton's *History of Scotland*; O. Airy's *Lauderdale Papers* (Camden Soc. 1884).

Sharp, WILLIAM (1749–1824), a London engraver and republican; see *Life* by Baker (1875).

Sharp, WILLIAM (1855–1905), poet and essayist, critic, and romance-writer, partly Lowland Scottish, partly Swedish, by descent, was born at Paisley, settled in London 1879, and published *Earth's Voices*, *Sospiri di Roma*, *Sospiri d'Italia*, and other volumes of verse, half-a-dozen novels, and books on Rossetti, Shelley, Heine, Sainte Beuve, Philip Bourke Marston, besides many miscellaneous essays and studies in literature and criticism. But he will chiefly be remembered as the author of the remarkable series of Celtic tales and romances 'by Fiona Macleod' which began in 1894 with *Pharais, a Romance of the Isles*. As 'Fiona Macleod' Sharp found his themes in the Celtic myths of early Ireland and Scotland, and so treated them as to become one of the chief representatives of that 'Celtic Revival' of which Mr W. B. Yeats was the protagonist. 'The beauty of the world, the pathos of life, the gloom, the fatalism, the spiritual glamour—it is out of these, the spiritual inheritance of the Gael, that I have fashioned these tales.' *From the Hills of Dream* is a collection of lyrics; *Through the Ivory Gates*, poems; *The Immortal Hour*, a drama based on a Celtic legend and set to music by Rutland Boughton. Sharp continued till his death to maintain the secret of his pseudonym.

See the Memoir (1910) by his wife, who arranged an edition of *The Works of Fiona Macleod* in 7 vols. (1910).

Sharpe, CHARLES KIRKPATRICK (1781–1851), was born at Hoddam Castle, Dumfriesshire; studied at Christ Church, Oxford; and in 1813 fixed his bachelor home in Edinburgh. A clever versifier and a clever draughtsman, he wrote for the *Anti-Jacobin*, edited club-books, but is chiefly remembered by his immense correspondence.

See the Memoirs prefixed to the *Letters* (2 vols. 1888) and to his *Etchings and Prose Fragments* (1869).

Sharpe, SAMUEL (1799–1881), a descendant of Philip Henry and nephew of Rogers the poet, in whose bank he worked till sixty, wrote on Egyptology and, from the Unitarian standpoint, on biblical subjects. See *Life* by Clayden (1883).

Shatt-al-Arab. See EUPHRATES.

Shaw, GEORGE BERNARD, an original, brilliant, and (latterly) eminently popular dramatic writer, Fabian Socialist, and unconventional critic of things in general, was born at Dublin in 1856. Privately educated, he came in 1876 to London, and there embarked, at first with small success, in a career of

journalism and literary work. Between 1880 and 1883 he produced four novels, the best known of which is *Cashel Byron's Profession*, with a boxer for hero. In 1883 he became a Socialist agitator, and helped to form the programme of the Fabian Society, editing the essays of the League, to which he had contributed, in 1889. Several tracts from his pen were also published by the same adventure, among them *The Quintessence of Ibsenism* in 1891 (completed to Ibsen's death, 1913). In 1892 appeared the first of his clever and eccentric plays, *Widowers' Houses*, produced by the Independent Theatre Society, and followed by *Arms and the Man* (1894), *Candida*, *The Man of Destiny*, and *The Admirable Bashville* (from *Cashel Byron*). *Man and Superman* (1903), with its long dream-interlude of Don Juan, whatever may be the fate of its philosophy of the 'life-force,' contends for truth against sentimentalism. *John Bull's Other Island* (1904), a study of the Irish question, was published along with *Major Barbara* and *How He Lied to Her Husband*, a parody of his own *Candida*. Seven of his plays were published as *Plays Pleasant and Unpleasant* (1898), and three as *Plays for Puritans*. Mrs Warren's *Profession*, one of the so-called unpleasant plays (plays arising out of facts that the sentimentalist prefers to be blind to), was condemned by the Censor, and was not acted until the Stage Society produced it in 1902, while public performance in Great Britain was not allowed till 1925. The same difficulty with *The Showing up of Blanco Posnet* (1909) was got over by producing it in Dublin. Later collections are headed by *The Doctor's Dilemma* (1906), *Misalliance* (1914), *Androcles and the Lion* (1916), and *Heartbreak House* (1919). *Fanny's First Play* won over many by its geniality, *Pygmalion* by a verbal audacity. *Back to Methuselah* (1921) is a philosophical pentology, but *Saint Joan* (1923) is generally accounted his masterpiece. The plays are more didactic and philosophical than artistic, though Mr Shaw is a master of dialogue and of English prose. They are full of an exuberant, satirical, paradoxical, iconoclastic, and tantalisingly elusive humour, and so far depart from dramatic form that the stage directions are essays, and *Misalliance* is frankly described as 'a debate in one sitting.' He owes much to Ibsen, but perhaps more to the later Samuel Butler. Besides plays, novels, and political and social tracts, he wrote books of musical and dramatic criticism and æsthetics (*The Perfect Wagnerite*, 1898, &c.).

See books on him by G. K. Chesterton (1909), McCabe (1914), and Collis (1925), and his own introductions.

Shaw, JACK, Life-guardsmen. See PUGILISM.

Shawl. Kashmir shawls are made of a very fine material called *pashm* or *pashmina*, consisting of the inner or under wool of the shawl-goat of Tibet (see KASHMIR GOAT). This wool is separated with much care from the longer hair of the animal, and is then cleaned and spun with great delicacy into a fine thread. The dyeing of the yarn is a very important and difficult operation, almost all the colours from native dyes being permanent.

In the case of those shawls which have their patterns produced by needlework or embroidery the ground consists of a plain pashmina fabric, and the thread used for the pattern is of the same material. The shawls with loom-woven patterns, notwithstanding their intricate nature, are made on very rude and primitive looms. Three or sometimes four weavers are engaged at one of these looms, and instead of using shuttles they work with numerous wooden needles (each being supplied with coloured yarn), which have slightly charred ends, but no eyes. The shawls are woven face downwards, and the work is carried on at the

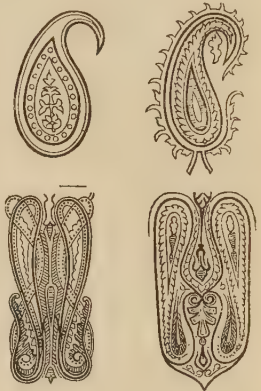
back or reverse side, on which the needles hang in rows. After the threads are worked in to suit the pattern across one line of weft, they are knotted to the warp and driven firmly into their place by the reed or comb. On an average five shawls are produced on one loom in a year, but a loom may be occupied during this period with only one shawl if it is of very fine quality and of an elaborate pattern. A shawl is, however, often woven in separate pieces, and so neatly joined together that it looks as if it had been woven in one piece.

Inferior shawls are manufactured in the Punjab by artisans who at various times have emigrated from Kashmir. They are woven at Amritsar, Ludhiana, Jalandpur, Narpur, and a few other places. For these the fine pashm is mixed with another kind of goat's wool called *koork* from Kerman in Persia. Shawls somewhat resembling those of Kashmir, though much less costly, are largely manufactured at Kerman itself, the *koork* of which they are made being, like the pashm from the Tibetan goat, the under-wool of the animal. But the most beautiful shawls woven in Persia are made of silk, and these too are like fine Kashmir shawls in general appearance. Both in India and in Persia shawl-cloth is made into tunics and other shaped articles of dress for men and women.

The production of shawls was formerly an important branch of manufacture in France, and gave occupation to a large number of designers in Paris, who furnished designs not only for those woven in their own country—chiefly at Paris, Lyons, and Nîmes—but also for shawl-manufacturers in England and Austria, and even for some in Kashmir. Shawls of various kinds are made at different places in England, and in past years many of these were designed in the Indian style. At Paisley, in Scotland, shawl-weaving was a staple industry from 1800 to 1860. Silk, cotton, and woollen yarns were selected, and used separately or in combination; but the best-known class of Paisley productions consisted of fine wool, with the patterns in the style of those woven in Kashmir. As many as 8000 hand-loomers are said at one time to have been engaged in the Paisley district on these goods. Soon after the middle of the century the trade, however, began to decline, and has not been since revived. Modern shawls are of a simpler variety, and are produced in the medium thicknesses of woollen and worsted yarns. They include wraps, warm neckwear, and rugs. Tartan checkings and twilled patterns in mingled colourings are chiefly applied, decorative schemes of design being neglected. In these forms they make a standard class of manufacture, more especially in the tweed centres of Scotland and Ireland, the travelling rugs and modes being single or compound in structure and either loosely or compactly woven. Many variations are made in the type and quality of the fabric. Thus in the heavier grade of travelling rugs and shawls, one surface may be composed of worsted yarns and 'clear' finished, and the second surface in woollen yarns and 'fibrous' or 'fleece' finished; while in the ordinary grades, in which both surfaces coincide in textural features, newness and freshness of manufactured product are acquired by the methods of blending tinted materials in the processes of yarn-spinning. Knitted shawls and wraps also give a useful branch of fabrication.

Though changes in fashion have eliminated the Eastern scheme of design from modern shawl manufacture, it is to be regarded as a pure and distinctive style of woven decoration. As such it is, from time to time, elaborated in the weaving of silk scarves, handkerchiefs, and the like, and in the origination of ornamental textiles. The most characteristic feature in a typical design is

what has been usually called the 'cone' or 'pine cone,' of which a few varieties are shown in the annexed figures. It appears, however, to be really a conventional representation of a wind-bent cypress-tree, as the term *sarv*, the native name of that tree, is also applied to this pattern or part of a pattern. The form has many modifications, one or more of which often make up the groundwork of the designs of other textile fabrics both in India and Persia, and it even appears on metal-work and papiermaché made in Kashmir. Sometimes it is simply called the shawl pattern. It is, however, not merely the graceful outline of their ornamental devices, but also the harmonious blending of their deep-toned colours, which gives a singular charm to these exquisite productions of Eastern looms.

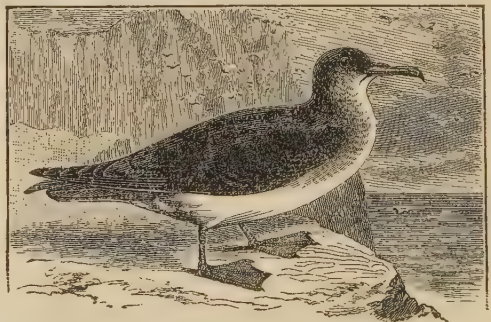


Shawnees, a tribe of American Indians of the Algonquin family, formerly settled mainly in New York, Pennsylvania, and Ohio, but driven westward by the Iroquois. They helped the French against the English, gave trouble to the newly-founded United States, and in 1812 some bands joined the English. They afterwards removed to Missouri, Kansas, and Indian Territory (Oklahoma).

Shea Butter. See BUTTER-TREE.

Shea Oak, or SHE OAK. See CASUARINA.

Shearwater (*Puffinus*), a genus of pelagic birds represented in all the oceans, nearly related to petrels. The name refers to the habit of skimming close to the waves. Shearwaters feed on fishes, cuttlefishes, and other open sea animals, often dashing down upon them with considerable force and disappearing for the moment. Most are sooty-brown or grayish above, and white below; the wings are long and pointed; the feet are webbed, with a rudimentary hind-toe; the nostrils are tubular and open separately; the strong bill is slightly hooked. The nest is a mass of grass and rubbish in a burrow in a bank, or in a hole among rocks. The fishermen of the Canary and Salvage Islands anticipate the needs of the birds by making little stone huts for them. A single whitish egg is laid, which both parents incubate for a prolonged



The Manx Shearwater (*Puffinus anglorum*).

period. The Manx Shearwater (*P. anglorum*), 15 inches long, is widely distributed in British waters, and nests in retired places, especially turf

islands and shelved cliffs. It is the 'Lyrie' of the Orkneys and Shetlands, the Fachach of other parts, and is often eaten. It vomits a greenish oil when captured. It is a shy bird, usually nocturnal or crepuscular; its note is *cuck-cuck-ōō*, generally thrice repeated. Nearly related is the Levantine Shearwater (*P. yelkouanus*), the well-known *âme damnée* of the Bosphorus. The Great Shearwater (*P. gravis*), the 'Hagdown' of fishermen, 19 inches long, often approaches British shores, and is common on the Atlantic. It is an expert diver. The only known nesting-place is Tristan da Cunha in the South Atlantic. Another species, occasionally visiting Britain, is the Sooty Shearwater (*P. griseus*); it nests in the southern hemisphere—e.g. on the Chatham Islands. A great rarity for Britain is the Little Dusky Shearwater (*P. obscurus*) from Madeira and Cape Verde.

Sheathing. See SHIPBUILDING.

Sheave. See PULLEY.

Sheba. See SABÆANS.

Shebeen (Irish), a term in use, especially in Ireland and Scotland, for a house where intoxicating liquors (usually whisky) are sold without a licence. See LICENSING LAWS.

Sheboygan, a port, capital of Sheboygan county, Wisconsin, on Lake Michigan, at the mouth of the Sheboygan River, 53 miles by rail N. of Milwaukee. It has a good harbour, and contains foundries, tanneries, and planing-mills, manufactures shoes, chairs, toys, &c., and has a lake-trade in agricultural products. Pop. 31,000.

Shechem. See NABLUS.

Shechi'nah. See ARK OF THE COVENANT.

Shee, SIR MARTIN ARCHER, portrait-painter, was born at Dublin, 20th December 1769, studied drawing, and as a boy of sixteen became famous as a portrait-painter. In 1788 he settled in London, where he became A.R.A. in 1798, R.A. in 1800, and President of the Royal Academy in 1830, when he was knighted. He was regarded as a rival of Lawrence, though his art was but poor and few of his portraits are now thought much of. He wrote several poems, didactic, tragic, and other; a novel; and a *Plan for the Encouragement of Historical Painting*. He died at Brighton, 19th August 1850. See the Life by his son (2 vols. 1860).

Shecahs. See SHITES.

Sheen. See RICHMOND.

Sheep (*Ovis*), a genus of ruminant quadrupeds of the family Capridæ, so nearly allied to goats that the propriety of generic distinction is very doubtful. They differ from goats in having the outline of the face more or less arched and convex; the horns spiral, sometimes very large in the males—in domestication, however, wanting in many breeds; the chin destitute of a beard; a sac or pit between the toes of each foot, lined with hair, and secreting a fatty matter. Upper incisors and canine teeth are wholly wanting: see BOVIDÆ, CAPRIDÆ. It is supposed by some that all the wild sheep existing in different parts of the world are mere varieties of one species; and it is impossible to say from which of the wild species the domestic sheep is sprung.

All the wild sheep known are natives either of mountainous regions or of dry and elevated tablelands. They are gregarious, a character which the domesticated sheep fully retains. They are generally seen in small flocks, and are not easily approached, taking refuge in flight, a sharp whistling sound emitted by one of the rams serving as an alarm to the whole flock; although they are very capable of making a vigorous defence when driven

to close combat. A ram of the domestic species is indeed able to sustain a conflict with a bull, taking advantage of his far greater agility, and butting against his foe with his strongly armed forehead. A ram has been known to throw a bull on the ground at the first onset, and is always ready to defend himself and his companions against a dog. Many rams exhibit great pugnacity. Sheep differ from goats in their mode of fighting; goats rear themselves on their hind-legs, and throw themselves sideways on their adversary, to bring the points of their horns to bear; whereas sheep rush straight at each other, a mode which better suits the different style of armature of the head. Rams of the black-faced variety are especially powerful with their heads, and often at the rutting season kill each other. Their naturally strong skull is further protected in battle by heavy arched horns. A thorough ram fight is a terrifying sight. The two warriors go backwards each some fifteen or twenty yards, and then meet each other with great violence, their heads cracking loudly, and their beam-ends rising in response to the collision of heads. Ewes of this breed fight also. Sheep without horns are not usually so pugnacious as the mountain breeds.

All the wild sheep have short wool, with an outer clothing of long and nearly straight hair. But even the long hair has usually the peculiar character of wool, in that roughness of surface which gives it the property of *felting* (see HAIR, WOOL, FELT). One effect of domestication in the common sheep has been to cause the disappearance of the outer long hair, and to produce instead an increase of the length and abundance of the wool, an object of great importance to the sheep-farmer. In neglected breeds of the common sheep the two kinds of hair or wool are very apparent. In some tropical climates the sheep loses its abundant fleece, and is covered with hair little longer than that of the ox.

Although not equal to goats in their adaptation to rocky steeps, and not endowed with such power of leaping from crag to crag, most breeds of sheep exhibit a strong disposition to seek their food in places where no animal not very agile and sure-footed could venture; and those of the domesticated breeds which retain much of their original wildness are thus adapted to situations in which otherwise the pasture would be of little value to man. In fine weather sheep ascend the heights, and in cold and stormy weather they repair to the lower grounds. In modern times it has been customary to remove the large flocks from mountainous regions to lower grounds to pass the winter; and in the fall of the year shepherds have difficulty in preventing the animals from leaving the summer pastures too early if the weather is unfavourable. On the other hand, if fine spring weather sets in before the period of removal from the winter-quarters, the flocks keep pressing towards the summering regions. Mountain sheep have favoured spots whither they go regularly over-night, and the ewes generally have choice localities to which they go to lamb. They get much attached to certain pastures, and many of them have been known to return stealthily, in the course of a few days, to their native or appreciated pastures, though removed many miles.

A very interesting wild sheep is the Great Mountain Sheep (*Ovis poli*) on the Thian Shan and other lofty chains of central Asia: 10½ hands high, the horns (each some 3 feet long) forming a wide open curve. It was met with by Marco Polo (hence the name). The Argali (*O. ammon*), found east and north of it, is the subject of a separate article. The Moufflon (*O. musimon*) is the wild sheep of the mountains of Corsica and Sardinia, and an allied form inhabits Cyprus and parts of Asia Minor. The Rocky Mountain Sheep, or Big-

horn (*O. montana*), of North America, is as big as the Argali, which it much resembles also in general appearance. The flesh is of the very finest quality. The wool is very fine, fully an inch and a half long, and completely concealed by long hairs. The general colour is brown, paler on the lower parts; the old rams are almost white in spring. The Big-horn is found from Nebraska to the Pacific coast-ranges, and from the Rio Grande northward to 68°, and occurs in herds of from three to twenty or thirty. The Aoudad, or Barbary Sheep (*O. tragelaphus*), a native of the north of Africa, inhabiting chiefly the lofty parts of the Atlas Mountains, has the throat, chest, and front of the forelegs adorned with long shaggy hair.

The Common Sheep (*O. aries*) was probably the first animal domesticated by man; Abel, the 'keeper of sheep,' brought an offering unto the Lord 'of the firstlings of his flock and of the fat thereof;' and lambs were amongst the most frequent sacrificial offerings of the Jews. The felting and weaving of wool were unquestionably among the earliest of the arts. The wool was probably at first pulled from the skin, a cruel practice which long survived in some places. Sheep-shearing is often referred to in Scripture. The leather made of the skin of the sheep is much employed in book-binding, and for making gloves. In patriarchal times the milk was much used, as it still is in some countries; it is richer than cow's milk, and the cheese made of it has a sharp taste and strong flavour, which, however, are greatly relished by some. In some mountainous parts of India the sheep is even used as a beast of burden, carrying loads of from 35 to 40 lb. up steep crags, where almost no other animal could be employed.

Those who watch sheep carefully, or keep them as pets, find them by no means devoid of intelligence. They have, however, a stupid habit of following, without scruple, the leader of the flock; so that, when sheep are being driven across a narrow bridge, or where a fence separates the road from a precipice, if anything occur to deter them from proceeding in the proper path, and one break over the fence or parapet, more of the flock may be expected to follow, as has sometimes happened, to their utter destruction. Sheep very soon come to know the voice of the shepherd, and also the appearance as well as the bark of the shepherd's dog. Though they stand more in awe of the shepherd's voice or commands than of any other human being's, the dogs that regularly move amongst them fail to keep them in such subjection as strange ones do.

The 'rutting' is from September till the middle of December, according to the variety of sheep and the system of feeding. White-faced modern breeds have the tups early among them, and the hill flocks are later. The period of gestation is about 21 weeks. Ewes occupying sown or low-ground pastures lamb in January, February, and March, while those not so well provided for—the mountain sheep—do not drop their lambs usually till April. The ancient breeds generally have only one lamb in a season, but modern highly-fed varieties frequently have twins, occasionally triplets, but rarely more. There is at least one variety in England, the Dorset Horn breed, which produces two crops of lambs each year. Lambs intended to come early into the market are as often as possible dropped in January. Generally lambs are weaned in July and August. Weaning of breeding or store lambs, however, is a feature of modern sheep-farming; at one time it was not uncommon to see several generations persistently following the parent stem. The shearing season ranges from the 1st of May till the middle of July, according to the description of sheep, the nature of the feeding, &c. Dipping, or immersion

in an insecticidal solution, is usually done a few weeks after clipping, and again in autumn. In Britain it is compulsory to dip twice a year.

The great object for which the ancient Britons possessed sheep before the Roman invasion was the production of wool. The demand for meat has now raised the value of mutton and lamb so much, that the farmer finds it profitable to devote much of his attention to supplying the market with these articles; and those breeds of sheep are reckoned most valuable which are most suitable for this purpose, even although the crop of the wool is inferior. When there was no food for sheep but the natural pasture, the animals could not be fattened for the market except during summer, and not until they had attained an age of three, four, or five years; whereas most of the mutton now consumed is the flesh of sheep not more than eighteen months old, fattening being aided by turnips, mangold, other green food, oilcake, and grain.

The young branches of heath, and in lower situations the shoots of furze, often serve as food for sheep, when the supply of grass fails. Sheep delight in the short grass and peculiar herbage of hill pastures and bare downs; and the mutton produced in such pastures, and by the breeds most suitable to them, is of superior quality to that of the large fat sheep fed on richer soils. The latter are also more liable to many diseases, particularly where the ground is at all moist. Aromatic and bitter herbs are particularly relished by sheep.

The breeds of sheep are very numerous, and very different.—The Black-faced Sheep of the Highlands of Scotland and of the north of England is perhaps as near the original type as any existing breed. Both male and female have horns; those of the ram large, with two or more spiral twists, those of the ewe much smaller, and little twisted. The face and legs are not always black. Many are speckled, and some principally white. The black-faced sheep is robust, very active, and hardy; enduring the rigours of a severe winter when sheep of most of the breeds common in Britain would perish. It survives on little food, and shifts admirably for itself in a snow-storm. The small quantity and even inferior quality of food with which a black-faced sheep will tide over a snowstorm is most surprising. So

great indeed is the tenacity of life in black-faced sheep that they have been known to be buried five weeks under a snow-wreath and come out alive. It has a bright, quick eye, with an expression very different from that softness which is seen in many of the breeds preferred for lower grounds and better pastures. The wool is long and coarse, and the weight of the fleece from 3 lb. to 5 lb.; but the mutton is of the finest quality; and on this account, and its hardiness, this breed is preferred to any other in many mountainous districts and on rough elevated moors.—The Welsh Sheep is much smaller than the black-faced; both sexes horned; the colour various; the mutton highly esteemed; the fleece seldom weighs 3 lb.—A very little larger breed with short deer-like tail, hornless, or with short and little twisted horns, has long existed in the Shetland Islands, its wool affording the material for the manufacture of Shetland hosiery. The Shetland sheep are very hardy, and in winter feed much on seaweed.—



Fig. 1.—Black-faced Ram.

Smaller than either of these, and indeed remarkably diminutive, is the hornless Breton Sheep.—The Forest Sheep of England, so called from being pastured in the royal forests, has now been supplanted by other breeds. The original forest sheep was generally small, with face and legs russet brown or gray, wild, restless, and difficult to fatten, but producing wool of fine quality.—The Dorset Sheep is one of the best of the old English upland breeds. Both sexes have small horns. The wool and mutton are of medium quality; but the ewes are remarkable for their fecundity, and the abundance of their milk—two crops of lambs being bred and reared by them each year. This breed is valued as affording a supply of early lamb for the London market.—The Ryeland Sheep has long existed in Herefordshire and some neighbouring counties of England. It is small, short-limbed, white, hornless; produces excellent mutton; and before the introduction of Merino wool its wool was preferred to every other kind for the manufacture of the finest broadcloths.—The Cheviot Sheep has existed from time immemorial on the Cheviot Hills, and is now very widely diffused over a considerable part of England and a large extent of Scotland, being hardy and well adapted for high grounds, although it is inferior in hardness to the black-faced. Cheviots, however, rather excel the black-faced both in size and in the value of the fleece, but require a richer pasture. Ewes are hornless, and the rams almost so. The general figure is longer than that of the black-faced sheep. They are narrow in shape, with slender forequarters and long pricked ears. The colour is white, the face and legs occasionally mottled with gray, but generally quite white. The fleece weighs from 3 to 5 or 6 lb. Great attention has for many years been devoted to the improvement of this breed.—The Leicester Sheep is another of the most valuable breeds. This breed, as it now exists, is a result of the skill and care of R. Bakewell (q.v.), who, soon after the middle of the 18th century, began to make experiments for the improvement of the old Leicester sheep—a large, coarse-boned sheep, not easily fattened, and with coarse long wool, of which, however, the fleece weighed from 8 to 10 lb. The new Leicester



Fig. 2.—Cheviot Ewe.



Fig. 3.—Leicester Ram.

sheep has wool moderately long, of better quality, the average weight of the fleece being about 7 or 8 lb., and is easily rendered very fat. It is naturally very broad on the back, with finely-arched ribs. The colour is white. Both sexes are hornless. The Leicester sheep is now common in all but the mountainous parts of Britain; and other breeds have been improved by crossing with it, particularly various breeds of long-woolled sheep, which have long existed in different parts of England, as those of Lincolnshire, Romney Marsh, &c. The Leicester, indeed, was the first to be submitted to improvement by a systematic system of breeding,

and in the general improvement of the sheep stock of the British Isles it has played a larger part than any other breed. One of the most valuable



Fig. 4.—Border Leicester Ram.

crossed breeds is the Border Leicester.—A famous long-woolled breed is the Cotswold, formerly called also the Gloucester, the wool of which was in great esteem in the 14th and 15th centuries, bearing a higher price than any other wool. In 1464 Edward IV. sent a present of Cotswold rams to Henry of Castille; and in 1468 a similar present was sent to John of Aragon. The Cotswold breed, however, as it now exists, has been modified by crossing with the Leicester, and produces shorter wool and better mutton than in former times.—The South Down Sheep has recently been improved with the utmost care. The colour is generally white, and the face and legs are generally brown or fawn. Black and spotted faces and legs were once common, but these are discounted now. Both sexes are hornless. The wool is short, very close, and curled. The South Down derives its origin and name from the chalky downs of the south of England, but is now met with throughout England and the south of Scotland.—The Shropshire sheep are large, with thick wool something like the South Down. They are hornless, and black or dun in the face and legs. They come early to maturity, but are suited only for finer climates and good keep.—The Hampshire, also hornless, is a valuable breed of sheep for fattening, matures early, and grows to a large size. It originated in a cross between the Old Wiltshire horned sheep and the Old Berkshire Knot with the South Down.—The Oxford Down, a successful blend of the Hampshire and Cotswold breeds, is a heavy, somewhat soft sheep, without horns, and capable of rapid and great development under good treatment. It is not suited to very cold and exposed situations. The Lincoln, a cross between the improved Leicester and the native sheep of the county, is one of the best long-woolled varieties in England. The fleece of the Lincoln Sheep is long and lustrous in the staple, and often exceeds 20 lb. in weight. Other English varieties



Fig. 5.—South Down Ram.



Fig. 6.—Shropshire Ram.



Fig. 7.—Lincoln Ram.

of good standing are the Suffolk Down, Devon Long-wools, Romney Marsh Sheep, Wensleydale, Exmoor, Dartmoor, &c. The Roscommon is the principal native breed in Ireland. They are large hornless sheep, improved from the native sheep by a cross of the Leicester.

The first sheep were taken to what is now the United States in 1609, merinos not till 1801; but now 95 per cent. of American sheep are mainly of merino origin, though the breeds have not been kept pure. The principal breeds are native, Spanish, and Saxon Merinos; the New Leicesters or Bakewells; Southdowns, Cotswolds, Cheviots, and Lincolns. The Texas sheep are largely crossed with a Mexican breed, originally from the Basque provinces of Spain. Two races, originating in America, have been allowed to die out—the Smith's Island and the Otter breeds—the latter with a long body and short legs.—Sheep-raising is carried on more or less extensively in Texas, New Mexico, in the Rocky Mountain states, in the uplands of the south-west, in Ohio, and in the northern New England states.

The merino is an important breed of sheep, originally Spanish, but now widely diffused throughout Europe and North America, and constituting a great part of the wealth of Australia. The merino has large limbs, and the male has large spiral horns, which do not rise above the head; the skin of the neck is loose and pendulous; the cheeks and forehead bear wool; the fleece, which is very heavy, often in choice animals exceeding 20 lb., sometimes even over 30 lb., is fine, long, soft, and twisted in silky spiral ringlets, abounding in oil, which attracts dust, so that it has generally a dingy appearance. The fleece is sometimes black, and black spots are apt to appear even in the most carefully bred flocks. The merino sheep fattens slowly, and owes its value altogether to the excellence of its wool. It has not been found profitable in Britain, where the production of mutton is a great part of the object of the sheep-farmer. Merinos are the main breed in Australia, sometimes variously modified by crossing with English long-woolled sheep. In New Zealand the



Fig. 8.—Merino Ram.

Lincoln, Romney, Leicester, and Cotswold breeds are largely represented, as they do not suffer so much from foot-rot as merinos, and their flesh of course tastes more like English mutton.

A clever Australian shearer will clip from seventy to a hundred and twenty sheep in eight and a half hours; the champion shearer of Queensland did three hundred and twenty-seven in nine hours. The Wolsley Sheep-shearer, invented in Australia, consists of a cutting wheel geared to the shaft of a small steam-turbine, which is worked by a current of steam conveyed from the boiler in an india-rubber tube. A comb moves in front of the cutter, effectually protecting the animal from injury. The shearing apparatus, made of brass and in shape similar to a small trowel, is held in the hand and

guided over the body of the sheep just as is the ordinary wool shears. The shearing-machine works with great expedition and perfect safety to the sheep. It will be of great advantage where flocks are large and labourers few.

The Iceland Sheep is remarkable for very frequently having three, four, or five horns—a monstrosity found also in northern Russia.—The north of Africa possesses a breed of sheep with legs of great length, pendulous ears, and much-arched face; the wool short and curled, except on the neck and shoulders, which have a kind of mane.—India has also a hornless breed, with pendulous ears, short tail, and very fine much-curled wool.—The Broad-tailed or Fat-tailed Sheep is found in many parts of Asia, in Barbary, Egypt, &c., and is now abundant in South Africa. It is rather of small size, with soft and short wool. Its chief characteristic is the enormous development of the tail, by the accumulation of a mass of fat on each side, so great that the tail has been known to weigh 70 or 80 lb. The tail is highly esteemed as a delicacy, and to protect it from being injured by dragging on the ground the shepherd sometimes attaches a board to it, or even a small carriage with wheels.—The Fat-rumped Sheep of southern Tataria has a similar accumulation of fat on the rump.—The Astrakhan or Bucharian Sheep has the wool twisted in spiral curls, and of very fine quality.—The Circassian Sheep has a remarkably long tail, covered with fine long wool, which trails on the ground.—The Wallachian Sheep, common in Rumania, is distinguished by the size and direction of its horns, which after one spiral turn rise up from the head to a great length. The wool is soft, and is concealed by long hair.

The importance to Britain of foreign supplies of mutton may be gathered from the articles **FOOD** and **PRESERVED PROVISIONS**. Reference should be made to the article **WOOL**, and for sheep diseases to the articles on **Anthrax**, **Bot**, **Braxy**, **Fluke**, **Foot-rot**, **Murrain**, **Sheep-pox**, **Sturdy**, &c. See works by G. S. Heatley (1884), C. Scott (1886), J. H. Steel (*Diseases*, 1890); Stephens, *Book of the Farm* (new ed. by Macdonald, 1910); Wallace, *Farm Live-stock of Great Britain* (1885; new ed. 1912), and *Rural Economy and Agriculture of New Zealand and Australia* (1891).

Sheep-dog, a name which often includes the Scottish Collie (q.v.), but which is more properly



Bob-tailed Sheep-dog, 'Wall-eyed Bob.'
(From a Photograph by Gambier Bolton, F.Z.S.)

applied to the English drover's dog. The Sheep-dog or Smooth-coated Collie performs the same work for the south-country shepherd as the

rough-coated for the northern one. The sheep-dog is built on more sturdy and powerful lines than the collie, but lacks the speed of the latter. His coat is short, thick, and wiry; and he is not so graceful as the collie, though possibly quite as useful. Another variety of the sheep-dog is the Bob-tailed or Moorland Collie. When the game-laws were more stringent farmers were only allowed to keep a dog with a docked tail, the current belief being that hares cannot be coursed with success by dogs with docked tails. This treatment long continued was alleged to have made the short tail hereditary. The bob-tailed collie has a long, shaggy, and curly coat. The colour is generally a gray or grizzle. As a cattle-dog he surpasses the other varieties, and is also often used as sheep.

Sheep-ked (in some parts **Kaid**), or Sheep Spider Fly (*Melophagus ovinus*), a wingless member of the order Diptera. This insect is common on sheep and lambs, sucking blood and causing skin irritation. It is about $\frac{1}{4}$ inch long, brown-gray in colour, covered with short hair. The female does not lay eggs, but gives birth at intervals of a few days to three to five oval, shining pupæ, and then dies. To the Ked have been given the very unfortunate names of sheep-louse and sheep-tick. It is not to be confused with the common true sheep-lice, *Trichodectes sphaerocephalus*, in the order Mallophaga; nor with the true sheep-ticks, *Ixodes ricinus* and *Hæmaphysalis punctata*, which are not insects at all, but Acarina allied to mites; nor with the minute mites, *Psoroptes communis*, which cause sheep-scab. For all these the shepherd must use appropriate dips.

Sheep-louse, a mallophagous insect, *Trichodectes sphaerocephalus*; see **LICE**. The name is commonly misapplied to the Sheep-ked (q.v.).

Sheep-pox (*Variola ovina*), although resembling the smallpox of men, is a distinct disease, not communicable either by contagion or inoculation to men or children, or even to dogs or goats. It prevailed as an epizootic in England in 1277, was well known for more than 200 years previous to that date, but in more modern times it did not invade the country until 1847, when it broke out in a farm near Windsor, and quickly spread throughout Norfolk and the eastern counties, and in the summer of 1862 in Wiltshire, near Devizes. It is not uncommon on the continent of Europe. Variolous sheep or infected skins appear in both cases to have imported the disease from abroad. It is scheduled under the Diseases of Animals Acts.

Sheep-scab. See **SCAB**.

Sheep-scoring Numerals of old Welsh (perhaps Strathclyde) origin, much disguised and turned into jingles, are or were lately used by shepherds in counting sheep in many districts all over Great Britain, especially NW. England. They have been found even among the Indians of Ohio and Maine. They have been used also for counting stitches in knitting, and as counting-out rhymes. The following example is from Borrowdale:

- | | | | |
|-------------|-------------|-------------------|-------------------|
| 1. Yan. | 5. Pimp. | 9. Dovera. | 15. Bumfit. |
| 2. Tyan. | 6. Sether. | 10. Dick. | 16. Yan-a-bumfit. |
| 3. Tethera. | 7. Lethera. | 11. Yan-a-dick. | 20. Giggot. |
| 4. Methera. | 8. Hovera. | 13. Tethera-dick. | |

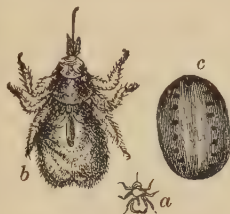
Sheepshead (*Diplodus probatocephalus*), an American fish of the family Sparidae, allied to the perches. It occurs along the east coast from

southern Florida to Cape Cod. The name refers to the shape and colour of the head, and to the teeth, which are broad blades in front and grinding molars on the sides of the jaws. The sheepsheads live near the bottom, especially about oyster and mussel beds or about wrecks, feeding on molluscs and barnacles. In the south they often ascend rivers. Except in spring, when they spawn, they live gregariously. In size they vary greatly, from 2 to 12 pounds' weight. They afford good sport to anglers. The Scup or Porgie (*Stenotomus chrysops*) is nearly allied, and not very far removed is the fresh-water Drummfish (*Haplodotus grunniens*), to which the name sheepshead is also applied.

Sheep-stealing, in England, is a felony, and by statute 6 and 7 Geo. V. chap. 50, sect. 3, is punishable with penal servitude to the extent of fourteen years. In Scotland it is an aggravated species of theft, and under certain old statutes was punishable by death. These statutes have been long ignored, and sheep-stealing, like other thefts, has been punished by imprisonment or penal servitude at the discretion of the judge. And by the Criminal Procedure (Scotland) Act, 1887, a capital sentence is no longer competent in the Scottish courts except on conviction of murder or murderous offences.

Sheerness, a strongly fortified seaport and royal dockyard in Kent, on the north-west extremity of the Isle of Sheppey, at the confluence of the Thames and Medway, 11 miles ENE. of Chatham and 52 E. of London by rail. It consists of three divisions, Blue-town, Mile-town, and Marina-town, and of these the first is within the limits of the garrison. The dockyard, dating from 1814, is one of the finest in Europe, and covers 60 acres, comprising wet and dry docks, immense storehouses, and official residences. The harbour is usually crowded with vessels of all descriptions. The chief trade is in supplying the requirements of the employees in the various government establishments and of the shipping. The neighbourhood was once thought to be very unhealthy, but important sanitary works have been carried out, and now few towns enjoy better health. Of recent years the town has made much progress as a health and pleasure resort. The sea-bathing is excellent. Pop. (1851) 8549; (1921) 18,596. Sheerness was captured by the Dutch under De Ruyter in 1667, and here the mutiny of the Nore (q.v.) broke out in 1798.

Sheers. The elemental form of a pair of sheers consists in two spars fastened together near the



Sheep-ked (*Melophagus ovinus*):

a, natural size; b, magnified; c, the pupa, magnified.

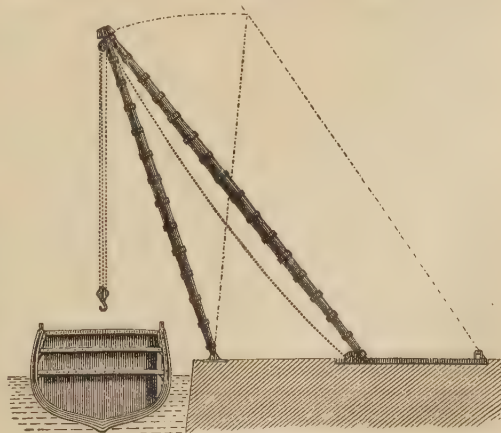


Diagram of Sheers.

top with a pulley at the point of junction, and held by a rope fastened to any convenient object,

in such a position that the weight lifted hangs nearly between the spars. This forms an easily improvised crane. An apparatus of this kind of great height and strength is used for masting vessels. In the principal dockyards there are tall permanent sheers, mounted either on the side of a masting-dock or on a floating *sheer-hulk*, often an old dismasted ship devoted to this use.

Sheffield, the largest city in Yorkshire and the fifth largest in England, a municipal, parliamentary, and county borough in the West Riding, is situated on the extreme southern border of the county, at the confluence of the rivers Sheaf and Don, and extends considerably into Derbyshire. It is 46 miles SSW. of York, 18 miles SW. of Doncaster, 38 miles S. of Leeds, 41 miles E. of Manchester, and 165 miles NNW. of London. Lying in a hilly district many of its streets have steep gradients. In 1875 an improvement scheme was commenced for making new streets and widening existing ones in the centre of the city. This was carried out at a cost of over half a million. Amongst the principal buildings are the old parish church of St Peter (now the cathedral), originally built in the early years of the 12th century, but of that structure very little remains, the church having undergone several restorations—the Shrewsbury chapel at the south side of the chancel contains fine monuments to the fourth and sixth earls of Shrewsbury; St Paul's Church, erected in 1721; St Marie's Roman Catholic (1850), surmounted by a spire 195 feet high; the Victoria Hall (Wesleyan Mission); Cutlers' Hall; Corn Exchange; Royal Hospital; Royal Infirmary; Jessop Hospital; Post-office; the University; Technical College; King Edward VII. School (formerly the Wesley College), and others. The dominating building is the Town Hall, begun in 1891, and considerably enlarged in 1923. It was opened in 1897, has two principal frontages in Pinstone Street and Surrey Street, at the corner of which is a lofty clock-tower, surmounted by a bronze statue of Vulcan. In addition to the council chamber and offices of the city officials it contains a fine suite of reception-rooms. The city is well provided with public parks: Norfolk Park (the gift of the Duke of Norfolk), Firth Park (the gift of Mark Firth, Mayor, 1875), Graves Park (the gift of Alderman J. G. Graves, Lord Mayor, 1926), Weston Park, Meersbrook, High Hazels, Millhouses, and Endcliffe. In Weston Park is the principal museum, which contains the well-known Bateman Collection of ancient British antiquities, as well as permanent collections of Sheffield plate, pottery and porcelain, and other antiquities. The Mappin Art Gallery adjoins the museum and contains the collection of pictures formed by John Newton Mappin, both the building and pictures being bequeathed by him to the town. Numerous additions were made to this collection by his nephew, Sir F. T. Mappin, Bart., who was M.P. for Hallamshire for many years. In Meersbrook Park is the Ruskin Museum (formerly the St George's Museum at Walkley) founded by Ruskin, in which he deposited an important collection of minerals, illuminated manuscripts, paintings, drawings, and engravings. There is also a museum at High Hazels, in which are specimens of iron-work, local prints and portraits. The reference library in Surrey Street has been greatly enriched by the Jackson Collection of local pedigrees, charters, manuscripts, and books. There is an up-to-date technical library, and lending-library with eight branch libraries. The university was founded in 1905, and the department of applied science occupies extensive buildings with a fine frontage in St George's Square. Sheffield has long been

noted for the manufacture of Cutlery (q.v.), but at the present day its chief products are iron and steel, which have given it the name of 'Steelopolis.' These trades find employment for many thousands of men, and include the manufacture of railway material, armour-plates, guns, machinery, tools of all descriptions. In addition to which are the older trades of silver and electro-plated goods, and the new one of safety-razor blades. The population (1821), 65,275; (1841), 111,091; (1861), 185,172; (1881), 284,508; (1901), 409,070; (1921), 482,798, but since the widening of the boundaries in 1921 is now about 520,000. There is an excellent service of Corporation tramcars and motor-buses, by which easy access can be had to the beautiful scenery of Derbyshire and Yorkshire by which Sheffield is surrounded.

Amongst the worthies of Sheffield are Benjamin Huntsman, the inventor of cast-steel, Thomas Boulsover, inventor of Sheffield plate, Sir John Brown, Sir Francis Chantrey, James Montgomery, Ebenezer Elliott, Thomas Creswick, R.A., Sir William Sterndale Bennett, Joseph Hunter, and J. O. Westwood.

The history of the town commences with Earl Walthef, who was lord of the manor at the time of the Conquest. A Norman family, De Lovetot, became the resident proprietors of Sheffield and the adjacent parishes, and established a market, a hospital, and a corn-mill. The property descended to a female heir, whose hand was given in marriage by King Richard I. to Gerard Furnival, who had fought with the king at Acre. The Furnivals took the side of Henry III. in his contests with the insurgent barons, during which an expedition was formed against the town and castle of Sheffield, when many of the inhabitants were slaughtered, and the castle burned, in 1266. Four years after this disaster the castle was rebuilt by Thomas de Furnival. His son, of the same name, was the great benefactor of the town, granting what is known as the 'Furnival Charter,' which enfranchised his vassals and gave them a court of justice and trial by jury. This charter is carefully preserved in the archives of the town burgesses. His grandson Thomas took part in the battle of Crécy, and died without issue, the property thus passing to another grandson, William, Lord Furnival, whose only daughter married Sir Thomas Nevil. This pair again left an only daughter, who married John Talbot, first earl of Shrewsbury, made familiar in Shakespeare's *Henry VI.* During the Wars of the Roses the Talbots sided with the Lancastrians, and the second earl fell at the battle of Northampton fighting for the king. His son and successor died young, leaving a son who was only five years old when he succeeded to the title and estates, which he held for 70 years. This earl made the castle a more permanent place of residence than his predecessor had done. It was a fortified building with spacious grounds, orchards, &c., and stood at the northern entrance to the town between the rivers Sheaf and Don. Not a vestige of it now remains. In the early part of the reign of Henry VIII. the earl built a more homely residence about two miles' distance from the castle, surrounded by a large park, which contained some magnificent oak trees and herds of deer. It was here that the earl entertained Wolsey for eighteen days when on his last journey (1530), and here the ill-fated Mary, Queen of Scots, spent some years of her captivity. Very little of this building remains, but the ruins still bear the name of 'Sheffield Manour.' The earls of Shrewsbury were amongst the very chief of the nobility of England, and the sumptuousness of living which they maintained, both at the castle and manour, was second only to that of royalty itself. Queen Elizabeth imposed

on George Talbot, sixth earl of Shrewsbury, the odious responsibility of holding Mary, Queen of Scots, a prisoner in his castle at Sheffield, and she was under his charge for the long period of fourteen years, most of which time was spent in Sheffield (1572-86). Gilbert, seventh earl of Shrewsbury, left three daughters, of whom the youngest only—whose husband was Thomas, Earl of Arundel—had a child, and to this son of the Earl of Arundel the property eventually passed through the entail having been cut. The title, however, passed to Earl Gilbert's brother Edward, and later to a younger branch of the family of Talbot, who still hold it. Through the Earl of Arundel the Sheffield property became henceforth vested in a line of descendants which has made the dukes of Norfolk owners and lords of Hallamshire. Lord Arundel lived much abroad, and the prosperity of Sheffield deteriorated greatly owing to the withdrawal from the local markets of all such custom as two grand mansions had hitherto afforded. Whilst the noble family maintained their loyal sentiments towards the king in the national contest, the townspeople took the side of the parliament. In August 1644 the castle was besieged and taken by the parliamentary army, and soon afterwards a resolution was passed by the government that it should be 'sleighted and demolished.'

Sheffield henceforth became dependent upon its cutlery trade, which as the special business of the town had existed from very early times. The 'Sheffield whittle,' spoken of by Chaucer in the 14th century, was the common knife used for all purposes by those whose social rank did not entitle them to carry a sword. The Cutlers' Company of Hallamshire, which has now a national reputation, was founded in 1624, and the annual feast may date from about that time, having originated in the permission granted by Earl Gilbert to the 'apron men,' or working smiths, to pull down as many deer as they could kill in the park and carry away with their hands. Up to the middle of the 18th century Sheffield was a mean place, and the cutler was a poor man; an income of £100 a year was accounted as riches. But in a century from that time, with railway approaches, the use of the steam-engine, machinery of every sort, and a variety of processes for the manufacture of steel, the growth and progress of the town was rapid, and Sheffield became the 'capital of steel.' It was the first place at which armour-plates to protect British warships were rolled.

The Nonconformist bodies have increased with the population. The old dissent commenced with the ejection of the Presbyterian clergy in 1662, of whose churches the Upper Chapel (Unitarian) in Norfolk Street is now the lineal representative. Sheffield was first enfranchised by the Reform Bill of 1832; by the bill of 1885 it was divided into five, by that of 1918 into seven, divisions, each being represented by one member.

In March 1864 a terrible calamity overtook the town through the bursting of the embankment of the Dale Dyke reservoir at Bradfield. This was a newly constructed dam covering 78 acres and holding 691 millions of gallons of water; the embankment was 95 feet high in the deepest part, and about 420 yards long. The disaster occurred in the night, and the flood swept down the valley with a force which nothing could withstand, doing immense damage and causing great loss of life: 250 persons perished; works, houses, and hamlets were swept away, and apart from the ruin of the dam, damage was done to private property to the extent of £300,000.

Sheffield was incorporated in 1843, became a city in 1893, and since 1896 has a Lord Mayor. In 1891 the see of a bishop-suffragan under York was constituted, and in 1913 Sheffield became a separate see.

See Joseph Hunter's *History of Hallamshire* (1869 ed.); Gatty's *Sheffield, Past and Present* (1873); R. E. Leader's *Sheffield in the Eighteenth Century* (1901); J. D. Leader's *Records of the Burgery of Sheffield* (1897); and *Mary Queen of Scots in Captivity* (1880); *Transactions of the Hunter Archaeological Society*.

Sheffield, JOHN, DUKE OF BUCKINGHAM, was born 7th April 1648, and succeeded to the title of his father, the second Earl of Mulgrave, in 1658. He served in the navy against the Dutch in 1666, and commanded a ship in 1672, but subsequently joined the army. He was lord chamberlain to James II., and a cabinet-councillor under William III., who in 1694 made him Marquis of Normanby. Anne raised him to the dignities of Duke of Normanby and of (the county of) Buckingham (1703); but for his opposition to Godolphin and Marlborough he lost all his offices. After 1710 under the Tory régime he was lord steward of the household and lord president till the death of Anne, when he lost all power, but intrigued zealously for the restoration of the Stuarts. He wrote two tragedies, a metrical *Essay on Satire*, an *Essay on Poetry* (his principal work), and some smaller poems, all of them much talked of at the time, but of little poetic value. He died 24th February 1721.

Sheffield, JOHN BAKER HOLROYD, EARL OF (1735-1821), is chiefly known as the friend of Gibbon (q.v.) and editor of his miscellaneous works. He wrote numerous pamphlets on the slave-trade, the corn laws, the navigation laws, and on commercial and agricultural questions.

Sheikh (Arab., 'elder,' 'aged person'), a title applied to the chieftain of an Arab tribe, to the principal preacher in a Mohammedan mosque, to the head of a religious order, and to a learned man or a reputed saint of Islam. The Sheikh ul-Islam in Turkey is the head of the Mohammedan church; he is possessed of very great influence and power (see ULEMA). From 1453 he was nominated by the Sultan; from 1922 by the National Assembly. Persia has likewise a Sheikh ul-Islam, appointed by the government. Sheikh al-Jebel (Old Man of the Mountain) was the name of the chief of the Assassins (q.v.).

Sheil, RICHARD LALOR, Irish patriot and orator, was born at Drumdowney, County Tipperary, 17th August 1791, son of a prosperous Cadiz merchant, who had returned to Ireland about the time that the most odious of the Catholic disabilities began to be relaxed. He passed his earliest years at his father's estate of Bellevue near Waterford, and in due time went to school, first to Kensington, then to Stonyhurst, whence he passed in 1807 to Trinity College, Dublin. Soon after this his father failed, but young Sheil was enabled through the help of friends to graduate B.A. in July 1811, and to enter Lincoln's Inn in November of the same year. He was called to the Irish bar in Hilary term, 1814. The next few years he devoted to literature, producing a series of plays, most of which proved successful at the time. His *Sketches of the Irish Bar*, written in conjunction with the younger Curran, appeared during 1822 in the pages of the *New Monthly Magazine* (2 vols. 1855). In 1823 Sheil joined O'Connell's Catholic Association, which was dissolved in 1825, and throughout gave the great tribune a loyal but an independent support. After the Lords threw out the Catholic Relief Bill (May 1825) he aided his chief in forming the New Catholic Association, and throughout the course of the agitation he devoted enormous labour to the preparation of those ornate and impassioned speeches, which, despite his shrill voice and feeble gestures, had often a magical effect on his audience, and many of which remain to

posterity among the masterpieces of English oratory. After Catholic emancipation was gained in 1829 Sheil devoted much more of his time than before to his profession. He was returned to parliament for Milborne Port, Somerset, a pocket-borough of Lord Anglesea's, and at the dissolution of 1831 for Louth, and later he sat for Tipperary and Dungarvan. After the defeat of Repeal in 1834, which years later he described as 'a splendid phantom,' Sheil mostly supported the Whigs, and in 1838 received a commissionership of Greenwich Hospital. In August 1839 under Melbourne he became vice-president of the Board of Trade, and a privy-councillor—the first Catholic to gain that honour. Under Lord John Russell in 1846 he was appointed Master of the Mint, and in 1850 British minister at Florence. Here he died of gout, 25th May 1851.

See his *Memoirs*, by W. Torrens McCullagh (2 vols. 1855). His *Speeches*, with a memoir by T. MacNevin, were published in 1845; the *Speeches, Legal and Political*, edited by M. W. Savage, in 1855 (2 vols.).

Shekarry (also spelt *shikarry*, *shikaree*, *chickary*; Hind. *shikāri*), an Anglo-Indian word for 'hunter,' 'sportsman,' familiar to English readers from the books on sport in India by 'The old Shekarry,' Major H. A. Leveson (1828-75).

Shekel (Heb., from *shaqal*, 'to weigh'), originally a certain standard weight in use among the ancient Hebrews, by which the value of metals, metal vessels, and other things was fixed. Gradually it became a normal piece of money, both in gold and silver, marked in some way or other as a coin, although not stamped. The gifts to the sanctuary, the fines, the taxes, the prices of merchandise are all reckoned in the Old Testament by the shekel, not counted but weighed. Three different kinds of gold, silver, and copper shekels are mentioned: the common shekel, the shekel of the sanctuary (possibly because the standard weight was kept in the Temple), and the shekel of royal weight (2 Sam. xiv. 26). Besides these there was a half-shekel (called *Bega'*) and a quarter-shekel (1 Sam. ix. 8). The sacred shekel was equal to 20 gerahs ('beans'), and 3000 sacred shekels made a talent. Originally the Israelites used the Babylonian system, in which the talent (*likkar*) consisted of 60 minas and each mina of 60 shekels; thus the talent would equal 3600 shekels. But when the Egyptian decimal scale superseded the Babylonian sexagesimal one, the talent contained 3000 shekels. The gold shekel is reckoned approximately to contain 161 Troy grains, the silver shekel 275. During the Babylonian exile the Persian money (*darics*) was used by the captives; nor do the Jews seem to have afterwards used any but the coins of their foreign rulers. It was first under the Maccabees that national money began to be struck. Simon, the 'prince and high-priest,' received, according to 1 Macc. xv. 6, the permission from Antiochus VII. to strike coins in 138 B.C. The emblems are sacred branches, sheaves, flowers, vases, &c., and the legend (in archaic script) contains the date, the name of the Jewish ruler, and the inscriptions 'Shekel of Israel,' 'Jerusalem the Holy,' 'Redemption of Israel.' The latest coins with Hebrew inscriptions date from Barcochba's fight against Hadrian for freedom. The value of the silver shekel is reckoned to be something over two shillings and ninepence. The intricate questions of the weight of the shekel at different periods are discussed in the *Jew. Ency.* (s.v. 'Shekel' and 'Numismatics'). See bibliography there given (and also in *Ency. Brit.* s.v. 'Shekel'); *Jewish Coins*, by Th. Reinach (Eng. trans. by Mrs G. F. Hill, Lond., 1903); *British Museum Catalogue*, by G. F. Hill, and *Handy*

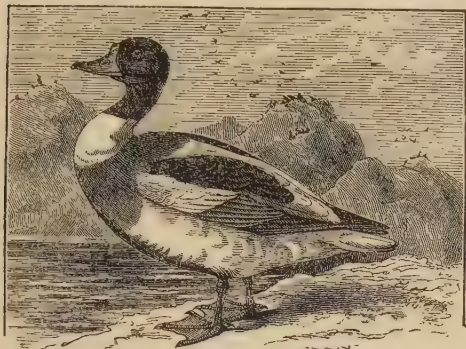
Guide to Jewish Coins, by E. Rogers (privately printed for Spink & Son, 17 Piccadilly, Lond., 1914).

Sheki'nah. See ARK OF THE COVENANT.

Shelburne, WILLIAM PETTY, EARL OF, son of the first earl, and maternal grandson of the famous Sir William Petty (q.v.), was born in Dublin, 20th May 1737, and, after studying at Oxford and serving in Germany, entered the House of Commons for the pocket-borough of Wycombe in 1761, but only sat for a few weeks, the death of his father calling him to the House of Lords. When George Grenville succeeded Bute in 1763 Lord Shelburne was placed at the head of the Board of Trade, and when Chatham formed his second administration in 1766 he became one of the Secretaries of State. Upon the fall of Lord North's ministry in 1782 George III. sent for Shelburne, and proposed to him to form a government. He declined, not being the head of a party, and was sent by the king to the Marquis of Rockingham with an offer of the Treasury, himself to be one of the Secretaries of State. It soon appeared that Shelburne was not so much the colleague as the rival of Lord Rockingham, the chosen minister of the court, and the head of a separate party in the cabinet. Upon Rockingham's death in the following July the king sent at once for Shelburne, and offered him the Treasury, which he accepted without consulting his colleagues. Fox thereupon resigned, and Shelburne introduced William Pitt, then only twenty-three, into office as his Chancellor of the Exchequer. Shelburne's ministry, on the occasion of the king's announcement of his determination to concede the independence of the American colonies, found itself outvoted by the coalition between Fox and Lord North (February 1783). He resigned, and the coalition ministry took his place, but soon broke up. The nation expected that the king on this event would have sent for Shelburne, but William Pitt received the splendid prize, and Shelburne was consoled by being made in 1784 Marquis of Lansdowne. The rest of his days he spent in retirement, amusing himself by collecting in Lansdowne House a splendid gallery of pictures and a fine library, and with the friendship of Priestley, Jeremy Bentham, Sir S. Romilly, Mirabeau, Dumont, and others. He died at Bowood Park, Wiltshire, 7th May 1805. See *Life of Shelburne*, by his great-grandson Lord Edmund Fitzmaurice (3 vols. 1875-76; revised 1912), in which he is shown to have been an advocate of reform, free trade, and Catholic emancipation.

Sheldrake (*Tadorna*), a genus of birds of the Duck family Anatidæ, having the hind-toe free. The Common Sheldrake (*T. cornuta* or *vulpanser*) is one of the most remarkable of all the duck tribe for its size and the beauty of its plumage. It is fully 2 feet long. The head and neck are dark glossy green; below this is a collar of white, and lower still a collar of rich chestnut extending over part of the back; the rest of the back is white; the middle of the under-parts is black; the wing speculum green, the primaries and part of the secondaries black; the bill and frontal knob bright carmine; the legs, feet, and webs flesh pink. The female is rather smaller and duller, and has no frontal knob. The sheldrake is confined to salt water, and is found upon flat shores, links, and sand-bars on various parts of the coasts of the British Isles. It is abundant in Sweden, Denmark, the Baltic, and Norway: it is a winter visitor to the Mediterranean, but resident in the Black Sea and the Caspian; it is found in Asia in salt lakes, and as far as Japan. It breeds in burrows made by rabbits and foxes in sand-dunes (hence the name Burrow Duck by which it is sometimes called), or it may make its own burrows. In

some sandy islands off the coast of Jutland burrows are made by the inhabitants, who protect the birds



Common Sheldrake (*Tadorna vulpanser*).

for the sake of their eggs and down. The food consists of small molluscs, sand-hoppers, and seaweed. The flesh is coarse and unpalatable. The note of the male is a shrill whistle; the female utters a harsh bark. The Ruddy Sheldrake (*T. rubra* or *casarca*) is rare as a British bird, and not common anywhere north of the Alps and Carpathians. It is not uncommon in Spain and various parts of North Africa. It is more abundant in the Black Sea area, southern Russia, and the elevated parts of Asia as far as China and Japan. In India, where it is known as the Brahminy Duck, it is very common during the cold season. Four other species are found respectively in South Africa, the Malay Archipelago, Australia, and New Zealand. The name is doubtless derived from *shield*, from the markings on the plumage. Other names are Skeel-duck, Skeeling-goose, Sly-goose, St George's Duck, and Bargander.

Shell, a general name for the hard enclosure or exoskeleton of many different kinds of animals, and including a great variety of structures, differing in composition, texture, and development. Many Protozoa have shells of lime (as in most Foraminifera), or of flint (in most Radiolarians), which may be distinguished as inorganic shells from organic shells such as those of acanthin (a protein skeletal substance found in many Radiolarians). As all these shells are the results of chemical processes (metabolism) in the living matter, they may be distinguished from shells of extraneous materials—e.g. in the arenaceous Foraminifera. Yet in the cementing of the extrinsic particles a secreted material may be used. The same contrasts recur at a higher level. Thus among Polychaet worms there are shell-tubes of lime and shell-tubes of organic material; there are shell-tubes secreted by the worm and others in the main extrinsic, consisting of sand-grains and the like cemented by a secretion. For the hard parts of corals of the Madreporarian type, the word shell is quite appropriate. The various parts are secreted by the outer layer of ectoderm, and though they may seem to intrude into the interior, the flesh of the polyp recedes before the passive growth of the walls and partitions which the process of secretion effects. Such ectodermic shells are very different from those of sea-urchins and some other Echinoderms, which are mesodermic in origin, and are added to by the secretory activity of enveloping mesoderm cells. They may seem to be external, but they are surrounded during life by transparent ciliated ectoderm.

The cuticular type of shell finds abundant illustration among Arthropods—e.g. crab and lobster, king-crab and beetle. It consists of an external

armature, not in itself living or cellular, which is made and remade by the underlying living skin. During the period of growth it is periodically moulted and replaced. In all cases there is an organic basis of chitin produced in the periphery of the epidermic cells; to this in crustaceans and king-crabs lime is added. The shell of a typical crustacean, such as the crayfish, consists of laminated chitin, impregnated with lime-salts (furnished by the blood), and containing a pigment called zooerythrin. The hardness of the shell or cuticle of many insects is mainly due to the thickness of the chitin; there are traces of copper in some beetles, and rare instances of calcareous hardening have been noted. It is quite possible that shells primarily expressed a method of dealing with waste-products, and it may be noted in this connection that chitin is a nitrogenous carbon-compound.

Another type of shell is characteristic of molluscs. It is also cuticular, and is typically a product of the fold of skin known as the mantle. There is an organic foundation of conchin or conchiolin, allied to chitin, and on this there is deposition of carbonate of lime. It is non-cellular and non-living like the shell of Arthropods, but it does not require to be moulted, since a free edge is retained, at which enlargement can be made in correspondence with the animal's growth. Apart from the organic matrix, the molluscan shell typically consists of pure carbonate of lime, but a little phosphate may be present, or a trace of carbonate of magnesia and the like. The lime may be laid down in granular or in crystalline form; if the latter, it may be either calcite or aragonite, sometimes both in one shell. The texture may be nacreous or porcellaneous; and almost all molluscan shells show layers of laminae, transversely or longitudinally disposed. In all molluscs there is an embryonic shell-sac which makes an embryonic shell; the adult shell, if there is one, is mainly a product of the mantle. In the Brachiopods or Lamp-shells, which are not in any way related to molluscs, the dorsal and ventral shell-valves are composed of small prisms or spicules of lime with a variable quantity of organic matrix, and in many cases there are numerous tubules or pores through the shell containing extensions of the mantle and of the skin of the body.

The word shell also finds application among back-boned animals. Thus tortoise-shell consists of epidermic horny plates, and the subjacent bony encasement of Tortoises (q.v.) and Turtles is a very intricate combination of exoskeleton and endoskeleton. Even the Armadillo (q.v.) among mammals may be said to have a shell—a unique armature of ossified integumentary plates.

See Rolleston's *Forms of Animal Life*, 2d ed. 1888, p. 127, giving a discussion of shells and references to literature. See also BIVALVES, CONCHOLOGY, EGG, FORAMINIFERA, IRIDESCENCE, MOLLUSCA, PEARL, &c. For vegetable shells, see DIATOMS, NUT. For shells in religion and magic, see MAGIC, IMAGES, CHANK SHELL. For shells as money, see COWRY.

Shell, a hollow projectile containing a bursting-charge of gunpowder or other explosive, and exploded, as desired, either in the air or on striking some object, by either a time or percussion fuse (see FUSE). In the past shells were spherical in form; but after the introduction of rifling elongated shell, as shown in the figures, were introduced.

Fig. 1 is a 'common' shell. Formerly these shell were made of cast-iron and filled with gunpowder; but they are now more usually made of the best forged mild steel and filled with a high explosive. In either case they are exploded by a fuse—generally percussion—screwed into the fuse-hole at their noses. A variant of this shell is the 'segment' shell, with lines of weakness cut in the

walls to make it burst into many pieces. It is not now much used. During the war of 1914-18 common shells, suitably modified and filled with smoke-producing composition and poisonous gases (see BOMB), were used very largely, and, to a lesser extent, filled with incendiary compositions. Special flaming shell were introduced for the attack of airships.



Fig. 1.

Fig. 2 is an armour-piercing ('A.P.') shell. Its cavity is much smaller proportionally than that of a common shell, as it needs a very strong head. A high-class A.P. shell will perforate, without breaking up, a plate of the best hardened steel of a thickness equal to its (the shell's) diameter, if it have a striking velocity of about 1800 to 2000 feet per second, and if it strike the

plate at right angles. The perforative power, without breaking up, falls off very rapidly if the striking velocity be diminished, or if the impact be oblique. It will be noticed that the shell has a cap over its point. This cap (of soft steel) undoubtedly does assist a shell to perforate armour, but the exact way in which the cap does its work has been the subject of much discussion, and no explanation has been universally accepted. A modern armour-piercing shell is made of one of the best 'alloy' steels of the chrome or chrome nickel class. The 'Palliser' A.P. shell, made of cast-iron specially hardened, was efficient against the old wrought-iron armour, but would be quite useless against modern hardened steel. A.P. shells are filled with gunpowder or high explosive—recently more usually the latter—and have base percussion-fuses. There is also a capped semi-A.P. shell, with a larger bursting-charge, capable of piercing about half its diameter of armour.



Fig. 2.

Fig. 3 shows a Shrapnel shell. It is filled with bullets, with melted rosin run in round them, and has a small bursting-charge in the cavity at its base, which is fired by the flash, passing down the tube in the centre of the bullets, from the fuse (shown dotted), screwed into the nose of the shell. Fig. 3 shows powder-pellets in the tube; these are sometimes not used. This shell is essentially a man-killing projectile, and is burst in the air by the time-action of a time and percussion fuse (see FUSE) a short distance in front of the troops attacked. When it explodes, the bursting-charge drives the bullets out of the shell in a coned shower, the angle of the cone being from 20 to 30 degrees. The bullets have the velocity of the shell at the time of bursting, with a small additional velocity due to the bursting-charge. For ranging purposes, or for the attack of troops only protected by light cover, it is burst on percussion. This shell was invented by Colonel Henry Shrapnel, R.A., in 1784, originally of course as a spherical shell; but its first trial did not take place until 1803. Its complete success depends on a good time-fuse, and as a result it was not adopted abroad until quite late in the 19th century. It is now universally adopted for field-artillery.



Fig. 3.

Efforts have been made in the past to produce a shell which shall have the properties of both the common and the Shrapnel shell. In one form some of the bullets in a Shrapnel shell are sacrificed to make room for an inner shell filled with high

explosive. Such shell have not as yet been adopted, nor, from recent war experiences, is it likely that they will be.

Star shell are shell which when burst by time-fuse send out a shower of burning stars. The latest practice is to use only one large star, which is supported by a parachute as it falls and gives light for a much longer time. They are used for illuminating the ground in front of a position. All shell fired from modern breech-loading guns have driving-bands near their bases, by which they are rotated by the rifling. Muzzle-loading guns had studs in their walls, or rotating gas-checks on their bases, for the same purpose. See also SHOT; and for 'tracers' for shell, see CANNON.

Shellac. See LAC.

Shelley, MARY WOLLSTONECRAFT, daughter of William Godwin and Mary Wollstonecraft, and wife of the poet Shelley, was born August 30, 1797. Her life from 1814 to 1822 was bound up with that of Shelley. Her first and most impressive novel, *Frankenstein*, had its origin in a proposal of Byron's, made in 1816 at his villa on the Lake of Geneva, that Mary and Shelley, Polidori (Byron's young physician), and Byron himself should write each a ghost story. *Frankenstein* (q.v.) was published in 1818. The influence of Godwin's romances is apparent throughout. Her second tale, *Valperga, or the Life and Adventures of Castuccio, Prince of Lucca* (1823), is a historical romance of mediæval Italy. In 1823 she returned to England with her son. Her husband's father, in granting her an allowance, insisted on the suppression of the volume of Shelley's *Posthumous Poems*, edited by her; and she was obliged to submit. *The Last Man* (1826), a romance of the ruin of human society by pestilence, fails to attain sublimity, but we can trace in it with interest idealised portraits of some of the illustrious persons most intimately known to her. In *Lodore* (1835) we read under a disguise the story of Shelley's alienation from his first wife. Her last novel, *Falkner*, appeared in 1837. She published several short tales in the annals, some of which have been collected and edited by Dr Garnett. Of her occasional pieces of verse the most remarkable is *The Choice*. She wrote also many of the lives of Italian and Spanish literary men in Lardner's *Cabinet Cyclopædia*. Her *Journal of a Six Weeks' Tour* (partly by Shelley) tells of the excursion to Switzerland in 1814; *Rambles in Germany and Italy* describes a series of tours in her later years. She will be remembered by *Frankenstein* and her admirable notes—in large part biographical—to her husband's poems. Those who knew her intimately valued Mary Shelley for her nobility of character, even more than for her fine intellect. She died February 21, 1851, and was buried in Bournemouth. In 1922 Koszul edited two short plays, *Proserpine* and *Midas*. See SHELLEY (PERCY BYSSHE), GODWIN (WILLIAM), GODWIN (MARY W.).

Mrs Julian Marshall wrote a valuable *Life of Mary Wollstonecraft Shelley* (2 vols. 1889); and there is a short *Life of her* by Mrs W. M. Rossetti.

Shelley, PERCY BYSSHE, one of the greatest of English poets, was born on 4th August 1792, at Field Place, near Horsham, Sussex, the eldest child of Timothy Shelley and his wife Elizabeth, daughter of Charles Pilfold of Effingham, Surrey. The family was old and honourable. Bysshe Shelley, the poet's grandfather, married two heiresses, acquired a great property, and in 1806 received a baronetcy; in 1815 he died. Percy was a boy of much sensibility, quick imagination, and generous heart; physically of a refined type of beauty, blue-eyed, golden-haired. At ten years old he became a pupil of Dr Greenlaw's at Sion

House School, Isleworth, where he made some progress in classics, listened with delight to lectures on natural science, and endured much rough handling from his schoolfellows. In 1804 he passed to Eton, where Dr Goodall was then head-master. He continued his study of the classics, read eagerly Lucretius and Pliny, became a disciple of the 18th-century sceptical and revolutionary writers, pored over Godwin's *Political Justice*, filled his imagination with the wonders of modern science, resisted the system of school-fagging, and held aloof from the throng of the schoolboys, who in turn made him the object of systematic persecution. While still at Eton he wrote a crude romance, in the manner of M. G. Lewis, which was published with the title *Zastrozzi* in April 1810. Before the close of the year a second romance, *St Irvyne, or the Rosicrucian*, appeared; it is as absurd as its predecessor in its sentimental extravagance, its pseudo-passion, and mock sublimity. He assisted his cousin Thomas Medwin in a poem on the subject of *The Wandering Jew* (1810), and issued with a fellow-rhymist a long-lost volume of verse, *Original Poetry by Victor and Cazire* (1810; ed. by R. Garnett, 1898). His collaborator was his sister Elizabeth, and not his cousin Harriet Grove, whom Shelley loved with a boy's passion. Her parents, alarmed by Shelley's religious scepticism, put a stop to the correspondence between the cousins. In April 1810 Shelley matriculated at University College, Oxford, and in Michaelmas term entered on residence. His chief friend was a student from Durham, Thomas Jefferson Hogg, who has left a most vivid account of Shelley's Oxford life. Hogg was shrewd, sarcastic, unimpassioned, and withal a genuine lover of literature. He aided Shelley in putting forth a slender volume of poems, originally written by Shelley with a serious intention, now retouched with a view to burlesque—*Posthumous Fragments of Margaret Nicholson*—the pretended authoress being a mad washerwoman who had attempted the life of the king. In February 1811 a small pamphlet by Shelley, entitled *The Necessity of Atheism*, was printed. When it was offered for sale in Oxford, the college authorities conceived it their duty to interfere; Shelley and Hogg were interrogated respecting its authorship, and having refused to reply, were expelled from University College (March 25, 1811) for contumacy and for declining to disavow the pamphlet. For a time the friends lived together in London lodgings; then Hogg departed to the country and Shelley remained alone. In his solitude he found some pleasure in the society of a schoolfellow of his sisters at Clapham, Harriet Westbrook, a fresh and pretty girl of sixteen, daughter of a retired coffee-house keeper. She moved under the tutelage of an unmarried sister nearly twice her own age. When summer came Shelley was with cousins in Wales; letters reached him from Harriet in London complaining of domestic persecution, and speaking of suicide as a possible means of escape; a letter followed in which she threw herself on Shelley's protection, and proposed to fly with him from her home. Shelley hastened to see her, but at the same time assured a cousin that he did not love Harriet, though he was prepared to devote himself to her through a sentiment of chivalry. On meeting him she avowed her passion, and he left her with a promise that if she summoned him he would come at her call and make her his. The summons came speedily; Shelley and Harriet, aged nineteen and sixteen, took coach for Edinburgh, and were there formally united as man and wife on 28th August 1811. He assured his bride that, in accordance with principles which he firmly held, the union of man and wife might be dissolved as soon as ever it ceased to contribute to their mutual happiness.

Coming from Edinburgh to York, where Hogg resided, the young married pair were joined by Eliza Westbrook, the elder sister. Ill conduct of Hogg towards Harriet caused a temporary alienation between the friends. The Shelleys with Eliza moved to Keswick, where Southey's presence was an attraction. Southey was kind and helpful, but his lack of revolutionary ardour and his indifference to metaphysical speculation displeased Shelley. The young enthusiast found a monitor more to his liking in Godwin, with whom he now corresponded as a disciple with a master. To apply at once his ideas of reforming the world he resolved to visit Ireland, and there advocate Catholic emancipation and Repeal of the Union. On reaching Dublin he printed and scattered abroad an *Address to the Irish People*, written at Keswick. This was soon followed by a second pamphlet, *Proposals for an Association of Philanthropists*. He spoke at a large public meeting from the same platform with O'Connell, and made the acquaintance of Curran. Discouraged by the small results of his efforts, and yielding to Godwin's advice, he left Ireland (April 4, 1812), and after some wanderings in Wales found rest in a cottage at Lynmouth, then a lonely fishing-village. Here he received as a visitor Miss Hitchens, a Sussex schoolmistress, whom both before and for a time after his marriage he had idealised into all that is most heroic and exalted in womanhood, and with whom he was ere long more than disenchanted. He wrote a vigorous pamphlet on behalf of liberty of printing—the *Letter to Lord Ellenborough*—amused himself with circulating, by means of bottles and boxes set afloat in the Channel and by fire-balloon, copies of his satirical poem *The Devil's Walk* and his revolutionary broadsheet *Declaration of Rights*, and was at work on his *Queen Mab*. His servant, having been found posting up at Barnstaple the offensive broadsheet, was imprisoned, and Shelley crossed to Wales. He took up his abode at Tremadoc, where he was much interested in the scheme of a great embankment against the sea. In October he made Godwin's personal acquaintance in London. During the winter he was active in the relief of the suffering poor of Tremadoc, studied history and philosophy, and added to his manuscript poems. On the night of 26th February 1813 an aggrieved shepherd attempted to enter the lonely house of Tanyrallt. Some have thought that Shelley with over-heated fancy conjured up such an outrage. He hastily quitted Tremadoc, and after an excursion to Dublin, Cork, and Killarney, once again settled in London. In June 1813 his wife gave birth to a daughter who was named Ianthe (married to Mr Esdaile, died 1876). On Harriet's recovery some stay was made at Bracknell in Berkshire. *Queen Mab* was printed for private distribution, its religious and political views being considered too hostile to received opinions to admit of public circulation. The poem sets forth Shelley's youthful conceptions of the past history of humanity, its present evils, and future progress. It is often crude, often rhetorical, yet there is more than a promise of poetical power in certain passages. In the autumn (1813)—perhaps to obtain time to settle with creditors—Shelley and his household went northward to the English Lakes, and thence to Edinburgh, but before the new year opened he was settled at Windsor. About this time he wrote a prose dialogue (published 1814), *A Refutation of Deism*, designed to prove that there is no *via media* between Christianity and Atheism.

In March 1814 Shelley went through the ceremony of marriage with Harriet according to the rites of the English Church, probably to set at rest any doubts of the validity of the Scotch marriage. He was endeavouring to raise large sums of money

on Godwin's behalf, and the marriage may have been considered advisable to render certain the legitimacy of a future son and heir. Four months later he had separated from his wife for ever. Their early married happiness had become hopelessly clouded; an attempt at reconciliation made by Shelley in May was rejected. Harriet withdrew to Bath. It was stated by Miss Clairmont, the daughter of Godwin's second wife, that Shelley declared in July 1814 that Harriet had yielded herself to a certain Major Ryan, and Godwin in 1817 stated in writing that he had evidence independent of Shelley of her unfaithfulness before Shelley left her. No such evidence is in our possession to-day, and statements to the contrary were made by Harriet herself and by several persons who knew her well. The division between husband and wife, whatever its causes, was deep. Shelley had become suddenly and passionately enamoured of Godwin's daughter, Mary, a girl of fine intellect and vigorous character. Having informed Harriet of his resolve to leave her finally, and having made arrangements for her material comfort, he took flight to the Continent with Mary Godwin on 28th July 1814. Miss Clairmont accompanied the fugitives. Shelley was inexperienced enough to suppose that Harriet could still regard him as a considerate friend, though no longer her husband.

After a journey across France and a short stay in Switzerland, Shelley and his companions returned by the Rhine to England. The last months of 1814 were full of vexation caused by debts and duns. But in January 1815 Shelley's grandfather died, and by an arrangement with his father he obtained an income of a thousand a year. His health unhappily showed the effects of the previous year's strain and excitement. He sought rest and refreshment in Devon, and in August found a home at Bishopsgate, on the edge of Windsor Forest. In the autumn of 1815 *Alastor*, his first really admirable poem, was written. It tells of the ruin of an idealist who, pining for absolute love and beauty, shuns human society; its visionary landscapes have the largeness and ideality characteristic of Shelley. In January 1816 Mary gave birth to a son, who was named after her father; but Godwin still held aloof. It was decided to try life upon the Continent, and in May Shelley and Mary travelled through France to Geneva. Miss Clairmont, whose intrigue with Byron was unknown to Shelley and Mary, accompanied them. On the shores of the Lake of Geneva a meeting took place between Byron and Shelley. They rowed and sailed together on the lake, and Shelley in company with Mary made an excursion to Chamouni. In the poem *Mont Blanc* and the *Hymn to Intellectual Beauty* we find a poetic record of the impressions of these memorable days.

In September they were once more in England. The suicide, following a state of deep depression, of Fanny, the half-sister of Mary (see GODWIN, WILLIAM), gave Shelley a great shock, and this disaster was soon followed by the death of Harriet Shelley. For some time past Shelley had in vain inquired for her. She had formed an irregular connection with one who, it is believed, deserted her. On 10th December her body was discovered in the Serpentine; had she lived she would soon have given birth to a child. It was another severe shock to Shelley, but he always maintained that he himself was 'innocent of ill, either done or intended.' Free now to make Mary his lawful wife, he at once celebrated his marriage (30th December 1816). A long Chancery suit followed, Shelley seeking to obtain possession of his daughter Ianthe and his son Charles (born November 1814—died 1826), the Westbrooks

resisting. At length Lord Eldon gave judgment which compromised the matter; Shelley's opinions being such as led to immoral and illegal conduct, he was disqualified for bringing up his children, but he might appoint caretakers and tutors to be approved by the court. The blow was deeply felt by Shelley. While the Chancery affair was proceeding he was cheered by the friendship of Leigh Hunt and of Horace Smith. His home was at Marlow on the Thames, and here he wrote fragments of his *Prince Athanase*, a portion of *Rosalind and Helen*, and his long narrative poem *Laon and Cythna*, designed to sustain men's hopes in ideals of freedom and progress during days of political reaction. When some few copies of *Laon and Cythna* had been issued the publisher withdrew it from circulation, and induced Shelley to alter certain lines and phrases which might give offence. As thus revised the poem was issued with a new title, *The Revolt of Islam*. During his residence at Marlow Shelley worked earnestly and systematically in the relief of the poor. He printed two pamphlets, *A Proposal for Putting Reform to the Vote*, by 'The Hermit of Marlow,' and *An Address to the People on the Death of the Princess Charlotte*. In the spring of 1818 it was feared that he was threatened with pulmonary disease. He decided to seek a southern climate, and in April, with Mary, little William, an infant daughter Clara (born 2d September 1817), Miss Clairmont and her child Allegra (Byron's daughter), he left England for Italy, never again to see his native land.

In the summer of 1818, at the Baths of Lucca, Shelley completed his *Rosalind and Helen*, and made his translation of Plato's *Banquet*. Grief came with the autumn; little Clara died on 24th September at Venice, where Shelley had been renewing his companionship with Byron. Memorials of this visit to Venice, with an idealised presentation of Byron, will be found in the admirable poem *Julian and Maddalo*. He contemplated a tragedy of *Tasso*, but this was set aside in favour of his great lyrical drama *Prometheus Unbound*, the first act of which was written at Este, September–October 1818. Seeking a warmer climate for the winter, he journeyed to Rome, and thence to Naples. His letters descriptive of Southern Italy are full of radiance and luminous beauty. In the spring (1819) he was again in Rome, and found great delight in its classical sculpture and architectural remains. Among the ruins of the Baths of Caracalla he wrote the second and third acts of *Prometheus*. The fourth act—not originally conceived as part of the poem—was added before the close of the year at Florence. On 7th June 1819 Shelley's beloved son William died at Rome. The afflicted parents sought the neighbourhood of kind friends near Leghorn, and here—at the Villa Valsovano—Shelley wrote the greater part of his dark and pathetic tragedy *The Cenci*. At Leghorn the first edition was printed in quarto. The other works of this memorable year were written at Florence—a prose treatise called *A Philosophical View of Reform* (still unpublished in its entirety); a poetical appeal to his countrymen on the occasion of the 'Peterloo' affair, entitled *The Mask of Anarchy*; a grotesque satire suggested by the supposed failure of Wordsworth's poetic powers under the blight of Toryism—*Peter Bell the Third*; a translation of *The Cyclops* of Euripides; and in addition to these some of his noblest lyrical poems, among them the magnificent *Ode to the West Wind*.

On 12th November 1819 a son was born to comfort his father and mother, Percy Florence (died 5th December 1889). The climate of Florence was found trying, and in January the Shelley household moved to Pisa, where was spent the

greater part of the poet's remaining days. The year 1820 was less productive than 1819. The charming poetical *Letter to Maria Gisborne*, a spirited translation of the Homeric *Hymn to Mercury*, the brilliant fantasy of *The Witch of Atlas*, the satirical drama *Ædipus Tyrannus* or *Swellfoot the Tyrant*, which deals not very happily with the affair of Queen Caroline, are the chief writings of 1820. As the year was closing the Shelleys made the acquaintance of a beautiful girl, Emilia Viviani, who was confined in the convent of St Anna. To Shelley's imagination for a brief time she became the incarnation, as it were, of all that is most perfect, all that is most radiant in the universe. At such a moment he wrote his *Epipsychidion*, which is rather a homage to the ideal as seen in womanhood than a poem addressed to an individual woman. It was followed by a remarkable piece of prose—the critical study entitled *A Defence of Poetry*.

A small circle of interesting friends had gathered about Shelley at Pisa. Among these were Edward Williams, a young lieutenant of dragoons, and his wife Jane, to whom many of Shelley's latest lyrics were addressed. In the summer of 1821 the Shelleys and Williams had much pleasant intercourse at the Baths of San Giuliano. The elegy *Adonais*, suggested by the death of Keats, was here written; it is Shelley's most finished piece of art. In the late summer or autumn he swiftly composed his *Hellas*, a lyrical drama suggested by passing events in Greece. Early next year Byron was settled in Pisa, and Shelley had also an interesting new companion in Trelawny, a young man of ardent and romantic temper. Shelley worked somewhat tentatively at his unfinished historical drama *Charles I*. His last great poem, also unfinished, *The Triumph of Life*, was written in his boat near Casa Magni, a lonely house on the eastern side of the Bay of Spezzia, occupied as a summer residence by the Shelleys, together with Edward and Jane Williams. On 19th June Shelley heard of the arrival in Italy of Leigh Hunt and his family. He and Williams, some days later, set sail for Leghorn. The meeting with Hunt was full of joy and hope. On Monday, 8th July, Shelley and Williams left the port of Leghorn with a favourable breeze; the boat was observed at ten miles distance; then it was lost in sudden storm and mist. Dreadful uncertainty for a time came upon the two widowed women at Casa Magni. On 19th July the bodies were found upon the shore near Via Reggio. By special permission they were consumed by fire in the presence of Trelawny, Hunt, and Byron. The ashes of Shelley were placed in a casket, and were afterwards interred in the Protestant burial-ground at Rome.

In person Shelley was tall and slight, and if not of exact formal beauty of face had a countenance full of spiritual beauty, radiant with its luminous blue eyes. His portrait, painted in Rome by Miss Curran, is the only likeness of Shelley in manhood. His poetry is inspired by an ardent passion for truth, an ardent love of humanity; it expresses desires and regrets with peculiar intensity, but also sets forth a somewhat stoical ideal of self-possession, as if to balance the excessive sensitiveness of its author. The earlier poetry is aggressive and doctrinaire, embodying the views and visions of Godwin's philosophy; the later is more purely emotional. Shelley's creed, which passed at an early stage from deism to atheism, rested in his mature years on a spiritual conception of the universe.

An edition of Shelley's *Complete Works* in 10 vols., ed. Ingpen and Peck, began in 1926 with his correspondence (vols. viii, ix, x.). The standard edition of Shelley's works in verse and prose is that of H. B. Forman (8 vols. 1876–80). Forman also edited an

admirable text of the poetical works in two volumes. Rossetti's edition of the poetical works is of great value. The most complete one-volume edition of the poetical works is that by Thomas Hutchinson (1904). The prose works were edited by Shepherd (1888), the letters by Ingpen (1909; enlarged 1915). *A Philosophical View of Religion* was first printed in 1920 (ed. T. W. Rolleston). Dowden's is the fullest and most exact Life of Shelley (2 vols. 1886). Short Lives have been written by Symonds, Rossetti, Salt, and W. Sharp, and by his daughter-in-law, Lady Shelley. Hogg's Life is excellent for the months at Oxford. Trelawny's *Records* gives a vivid picture of Shelley during his last days. Biagi's *Gli Ultimi Giorni de P. B. Shelley* (1922) contains the most authentic account of his death. See also books by Elton (1894) and Ingpen (1917); Francis Thompson's essay (1909); Clutton-Brock's study (1909); Mrs O. W. Campbell's *Shelley and the Unromantics* (1923); T. Spira's *Shelley's Geistgeschichtliche Bedeutung* (Giessen, 1923). Forman's *Shelley Bibliography* (1882) is full and accurate, and there is an essay by Chevrillon in his *Études Anglaises*. The publications of the Shelley Society include reprints of several rare editions. An admirable *Lexical Concordance to Shelley's poems* was published by F. S. Ellis in 1892.

Shell-fish, a popular term for many aquatic animals not fishes (in the sense in which the word 'fish' is now understood); especially oysters, clams and all molluscs, and crustaceans such as crabs and lobsters.

Shell-lac. See LAC.

Shells. See SHELL.

Shell-sand. Sand consisting in great part of fragments of shells, and often containing a small proportion of organic matter, is a very useful manure, particularly for clay soils, heavy loams, and newly-reclaimed bogs. It is also advantageously applied to any soil deficient in lime. It neutralises the organic acids which abound in peat, and forms with them compounds which serve as food for plants. Great deposits of shell-sand are found on the coasts of Devonshire and Cornwall, and are of much value in the agriculture of that district. Shell-sand is also found on many other parts of the British coast, and nowhere more abundantly than in the Outer Hebrides. The sand of many parts of the coast being mostly siliceous is incapable of the same use. Shell-sand is much used as a manure in some of the maritime districts of France, as Bretagne and Normandy.

Shelta, or SHELTRŪ, is a secret jargon of great antiquity spoken by Irish tinkers, beggars, and pipers, the descendants of the ancient ceards and bards. The word SheltŪ is a perversion of the Irish *béultra*, 'language.' Shelta is otherwise known as 'Cainnt cheard,' 'Minkur-tharal,' 'Gam (or Gamoch) cant,' 'Bog-latin,' and 'Béarl'eagair.' For use of last name see *Gaelic Dictionary of the Highland Society* (1828), i. 113: "'Beurl'eagair" or "'Laidionn nan ceard," the gibberish of tinkers: *figulorum stribligo*; *dialectus qua utuntur ollarum sartores circumforanei*;' also i. 548: 'Gibberish: *mendicorum et nebulonum ex compacto sermo, barbaries*.' Béarla eagair (i.e. 'vernacular') thus used must not be confounded with Béarlagair na saor (mason's jargon), a few words of which are given by MacElligott (*Dublin Gaelic Society*, 1808). The earliest specimens of this idiom, collected (1877–80) by C. G. Leland from an English vagrant in North Wales and an Irish tinker in Philadelphia, are published in *The Gypsies*, pp. 354–372. The investigation of Shelta was continued by D. MacRitchie in the *Journal of the Gypsy Lore Society* (i. 350–357), where fresh examples from the Scottish Highlands and south of Ireland subsequently appeared. In the same *Journal* (ii. 204–220) Mr John Sampson showed Shelta to be a systematic perversion of the preaspirated Gaelic

spoken anterior to the 11th century, and Dr Kuno Meyer (ii. 257-266) in an erudite paper on 'The Irish Origin and Antiquity of Shelta' adduced numerous references to this jargon in early Irish MSS. Shelta has been identified by Dr Meyer with the ancient secret language called Ogam (q.v.), a word probably surviving in the name Gam or Gamoch cant. References to Ogam as a spoken tongue occur in the *Annals of Clonmacnoise* (1328) and in O'Molloy, *Grammatica* (1677), p. 133. Several common Shelta words are found in the *Dúil Laithne* or Book of Latin (cf. 'Laidionn nan ceard,' for Latin = cant, see Pott's *Zigeuner*, i. 8), an Ogam glossary copied by MacFibris from an old or middle Irish MS. Professor Thurneysen (*Revue Celtique*, vii. 369-375) has shown that many of these Ogam words are formed by substituting for the initial its runic name: thus *manaith* (*D. L.* 137 = Shelta *münni*) is formed from *Ir. maith* by changing *M* into *mün*, the name of the letter; Shelta *nadherum*, 'mother,' being similarly an anagram of *münathair* (*Ir. mathair*). Shelta words are also fabricated from Irish by reversing or transposing the letters of the original word (e.g. *grē*, 'rise,' *Ir. érg*; *tober*, 'road,' *Ir. bothar*), by changing the initial (e.g. *jünnik*, 'Sunday,' *Ir. domnach*), and by the prefix, suffix, or interpolation of arbitrary letters to the Irish word or its anagram (e.g. *gladher*, 'skin,' *Ir. leather*; *thalosk*, 'day,' *Ir. latha*; *grigo*, 'king,' *Ir. rig*; *laskon*, 'salt,' *Ir. salann*). Analogous modes of word-disguise are described in the *Amra Choluimchille*, an Irish MS. of the 12th century, and in the *Uraicept na n-Eges* (Primer of the Poets), each of these processes having a recognised name. A few old Irish words are used in Shelta without disguise, as *künya*, 'priest,' *Ir. cairneach*, 'druidical priest'; *gyukera*, 'beggar,' *Ir. geocaire*. Shelta borrows its grammar and unimportant words from Irish or English. The following translation of the Lord's Prayer ('Staffara a' Dhalyon') by an old Irish tinker illustrates the hybrid grammar of the Ulster dialect:

Mülsha's gather, swürth a münniath, münni-gráda kradyt chülsha's münnik. Gra be grēdhi'd shedhi ladhu, as aswürth in münniath. Büg mülsha thalosk münrth goshta dhurra; gretul our shakü arafk mülsha getyas nidyas grēdhi gamiath mülsha. Nijesh solk mwi-il stürch gamiath but bug mülsha achim gamiath. Dhi-il the sridug, thardyürath and münniath. Gradhum a gradhum.

The tinkers believe Shelta to be an independent language of Pictish origin (*The Gypsies*, p. 371). MacRitchie connected this tradition with the fact that Creenie (Cruithnigh) is a Connaught tinker surname and Crink (Cruithneach) a nickname for Irish tinkers (Groome, *In Gypsy Tents*, p. 147). Shelta contributes largely to other English and Irish cants. See *ken* and *gage* (vb) in Harman's *Caveat* (1566), *cín* (Shelta, *ken*) in MacElligott's *Berlagar na saer*, and *tobar* in *Rapparee* (*Ir. rapaire*) cant.

Shemakha, a town of the republic of Azerbaijan, on the Pisargat River, 63 miles W. by N. of Baku, with silk manufactures. It was known to Ptolemy and the Greek geographers as Semachia, and was subsequently for centuries the capital of the Tatar khans of Shirvan, but was entirely destroyed by Nadir Shah in 1742. Nevertheless it was soon rebuilt, but was overwhelmed by an earthquake in 1859, and a second time in 1872. Pop. 20,000.

Shemites. See SEMITES.

Shenandoah, (1) a river of Virginia, drains the beautiful and fertile valley between the Blue Ridge and the principal range of the Alleghanies. It rises in two branches, which unite about 85 miles W. of Washington, and runs north-east 170 miles to the Potomac, at Harper's Ferry. In the war of 1861-65 this valley was the scene of numerous

battles, was successively occupied by the opposing armies, and finally was carried and laid waste by General Sheridan (q.v.) in 1864-65.—(2) A borough of Pennsylvania, 105 miles north-west of Philadelphia. It has a very large trade in anthracite coal. Pop. (chiefly foreign) 25,000.

Shendy, a town in Lower Nubia, on the right bank of the Nile, 100 miles NNE. below Khartum, with a trade in salt, wool, carpets, ostrich-feathers, &c., and a pop. of about 10,000 (40,000 prior to its destruction by the Egyptians in 1822).

Shenstone, WILLIAM, son of Thomas Shenstone of the Leasowes, Hales Owen, Worcestershire, was born there 18th November 1714. In 1732 he was sent to Pembroke College, Oxford, and whilst there devoted himself much to the study of English poetry. In 1737 he published anonymously a small volume of *Poems upon Various Occasions*; in 1741 *The Judgment of Hercules*; and next year *The School-mistress*, the work by which he is chiefly remembered. In 1745 he succeeded his father in the estate of the Leasowes, where he thenceforth busied himself with landscape-gardening. Such was his success in beautifying his little domain that it attracted visitors from all quarters, and brought him more fame than his poetry, but at the same time involved him in serious pecuniary embarrassments. He died 11th February 1763. *The School-mistress*, which has secured for the 'water-gruel bard' (as Horace Walpole dubbed him) a permanent if humble place among English poets, is written in the Spenserian stanza; and in the contrast between the stateliness of the vehicle and the familiar and homely quality of the subject, with the graphic truth of its treatment, there is a singular source of charm. Shenstone's other works are for the most part quite insignificant; but his *Pastoral Ballad* has touches of exquisite tenderness and truth of sentiment expressed in a simple and appropriate melody.

See Life by Dr Johnson prefixed to the pithy *Essays on Men and Manners* (new ed. 1868) and that by George Gilfillan to an edition of his *Poems* (Edin. 1854).

Sheol. See HELL.

Shepherd of Her-mas. See HERMAS.

Shepherds. See FRIENDLY SOCIETIES.

Shepherd's Dog. See SHEEP-DOG.

Shepherd's Purse (*Capsella Bursa-pastoris*), an annual plant of the family Crucifere, a most abundant weed of roadsides, gardens, and cornfields in Britain, and remarkable as one of the few plants that are found over almost the whole world without the tropics, adapting themselves to almost all soils and climates. It is a very variable plant, from three inches to two feet in height, with root-leaves more or less pinnatifid, all the leaves more or less toothed, and rough with hairs. The root-leaves spread closely along the ground. The flowers are white and diminutive.



Shepherd's Purse
(*Capsella Bursa-pastoris*).

The pouch, from which the English name seems to be derived, is laterally compressed and somewhat heart-shaped. The 'species' has been broken up into a vast complex of elementary species and races, numbering several hundreds.

Sheppard, JACK, born at Stepney in 1702, was the son, grandson, and great-grandson of a carpenter, and himself at twelve, after a year and a half's schooling in Bishopsgate workhouse, was apprenticed to a carpenter in Wych Street, Drury Lane. For six years he did well, but, falling then into bad company, in July 1720 he committed the first of many robberies. In the course of 1724 he was four times caught, but as often escaped, on the occasion of his third evasion from Newgate forcing six great doors. The fifth time luck deserted him, and on 18th November he was hanged at Tyburn in the presence, it was said, of 200,000 spectators. Harrison Ainsworth made him the hero of a novel (1839). See *Celebrated Trials* (vol. iii. 1825).

Sheppey, ISLE OF, a portion of the county of Kent, insulated from the mainland by the Swale, an arm of the Medway. It is 9 miles long and 4 broad. Once it was larger; but the sea is eating away the north shore, which is lined by cliffs of London Clay 60 to 80 feet high. The church of Minster, formerly in the middle of the island, is now close to the north coast. Almost the whole of the inhabitants are massed in Sheerness (q.v.). In 1732 Hogarth and four others made 'a five days' peregrination' of the island; see their illustrated account (1781, 1782, 1817, &c.).

Shepton Mallet, an ancient market-town of Somersetshire, 15 miles from Bath. It has a market-cross, dating from 1500, 51 feet high; a church with a splendid timber roof; a grammar-school (1627); and some manufactures of silk, velvet, crape, and ale. Pop. 4300.

Sherardising. See GALVANISED IRON.

Sheraton, THOMAS, designer of furniture, was born at Stockton-on-Tees in 1751. In 1791 he produced *The Cabinet-maker and Upholsterer's Drawing-Book*, with over one hundred plates (new ed. 1793-6-1802; reprinted 1896). He gave his name to a style in which ornament was subordinated to utility, and on severer lines than that of his predecessor Chippendale (q.v.). He died in 1806.

Sherbet, a beverage much used in Mohammedan countries, where stimulating drinks are forbidden. It consists of the juices of various fruits diluted with water, and sweetened.

Sherborne (O.E., 'clear brook'), a pleasant old-fashioned town of Dorsetshire, in the Vale of Blackmore, on a gentle southern hill-slope above the Yeo, 17 miles N. by W. of Dorchester and 5 E. of Yeovil. In 705 Ina, King of Wessex, made it the seat of a bishopric, with St Aldhelm for first bishop, whose twenty-fifth successor, Hermann, in 1075 transferred the see to Sarum. The noble cruciform minster, measuring 207 by 102 feet, with a tower 114 feet high, was the church of a great Benedictine abbey, founded by Bishop Roger in the first half of the 12th century. It was converted from Norman to Perpendicular after a great fire in 1436, and restored in 1848-58. Noteworthy are the clerestory, vaulting, and choir; and in the retrochoir are the graves of Asser and two of King Alfred's brothers. King Edward's School, comprising remains of the abbey buildings, was founded in 1550, reorganised in 1871, and has since risen to be one of the great public schools of England. Sherborne Castle is an Elizabethan mansion, built in 1594 by Raleigh in the grounds of Bishop Roger's Norman castle (c. 1125), which, taken by Fairfax in 1645, is now a ruin. Sherborne has also

a literary institute (1859), Bishop Neville's 15th-century hospital, and the Yeatman memorial hospital (1863), with some manufactures of lace, buttons, and silk. Pop. 6400.

Sherbrooke, a city of Quebec, capital of Sherbrooke county, at the junction of the rapid Magog (with falls) and St Francis rivers, 82 miles E. of Montreal, with many busy factories and large woollen, saw, and flour mills; pop. 23,500.

Sherbrooke, LORD. The Right Hon. Robert Lowe, Viscount Sherbrooke, was born in 1811 at Bingham, Notts, of which parish his father was rector. He was educated at Winchester, and University College, Oxford, where he became a fellow of Magdalen. Called to the bar, he emigrated in 1842, and soon attained a lucrative practice at the Sydney bar; he also took a leading part in the political life of the colony, ultimately as member for Sydney. At home again in 1850, and returned in 1852 for Kidderminster as an independent member with Conservative tendencies, he in 1853 took office under Lord Aberdeen, and in 1855 under Lord Palmerston. In 1859 he was returned for the borough of Calne by the influence of the Marquis of Lansdowne; and he represented London University from 1863 till he went to the Upper House. During 1859-64 he was vice-president of the Education Board (and virtual minister for Education) in the second Palmerston administration, resigning in 1864, and introduced the Revised Code of 1862, with its principle of 'payment by results.' He largely contributed to ensure the rejection of the Whig Reform Bill in 1866. He was, with other 'Adullamites,' offered a post in the Derby government, but he declined to leave the Liberal party, though in 1867 he was still an opponent of all reduction of the suffrage. In 1868 his feud with the Liberal party was forgotten in the strenuous aid he gave the Liberal leaders in carrying the disestablishment of the Irish Church. Accordingly he obtained in Mr Gladstone's Liberal ministry the office of Chancellor of the Exchequer; exchanging it in 1873 for that of Home Secretary. As Chancellor of the Exchequer, his proposal of a tax on matches was very unpopular; but the annual surpluses were large almost beyond example. He exerted himself to keep down the public expenditure; and his curt treatment of all claimants of public money brought odium upon him. In acuteness and cogency of argument he had hardly an equal. In education he opposed the once exclusive study of the classics. An LL.D. of Edinburgh D.C.L. of Oxford, in 1880 he went to the Upper House as Viscount Sherbrooke. He published a volume of poems (*Poems of a Life*) in 1884; and he died 27th July 1892, at Warlingham, Surrey. See his *Life* by A. Patchett Martin (2 vols. 1893).

Shere Ali. See AFGHANISTAN.

Sheridan, PHILIP HENRY, a brilliant American cavalry commander, was born in Albany, New York, March 6, 1831, third son of John and Mary Sheridan, but a few weeks after the arrival of his Irish parents in the New World. After attending a public school in Ohio, to which state the family removed soon after his birth, he was employed for a time as a shop-boy. In July 1848 he was appointed a cadet at West Point, graduated in 1853, and was appointed a brevet second-lieutenant in the Third Infantry. In May 1861 he was a captain in the Thirtieth Infantry, and in December of that year he was made chief quartermaster of the army in southwestern Missouri. In April 1862 he became chief quartermaster under General Halleck; but in May he was given a regiment of cavalry (the Second Michigan), and, being now in his proper sphere, did such excellent work that he was soon pro-

moted to the command of a brigade, and then to a division of the Army of the Ohio. In the battle of Perryville (8th October), and still more in the battle of Stone River (Murfreesboro'), which ended on 3d January 1863, and where his division lost over 1600 men, he performed brilliant services, and earned his promotion to major-general of volunteers. He took part in the severe battle of Chickamauga, from which field the Northern army fell back within the defences of Chattanooga, and there, serving now under the immediate command of General Grant, he was engaged in all the operations of the campaign that followed, gaining especial credit for the dash and gallantry with which his division drove the enemy up the slope and over the summit of Mission Ridge. Soon afterwards transferred to Virginia, in April 1864 he was given command of all the cavalry of the Army of the Potomac, took part in the battle of the Wilderness, and made a notable raid (May 9-25) on the Confederate lines of communication with Richmond, advancing to the outer defences of that city, cutting railroads, destroying depôts, and on the 11th defeating the enemy's cavalry at Yellow Tavern with the loss of their commander, General Stuart. In the same month he was first into Cold Harbor, and in June took part in the heavy battle there, and fought a number of cavalry actions. In all these his dash and skill attracted Grant's admiration, and in August he placed Sheridan in command of the Army of the Shenandoah, giving him two cavalry divisions commanded by Generals Torbert and Wilson. The task set him was to drive the Confederates out of the Shenandoah Valley and to close this gate into Pennsylvania and Maryland. In September he attacked the enemy under General Early, drove them through and many miles beyond Winchester, and captured 5000 prisoners and 5 guns; and from Fisher's Hill, where Early halted, he again dislodged him, and pursued him through Harrisonburg and Staunton. These battles made him a brigadier-general in the regular army. But Early's army, being largely reinforced by General Lee, again appeared in the Shenandoah Valley, and on October 19, advancing under cover of fog and darkness, succeeded in surprising the Northern army and driving it back in confusion. Sheridan had been in Washington, and at this time was at Winchester, twenty miles away. Hearing the guns, he put his horse to its speed, and arrived on the field by ten o'clock, waving his hat and shouting to the retreating troops, 'Face the other way, boys; we are going back.' His unexpected appearance restored confidence, the lines were re-formed, and a serious defeat was suddenly converted into a great victory. The enemy's left was soon routed, the rest shared their fate, and the Confederates were again, and finally, driven from the valley, which Sheridan, by Grant's orders, now devastated. For Winchester he was promoted to major-general and received the thanks of congress, and Grant's armies fired a salute of 100 guns in honour of the victory.

Henceforward Sheridan fought always under Grant's direct command, and took an active part in the final battles which led to Lee's surrender at Appomattox Court-house, April 9, 1865. His ability as a general was nowhere better displayed than in the action at Dinwiddie Court-house and the assault of Five Forks in March and April, which drove Lee from Petersburg and Richmond. After the war Sheridan was placed in command of the military division of the Gulf, and later of the department of the Missouri. When Grant became president of the United States General Sherman was made general-in-chief and Sheridan promoted to lieutenant-general. In 1870 the latter visited Europe to witness the conduct of the Franco-

German war, and was with Von Moltke during the battle of Gravelotte. On the retirement of Sherman in 1883 he succeeded him as general-in-chief. In May 1888 Sheridan became seriously ill, and a bill was speedily passed by both Houses of Congress restoring for him the full rank and emoluments of general. He died at his country-house in Nonquitt, Massachusetts, August 5, 1888, leaving a widow and three children. He was buried at Arlington, Virginia, within sight of Washington, where a beautiful monument marks his grave.

Sheridan was the nineteenth general-in-chief of the United States army. He never lost a battle, and the confidence and affection which 'Little Phil,' as they delighted to call him, inspired in his troops may be gauged by the story of Winchester. Among the Northern generals he ranks second only to Grant and Sherman. See his *Personal Memoirs* (2 vols. 1888).

Sheridan, RICHARD BRINSLEY BUTLER, was born in Dublin, 30th October 1751. He was the grandson of Swift's friend, Thomas Sheridan, D.D. (1687-1738), and the second son of Thomas Sheridan (1719-88), a man of established reputation as a teacher of elocution, and the author of a now forgotten *Life of Swift*. His mother, Frances Sheridan, *née* Chamberlaine (1724-66), also had achieved some success in literature, being the author of a novel called *Sidney Biddulph*, and of one or two plays. Richard Sheridan was educated at Harrow, where he does not seem to have distinguished himself much. After leaving school he made his first attempt at literature, in collaboration with a school-friend named Halhed, in the form of a three-act farce called *Jupiter*, the general idea of which bears some resemblance to that afterwards worked out in the *Critic*. It does not, however, appear to have ever been completed. The two friends next attempted a verse translation of the *Epistles of Aristænetus*—a pseudo-classical author of unknown date and doubtful identity—of which the first part was published, but attracted no favourable notice. In 1771 the Sheridans settled at Bath, where they made acquaintance with the family of Linley the composer. A sort of sentimental friendship, ripening into a warmer feeling, appears to have been set up almost immediately between Elizabeth Linley, the eldest daughter—a girl of great beauty and musical talent, popularly known as the Maid of Bath—and Richard Sheridan, which, after various romantic episodes, terminated in a marriage, with the rather reluctant consent of the parents in 1773.

The young couple settled down in London to a life considerably beyond their means. Mrs Sheridan had a fortune in her voice, but her husband would not allow her to use it professionally. He himself now made more serious efforts at dramatic composition—which had always attracted him—and got a play accepted at Covent Garden. On the 17th of January 1775 the *Rivals* was produced for the first time with no great success; but after a slight alteration in the cast the play met with universal approval. Probably it will always remain the most popular of Sheridan's performances. There is nothing in it to strain the understanding or require any education of mind to comprehend. Nor does it contain the least touch of bitterness; vices are not satirised, but only oddities laughed at. Above all, the plot is clear and connected, a point by which the ordinary playgoer is naturally apt to judge. It is not too much to say that in genuine mirthful humour Sheridan has been surpassed by Shakespeare alone; and this quality predominates in the *Rivals*. In the same year appeared the farce called *St Patrick's Day*—a poor performance which Sheridan wrote for the benefit of

the Irish actor whose personation of Sir Lucius had saved the *Rivals*—and also the *Duenna*, which received an exaggerated meed of praise, and had a (then) phenomenal run of sixty-three nights. In 1776 Sheridan, with the aid of his father-in-law, Linley, and another friend, bought half the patent of Drury Lane Theatre for £35,000 from Garrick, who was retiring from the stage, and some years later the remaining share for £45,000 from Mr Willoughby Lacy, thus becoming complete owner. His first production here was a purified edition of Vanbrugh's *Relapse*, under the title of a *Trip to Scarborough*, while three months later appeared his greatest work, the *School for Scandal*. As a dramatic composition the *School* is inferior to the *Rivals*; the plot is involved and its details obscure, the play a series of extraordinarily brilliant scenes, but wanting in cohesion. So powerful is the satire, however, and so real and striking are the characters, that Sheridan's contempt for the dramatic unities has never diminished the enthusiastic approval awarded to it from the first. It brought back prosperity for a time to Drury Lane, where Sheridan's idle and careless management had done much mischief. In 1779 he produced the *Critic*, a play of even more heedless composition than the *School for Scandal*, but teeming from end to end with a sparkling wit which carries it over all obstacles. This was Sheridan's last dramatic effort, with the exception of a tragedy called *Pizarro*—in no respect superior to Mr Puff's tragedy—prepared for the stage by him some twenty years later.

Sheridan now began to turn his thoughts to another field for ambition, and on the dissolution of parliament in 1780 he was elected member for Stafford. He adhered to the opposition, then under the leadership of Burke and Fox, and on the change of government in 1782 became under-secretary for foreign affairs under Rockingham, afterwards serving as secretary to the Treasury in the coalition ministry (1783). His parliamentary reputation, however, may be said to date from the impeachment of Warren Hastings. His part in the attack was to expose the connivance at the plundering of the Begums of Oudh, on which subject he delivered three great speeches. The first, in the House of Commons, was a marvel of oratory, and produced such an effect upon the audience that the House decided to adjourn, as being still too much under the influence of this wonderful speech to give a cool, impartial vote. The second, on the actual trial of Hastings, was rather less successful, and the answer to the pleadings of Hastings' counsel, seven years later, was, comparatively speaking, a failure. The reputation thus acquired was not sustained, his habitual indolence perhaps rendering him incapable of a continued effort. During the thirty-two years he sat in parliament Sheridan took an active part in the debates, and was known as a lively and occasionally impassioned speaker. In 1794 he again electrified the House by a magnificent oration in reply to Lord Mornington's denunciation of the French Revolution, but with this exception he never again rose to the same height. At the critical period of the mutiny at the Nore he did much to strengthen the hands of the government by his unselfish and patriotic support. He remained the devoted friend and adherent of Fox till the latter's death, and was also the defender and occasional mouthpiece of the Prince Regent. Few rewards fell to his share. In 1806 he was appointed Receiver of the Duchy of Cornwall, and in 1806 held for a short time the small post of treasurer to the navy. In 1812 he was defeated at the polls at Westminster, and his parliamentary career came to an end.

To turn to his private life. In 1792 his first wife,

to whom he had been passionately attached, though he must at times have caused her great unhappiness, died; and three years later he married again a Miss Ogle, daughter of the Dean of Winchester, who survived him. The affairs of the theatre had gone badly. The old building had to be closed as unfit to hold large audiences, and a new one built which was opened in 1794, but this also was destroyed by fire in 1809. This last calamity put the finishing touch to Sheridan's pecuniary difficulties, which had long been serious. Misfortunes gathered thick upon him, and his latter days were spent in trouble and privation. He died on the 7th July 1816 in great poverty, with bailiffs actually in possession of his house; but the friends of his prosperity came forward to give him a magnificent funeral in Westminster Abbey.

See the Memoirs prefixed to editions of his works by Leigh Hunt (1840), James P. Browne (2 vols. 1873-75), and Stainforth (1874); Lives by Watkins (2 vols. 1817) and Moore (2 vols. 1825); *Sheridan and his Times* (2 vols. 1859); *Memoirs of Mrs Frances Sheridan*, by her granddaughter, Alicia Le Fanu (1824); W. Fraser Rae, *Wilkes, Sheridan, and Fox* (1874); the short Life by Mrs Oliphant (1883); Percy Fitzgerald, *Lives of the Sheridans* (2 vols. 1887); Lloyd C. Sanders, *Sheridan* (1891); and the Lives by Fraser Rae (2 vols. 1896) and W. Sichel (2 vols. 1909). The edition by I. O. Williams (1926) is the accepted text of his dramatic works. See also NORTON (MRS).

Sherif, or **SHEREEF**, designates a descendant of Mohammed through his daughter Fatima and Ali. The title is inherited both from the paternal and the maternal side; and thus the number of members of this aristocracy is very large among the Moslems. The men have the privilege of wearing green turbans, the women green veils, green being the prophet's colour. Many of these sherifs founded dynasties in Africa: the line which reigns in Morocco (q.v.) boasts of that proud designation. The ruling princes of the district of Mecca and guardians of the Kaaba (q.v.) have been called grand sherif for the sake of distinction.

Sheriff (O.E. *scir-gerefa*, the reeve or fiscal-officer of a shire), in English law, is an officer whose duties are chiefly ministerial (for he has only a few trifling judicial duties). The office is of great antiquity. The sheriff was (next to the ealdorman or earl, and the bishop) the chief man of the shire, and seems to have possessed unlimited jurisdiction to keep the peace; to have presided in the courts of the shire; to have punished all crimes, and have redressed all civil wrongs. The sheriff was formerly chosen by the inhabitants, though probably requiring confirmation by the crown. But popular elections for that purpose were put an end to by a statute of 9 Ed. II., which enacted that in future the sheriffs should be assigned by the chancellor, treasurer, and judges. Ever since that statute the custom has been, and now is, for the judges, the Lord Chancellor, and Chancellor of the Exchequer to meet in the Court of Exchequer (now the King's or Queen's Division) on the morrow of St Martin (12th November), and there propose three persons for each county to the crown. On the morrow of the Purification (3d February) the names are finally determined on, the first on the list being generally chosen; and the sovereign afterwards 'pricks off' the person selected, by piercing the list with a punch opposite his name, and so appoints him to the office. A sheriff continues in office for one year only, and cannot be compelled to serve a second time. The office is not only gratuitous, but compulsory, for if the person appointed refuses he is liable to be fined. In practice, country gentlemen of wealth are appointed. As military head of the county the sheriff was superseded by the Lord-lieutenant

(q.v.) as early as the reign of Henry VIII. In the city of London the sheriffs are appointed not by the crown, but by the citizens. The sheriff has important official duties in elections of members of parliament. He is, by his office, the first man in the county, and superior to any nobleman while he holds office. He has the duty of summoning the *posse comitatus*—i.e. all the people of the county—to assist him in the keeping of the peace; and if any person above the age of fifteen, and under the degree of a peer, refuse to attend the sheriff after due warning, he incurs a fine or imprisonment. The chief legal duty which the sheriff discharges is that of executing—i.e. carrying out—all the judgments and orders of the courts of law. It is he who seizes the goods of debtors or their persons, and puts them in prison. For this purpose he has a number of persons called bound-bailiffs (or, in popular dialect, bumbailiffs), who in practice do this invidious work, and give a bond to the sheriff to protect him against any mistake or irregularity on their part. The necessity of this bond is obvious, for the doctrine of law is that the sheriff is personally responsible for every mistake or excess made or committed by the bailiffs in executing the writs or process of the court; actions may be brought against him by indignant prisoners, or debtors whose persons or goods have been arrested; and the courts watch jealously the least infringement of personal rights caused by these bailiffs. Every sheriff ('high-sheriff') has an under-sheriff, usually a solicitor, who takes charge of the legal business; and he is required to name a deputy in London to whom writs may be delivered.

The sheriff's extensive jurisdiction, gradually acquired at the cost of local courts, has been gradually infringed upon, partly by the exercise of the royal prerogative, and partly by parliament. But in England it suffered more from the appointment to the office of men not specially qualified to exercise judicial powers, and from the consequent usurpation of their functions by the supreme courts. The same causes operated in Scotland, though to a less extent. In England they resulted in the almost entire abolition of the judicial functions of the sheriff. In Scotland they resulted in his being deprived of the more important parts of the criminal jurisdiction, particularly of the power to punish by death, and in his civil jurisdiction being limited mainly to questions affecting movables. In both countries the office was entrusted to gentlemen having estates in the county; in some cases it was hereditary; these arrangements tended to a separation of the duties of the office into the honorary and the laborious—the former being performed by the sheriff, and the latter by his deputy. In Scotland this separation was completed by the act of Geo. II., which entirely separated the offices by the transference of the power of appointing the depute from the principal sheriff to the crown. In England this complete separation has never become necessary, from the fact of the sheriff's power having been much more crippled than in Scotland. Indeed, in England, so purely honorary and ministerial has the office become, that it has been held by a female, and in Westmorland the office was hereditary down to 1849. The duty of enforcing the orders of the supreme courts, which now in England is a principal part of the duties of the sheriff, appears to have been engrafted on the office—probably on the theory that these orders were those of the king himself. In Scotland the sheriff has never been called on to enforce any writs except those actually and not merely in name proceeding at the instance of the crown.

SHERIFF, in Scotland, is a title given to the magistrate and judge of a county. In Scotland the office of sheriff is still that of a local judge,

and not merely ministerial, as in England; and the jurisdiction, both civil and criminal, is still very extensive. The duties of the office are now performed by two officials, the sheriff and the sheriff-substitute. The term 'depute,' often used since the abolition of the Heritable Jurisdiction (q.v.) to distinguish the sheriff from the sheriff-substitute, is inappropriate and obsolete. The title of sheriff-principal was until the Sheriff Court Act of 1907 the popular and the correct legal designation of the sheriff, but that act, while it does not in terms abolish the title, uses throughout the title of sheriff. The sheriff, except in the case of Edinburgh and Glasgow, does not reside in the county, but holds courts therein at stated periods. The sheriff is disqualified from acting as advocate in any cause originating in his county, though in other respects he is at full liberty to practise. He is appointed by the crown exercised on the recommendation of the Secretary of State for Scotland. He must either be an advocate of at least five years' standing or, if not an advocate, he must have occupied the position of salaried sheriff-substitute for at least five years preceding the date of his appointment. He holds his office for life or good behaviour, but he can be removed by the Secretary of State for Scotland upon a report by the Lord President of the Court of Session and the Lord Justice-clerk, which must be before both Houses of Parliament for four weeks while parliament is sitting. The sheriff-substitute was at first appointed by the sheriff, but he is now appointed by the crown, requires to be an advocate of five years' standing or a duly qualified law agent of a similar standing in his profession. His tenure of office is, like that of the sheriff, *ad vitam aut culpam*. He may, however, be removed from office by the Secretary of State for Scotland, upon the report of the Lord President and the Lord Justice-clerk, for inability or misbehaviour. He resides within the county, and presides over the ordinary sittings of the court. The civil jurisdiction of the sheriff extends to all personal actions on contract or obligations without limit, actions for rent, and other questions between landlord and tenant, and actions by employers against employees. His powers are limited in matters of heritable right and title to cases where the value does not exceed £1000, or £50 by the year. He can, however, adjudicate on questions of possession beyond these limits, and he can also deal with questions of servitude and nuisance. He cannot decide questions of status, but he may entertain questions of aliment. There are various other matters with which the sheriff may deal, such as questions of poor-law, lunacy, elections, &c. Besides his ordinary court the sheriff holds the Small Debt Court, which is a statutory court for actions which do not exceed £20 in value, or which have been restricted to that amount. This court is made great use of by all classes of the community. The Debts Recovery Court was abolished by the Act of 1907 (*supra*). The civil proceedings in the Sheriff Court also include the 'summary cause,' which was the creation of the Act of 1907 (*supra*). That statute introduced a special form of procedure for cases of small importance, which is informal and reduces the costs of litigation. The term 'summary cause' includes actions for payment of money not exceeding £50 in amount, exclusive of interest and expenses, with the exception of actions brought in the Small Debt Court and claims under the Workmen's Compensation Act. The sheriff has also jurisdiction in cases of bankruptcy and insolvency. Against most judgments in ordinary cases by the sheriff-substitute there lies an appeal to the sheriff, and in some cases to the Court of Session. In criminal cases the sheriff has jurisdiction in all the

minor offences which do not infer death or banishment, but his powers of punishment are practically limited to imposing a sentence of not more than two years' imprisonment. The forms of trial in use before the sheriff are jury trial and cases which are brought under the Summary Jurisdiction Acts. Changes of considerable importance, and in many of the details of criminal procedure, were introduced by the Criminal Procedure (Scotland) Act, 1887. The sheriff's jurisdiction excludes that of the justices of peace in riots. He is occasionally consulted by the procurators-fiscal in difficult cases, and the sheriff-substitute is occasionally called in to superintend criminal precognitions. He returns the writs for the election of members of parliament, and this duty is almost the only one which he performs in common with the English sheriff. An idea of the multifarious duties performed by the Scottish sheriff may be gathered from the statement that he exercises somewhat similar functions to those which in England are exercised by the commissioners in bankruptcy, county-court judges, the stipendiary magistrates, recorders, and coroners. The office of Commissary (q.v.) has been amalgamated with that of sheriff. Additions to the miscellaneous duties of the Scottish sheriffs are not infrequently made in the course of legislation. See COUNTY.

The sheriff-clerk, in Scotland, is the registrar of the sheriff's court, and as such has charge of the records of the court. He registers, and, when required by the proper party, issues the sheriff's judgments. He also conducts what correspondence may be required. He has important duties to perform in regulating the summary execution which is issued in Scotland against the debtors in bills of exchange, promissory-notes, and bonds. See J. D. Wilson, *Practice of the Sheriff Courts of Scotland*; W. J. Lewis, *Sheriff Court Practice* (1923); and Sheriff Courts (Scotland) Act, 1907, as amended by the Sheriff Courts Act, 1913.

In the United States the office of sheriff is mainly ministerial; the principal duties being to maintain peace and order, to attend courts as administrative officer, to guard prisoners and juries, to serve processes and execute the judgments of the courts, and to preside at inquisitions. In most of the states the sheriff is appointed by the popular vote, and the shrievalty in such places as New York is a highly paid and highly coveted political office. In all the states there are deputy-sheriffs, who are the servants and agents of the sheriff; and in some of the states there is an under-sheriff, who does duty for the sheriff in his absence.

Sheriffmuir, in Perthshire, on the northern slope of the Ochils, 2½ miles ENE. of Dunblane, was the scene, on 13th November 1715, of an indecisive battle between 8400 Jacobites under the Earl of Mar and 3500 Hanoverians under the Duke of Argyll. The Macdonalds, who formed the centre and right of the Highland army, completely routed the left of their opponents; but Argyll with his dragoons had meantime driven the left of the Highlanders back for two miles. About 500 fell on each side.

Sherlock, WILLIAM, was born in Southwark in 1641, had his education at Eton and Peterhouse, Cambridge, and became Rector of St George's, Botolph Lane, London, in 1669. Later he was preferred to be prebendary of St Paul's, Master of the Temple, Rector of Therfield in Herts, and Dean of St Paul's (1691). At the Revolution he refused at first to take the oath, but soon complied. He died at Hampstead in 1707. He wrote about sixty books or pamphlets, mostly controversial. His *Practical Discourse Concerning Death* (1689) was long famous, and was styled by Addison 'one of

the strongest Persuasives to a Religious Life that ever was written in any language.' The *Vindication of the Doctrine of the Trinity and of the Incarnation* (1690) opened up a fierce and unseemly controversy with South (q.v.) and others, which is said to have been closed only by the express desire of the king. Sherlock attempted to explain the relations of the three Persons by 'a mutual self-consciousness,' but his metaphysical powers were not subtle enough for his task, and he cannot be said to be altogether undeserving of South's charge of Tritheism. His *Case of Allegiance to Sovereign Powers Stated* (1691) was published to justify his own swallowing of the oath, and at once excited a raging controversy. Other works discussed Future Judgment (1692) and Future Punishment (1704-5), but these have long lost their importance.

His son, THOMAS SHERLOCK, was born in London in 1678, educated at Eton and Catharine Hall, Cambridge, and in 1704 succeeded his father as Master of the Temple. In 1715 he became Dean of Chichester, in 1728 Bishop of Bangor, in 1734 of Salisbury, and in 1748 of London. He died in 1761. Sherlock was a strenuous Tory, yet so much of an observer of the times as to earn Bentley's nickname of Cardinal Alberoni. His volumes of Temple Sermons were highly praised in their day, and the Rev. T. S. Hughes edited his complete writings, including treatises against Hoadly, on prophecy, the *Trial of the Witnesses* for the resurrection, &c. (5 vols. 1830).

Sherman, capital of Grayson county, Texas, 64 miles by rail N. of Dallas, contains a fine courthouse and jail, has foundries and mills, is in a farming and stock-raising district, and is a dépôt for grain and cotton. It has several colleges, three of them for women. Pop. 15,000

Sherman, WILLIAM TECUMSEH, eighteenth general-in-chief of the United States army, was born in Lancaster, Ohio, February 8, 1820, the sixth son of Judge Sherman, who died when William was nine years old. He attended school in Lancaster until 1836, then was appointed to a cadetship at West Point, and graduated in July 1840 sixth in a class of forty-two. He was commissioned second-lieutenant in the Third Artillery and ordered to Florida, where there was some trouble with the Seminole Indians, and was afterwards stationed at Fort Morgan and Fort Moultrie, and from 1846 to 1850 in California. Seeing no prospect of promotion Sherman resigned from the army in 1853, having previously married Miss Ellen Boyle Ewing, daughter of Thomas Ewing, secretary of the Interior, and entered civil life. He was a banker in San Francisco for several years, and at the beginning of the civil war was superintendent of the Louisiana Military Academy at Alexandria, which position he immediately resigned. In May 1861 Sherman was commissioned colonel of the Thirtieth Infantry, and joined his regiment at Washington. In the battle of Bull Run he commanded a brigade, and for good conduct in that engagement was promoted to brigadier-general of volunteers. Sherman was one of the first to estimate properly the serious nature of the struggle before the country. In August he was sent to Kentucky, but when he asked for 200,000 men to put an end to the war in that section, the authorities at Washington looked on his demand as wildly extravagant, if not insane, and deprived him of his command. But soon after he was given a division in the Army of the Tennessee, and in April 1862 displayed both coolness and skill in the severe two days' battle of Shiloh, where he was wounded, but would not leave the field. Grant afterwards wrote: 'To his individual efforts I am indebted for the success of that battle.' In May

he was made a major-general of volunteers, and stationed at Memphis.

In the various movements made by General Grant against Vicksburg Sherman was most active, commanding the famous Fifteenth Corps of the Army of the Tennessee, and being next in rank to Grant. Immediately after the surrender of that Confederate stronghold, July 4, 1863 (the date of his brigadiership in the regular army), he moved against General J. E. Johnston at Jackson, Mississippi, and drove him out of that city. In November Sherman joined Grant at Chattanooga, and rendered excellent service in the great victory won there on the 25th, withstanding a long series of attacks intended to crush his command; and a few days later he hurried to relieve Burnside, besieged at Knoxville by General Longstreet, whose forces fled at the approach of the Northern cavalry. On 12th March 1864, the same day that Grant became commander-in-chief, he appointed Sherman to the command of the south-west, with headquarters at Nashville. In April he commenced his campaign against Atlanta, his command consisting of the armies of the Cumberland, Ohio, and Tennessee, in all about 100,000 men, with 254 guns. Moving from Chattanooga Sherman first encountered General Johnston at Dalton, May 14, and, by repeatedly turning his position and constantly pursuing and pressing him, drove him to Cassville and beyond the Etowah, thence to a strong position on Kennesaw Mountain (where the Union army was at first heavily repulsed), and finally to Atlanta, the direct attack on which began on July 17. Many bold sorties were made by General John B. Hood, who had superseded General Johnston, and fierce encounters occurred at Peach Tree Creek, Ezra Church, and elsewhere, all unfavourable to the Confederates, until on 1st September they evacuated the city, and Atlanta was won.

After giving his gallant army a rest Sherman moved out of Atlanta on his famous march to the sea, with about 65,000 men. Passing between Augusta and Macon, and meeting with little serious opposition, for Hood and his army had been disastrously defeated by General Thomas in the battle fought near Nashville, he reached the outskirts of Savannah on December 10—a march of 300 miles in twenty-four days, with a loss of 63 killed and 245 wounded. The works were soon carried, and on the 20th General Hardie evacuated the city, Sherman marching in on the 21st. To President Lincoln he wrote: 'I beg to present you as a Christmas gift the city of Savannah, with 150 guns, plenty of ammunition, and 25,000 bales of cotton.' For his great services he had already been made a major-general in the regular army, and now he received the thanks of congress for his 'triumphal march.'

Early in February Sherman and his army left Savannah for the north, and by the 17th, compelling, by another flanking movement, the evacuation of Charleston, he had reached Columbia, the capital of South Carolina. Thence he moved on Goldsboro' by way of Cheraw and Fayetteville, fighting by the way severe battles at Averysboro' and Bentonville in March, and aiming either to cut off Lee's retreat or to join Grant before Richmond. But on April 9 Lee surrendered, and word of this coming to General Johnston, he made terms with Sherman on the 17th, which, however, were disapproved as too lenient by Secretary Stanton and repudiated: Lincoln had been assassinated on the 14th. The surrender of Johnston's army was soon followed by all the other Confederate forces then in the field, and the four years' war was at an end.

Before the disbandment of Sherman's army and the Army of the Potomac, they passed in review at Washington before President Johnson and General

Grant on May 23 and 24, 1865. Sherman took leave of his troops in a field order of May 30. For the four years following he was in command of the division of the Mississippi; and when Grant became president Sherman succeeded to the head of the army with the rank of general, having been previously promoted to lieutenant-general. In 1872 he visited Europe, everywhere receiving distinguished honours; and in 1874, at his own request, to make room for Sheridan, he was retired on full pay. His remaining years were spent in St Louis and in New York, where he died February 14, 1891. He received a public funeral in both these cities, and was buried by the side of his wife and favourite son William in the St Louis Cemetery. Many lives have been published of Sherman, but much the most valuable are his own Memoirs, first issued in two vols. in 1875, and of which revised editions were published in 1885 and 1891. A noble equestrian statue of Sherman adorns New York City.

JOHN SHERMAN, senator, a younger brother, was born at Lancaster, 10th May 1823, was for a time attached as rodman to a corps of engineers, and then studied law with his brother Charles, whose partner he became after his admission to the bar in 1844. From 1855 to 1861 he sat in congress, from 1859 as chairman of the committee of ways and means; and in the senate, of which he was a member from 1861 to 1877, he was for many years chairman of the committee on finance. As a congressman he had been eminent for the steady but statesmanlike opposition which he offered to slavery, and on the outbreak of the war he raised a brigade in Ohio largely at his own expense. Two bills for which he was largely responsible were that for the reconstruction of the seceded states and that providing for the resumption of specie payment (1879). A supporter of Hayes, he was appointed by him in 1877 Secretary of the Treasury, and in 1878 had prepared such a redemption fund in gold as speedily raised the legal-tender notes to par value. In 1881 and 1887 he was again returned to the senate, was for a while its president, and afterwards chairman of the committee on foreign relations. In 1880-84-88 he was a popular Republican candidate for the presidency. The Sherman Act (1890), authorising large purchases of silver by the Treasury, was repealed in 1893. In 1897 he was made Secretary of State by McKinley; but, becoming infirm, he retired from public life in April 1898. He died at Washington, 22d October 1900. See *Life* by Bronson (1880), his *Selected Speeches on Finance and Taxation* (1879), and the *Sherman Letters* (1894).

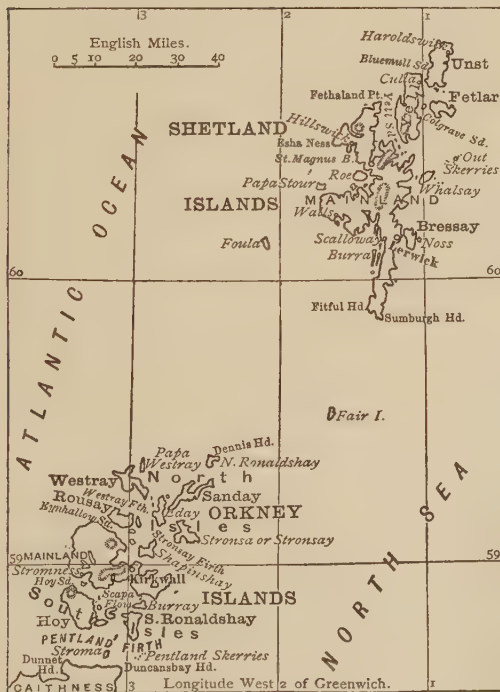
Sherrington, SIR CHARLES SCOTT, physiologist, born in London, 29th November 1859, passed through Caius College, Cambridge, and became Brown professor of pathology in the University of London. Later he taught physiology in St Thomas's Hospital, London, the University of Liverpool (1895-1913), the Royal Institution (1914-17), and became Waynflete professor of physiology at Oxford. His researches in the field of nerve physiology, more particularly his formulation of the general principles of reflex action, and his able statement of his discoveries in *The Integrative Action of the Nervous System* (1906; based on the Silliman Memorial Lectures delivered by him at Yale in 1904), have gained him an international reputation. Among the very numerous honours which have fallen to him are the Royal Medal of the Royal Society, the Baly Medal of the Royal College of Physicians, the Retzius Medal of the Royal Swedish Academy, membership of many British and foreign learned societies, honorary degrees of universities at home and abroad, the presidency of the physiological section of the

British Association (1904), the presidency of the Royal Society (1920-25), and his creation as G.B.E. in 1922.

Sherry, a name derived from Xeres (q.v.), or Jerez de la Frontera, near Cádiz, and applied to the better kind of white wines grown over a considerable area in the neighbourhood of Xeres, between the mouths of the Guadalquivir and Guadalete. Sherries may be divided into the Amontillado class and the Montilla—the latter the lighter and dryer, with grape spirit added only when it is required to enable the wine to stand transport. The Amontillados are generally fortified so that sherry of this type contains about 32 degrees of proof spirit. So-called 'natural sherry' has from 2 to 4 per cent. of spirit added to make it keep. Sherries are coloured by introducing wine boiled down to a liqueur, and sweetened by mixing with them wine made from over-ripe grapes. The trade is largely in the hands of Englishmen settled at Xeres: Cádiz is the chief shipping port, and the export is mainly to England. See SACK, WINE.

Sherwood Forest, a stretch of hilly country in the west of Nottinghamshire, lying between Nottingham and Worksop, and extending about 25 miles from north to south and 6 to 8 miles from east to west. It was formerly a royal forest, and the traditional scene of many of the exploits of the famous Robin Hood (q.v.); but it is now almost wholly disafforested, and is occupied by fine parks. The town of Mansfield and a number of villages are situated within the ancient bounds. Numerous remains of the old forest are still to be seen. Railway developments in 1925 threatened to spoil the amenities of the forest.

Shetland, or ZETLAND (Scand. *Hjaltland*, 'high land'), a group of more than a hundred islands, islets, and skerries, forming the northernmost Scottish county, whose capital, Lerwick, is



116 miles NE. of Kirkwall, 300 N. by E. of Edinburgh, and 222 W. of Bergen in Norway (direct distance). Extending 70 miles in length, and 36 in extreme breadth, they have a total area of 551

sq. m., the largest of the twenty-seven inhabited islands being Mainland (378 sq. m.), Yell (83), Unst (47), Fetlar, Bressay, Whalsay, and Foula. The cliff-scenery is very fine, and the sounds and voes, or firths, are so numerous that no spot is more than 3 miles from the sea. The surface is more rugged than that of Orkney, the highest points being Ronas Hill (1475 feet) in Mainland, and the Sneug (1372) in Foula. Metamorphic crystalline rocks predominate, with isolated Old Red Sandstone; and the soil is peaty, barely one-sixth of the total area being in cultivation, whilst trees there are none. The live-stock includes, besides sheep and cattle, many shaggy 'Shetland ponies,' 9 to 10 hands high. The climate is equable but moist (rainfall, 49 inches); at the longest day the sun sets for only five hours, at the shortest for over eighteen. The herring and other fisheries are the leading industry, having been greatly developed since 1872. Shetland unites with Orkney to return one member to parliament; but it was dissevered therefrom as a county by the Local Government (Scotland) Act, 1889. Pop. (1801) 22,379; (1861) 31,679; (1921) 25,520. Subject, like Orkney (q.v.), to the Scandinavian crown until 1468, Shetland is still markedly Norse in many of its characteristics, Norse being still spoken in Foula as late as 1774, and having bequeathed many words to the Shetland dialect. In 1766 it was sold by the Earl of Morton to the ancestor of the Earls of Zetland, but the present earl's property here is small.

See LERWICK, FOULA, BROCH, CROFTERS, and for the old Udal tenures, ALLODIUM; Scott's *Pirate*; Tudor's *Orkneys and Shetland* (1883); books by Brand (1701), Rampini (1884), J. Russell (1887), and for dialect Edmondston (1866), Jakobsen (1897, 1909), and Angus (1914).

Shevchenko, TARÁS, Ukrainian lyric poet born in serfdom near the Dnieper in 1814. In his youth he was in turn a sexton's apprentice, a shepherd, a wandering artist, a scullion, a page, and a decorator's apprentice, his travels leading him from his own village of Kirillovka first to Poland then to St Petersburg. His flair for drawing brought him friends in the St Petersburg Academy of Arts, the director himself redeeming him from serfdom. He studied art at the academy, and became art lecturer at Kiev university in 1847. In 1840 and 1842 he published volumes of verse in the Ruthenian dialect, which by their simplicity and directness won the admiration of the peasant folk of his homeland. But in 1848 he was accused of seditious writing and drawing, and spent ten miserable years in military penal servitude mostly in the salt deserts of the Caspian district. There any writing or drawing had to be done surreptitiously. His intellect was blighted, and when he was released in 1858 he was both mentally and physically wrecked. Some of his poems written during the early years of exile were lost, but a gem of lyric art remains in *Winter*, a poem written a month before his death, which took place 26th February 1861. He was buried beside the Dnieper. See E. L. Voynich's translation of *Six Lyrics* (1911).

Shiahs. SHĪTES.

Shibboleth (properly *Shibbo'leth*, Heb., 'ear of corn,' or 'stream'), the test-word used by the Gileadites under Jephthah after their victory over the Ephraimites, recorded in Judges, xii. 6. The latter could not pronounce the *sh*, and, by saying sibboleth, betrayed themselves, and were slaughtered at the ford. All those Hebrew names in the Old Testament which commence with the *sh* have now, through the inability of the Septuagint to render this sound in Greek, become familiar to us, through the versions that flowed from it, as beginning with the simple *s*—e.g. Simon, Samaria, Solomon, Saul,

&c. The word Shibboleth is still used to mean a test of opinions and manners.

Shiel, LOCH, a fresh-water lake in the west of Scotland, on the boundary between Moidart in Inverness-shire and Ardgour in Argyllshire, 18 miles W. of Fort-William. It extends $17\frac{1}{2}$ miles south-westward, is 1 mile broad, is overhung by mountains nearly 3000 feet high, abounds in fish, and communicates with the sea by the river Shiel and salt-water Loch Moidart. Prince Charles Edward was here, a fugitive, in 1746; and Queen Victoria in 1873. At the head is Glenfinnan (q.v.).

Shield, a portion of defensive armour held in the left hand or worn on the left arm to ward off sword-strokes or missiles. The earliest known shields date from the close of the bronze age. They are circular and flat, or but slightly convex, with a central boss, under and across which the handle is fixed. The material is thin beaten bronze, strengthened by a turned-over rim round the circumference, and by the surface being embossed with concentric circles alternating with circular rows of small bosses. The Greek shield of the Homeric period was also of bronze, circular, convex, and often ornamented with devices. The Etruscan shield of bronze, of which there is a fine specimen in the British Museum, is also circular and ornamented in concentric bands of embossed work round the central boss. The Roman infantry used a light round shield about three feet in diameter, and the cavalry carried a smaller buckler also of a round form covered with hide, while the spearmen had a large oblong convex shield of wood and leather strengthened with iron, which covered the whole body. The early Germanic shields were also large, oblong, and convex, and Tacitus, in the 1st century of our era, mentions that they were painted with gay colours and devices. These are supposed to have been the precursors of the heraldic devices on the shields of the middle ages. From the downfall of the Roman empire to the 10th and 11th centuries there seems to have been considerable variety in the forms of the shields in use among European nations, though the circular shield was perhaps the most common. The shields of the Anglo-Saxon invaders of England and of the Scandinavian vikings were mostly circular. But the Norman shield of the 11th century was kite-shaped (see BAYEUX TAPESTRY), and the triangular form continued to prevail till the 15th century, becoming gradually shorter and more obtusely pointed, or heater-shaped. After the 14th century the small round buckler came into fashion, and retained its place till the 16th century. By this time the use of firearms had made the shield practically useless in warfare. The large shields used at tournaments and pageant shields and bucklers were often highly ornamented, some of the latter being among the most beautiful works of art of the middle ages. Round shields or *targets*, covered with hide or leather, ornamented with brass studs and bosses, were used in the Highlands of Scotland down to 1745. Many savage tribes still use shields of wood or hide of various forms. For the heraldic shields, see HERALDRY.

Shield, WILLIAM (1748-1829), composer, was born in Durham, and early became a violinist and violist at Scarborough and London. He was appointed composer to Covent Garden (1778-97) and Master of the King's Musicians (1817-29). He wrote about forty stage pieces, also two textbooks on harmony.

Shields, NORTH, is now part of the burgh of Tynemouth (q.v.).

Shields, SOUTH. See SOUTH SHIELDS.

Shigatze, or DIGARCHI, a town of Tibet, stands near the left bank of the Nyang-chu near its

confluence with the Brahmaputra, 140 miles W. by S. of Lhasa, at an altitude of over 12,000 feet. Near by is the great monastery of the Tashi-lunpo, the residence of the Tashi-Lama. Pop. of Shigatze, 9000. See Hedin, *Trans-Himalaya* (1909).

Shih-wei. See MONGOLS.

Shiites (also *Sheeahs*; 'sectaries,' from the Arab. *shī'ah*, 'a party'), the name given by orthodox Muslims or Sunnites to Ali's followers, who call themselves *al-adeliyyah*, 'the right people.' They were the champions of Ali's right to be Mohammed's successor as being his cousin and son-in-law (see KHALIF, ALI); and after Ali's death they took the side of his sons Hassan (Hasan), Hussein (Hosain), and Mohammed ibn al-Hanafiyyah. The Persians, believers in the divine right and even in the divine nature of kings, took this side. All Shiites allegorise the Koran; but the ultra-Shiites, founded by Abdallāh ibn Sabā, a converted Jew of Yemen, differed from the moderate Shiites or Zaidites in believing in the transmigration of souls, and in calling Ali and his legitimate successors incarnations of God. By Shiite help the Abbāsides in 750 wrested the khalifate from the Omniades. Yet, unsound as the Abbāsides were, and decided as Persian ascendancy was for 100 years, the Shiites gained little. They were the strength of 'the veiled prophet' (see MOKANNA) in 770-779 and of Bālek 817-837. Their disaffection was one chief reason for the introduction of Turks into the khalif's service (830-840). In 765 the death of Jaafar the Veracious, the sixth Shiite Imām, developed the Ismaili sect of the Shiites. Those followed the eldest son Ismael; the majority, following Moosā the second son, were afterwards named *Twelvers*, the series of their Imāms ending with the twelfth. In 'Iraq in 887 arose the Karmathian branch of the Ismailis. In 909 an Ismaili proclaimed himself in North Africa as the first Fātimide khalif. The 6th khalif of this line, Hākim, was declared to be God's tenth and final incarnation by Darazi, who founded the sect of the Druses. In 1090 Hassan Sabbāh, an Ismaili of Khorasān, as the Sheikh of the Mountains instituted the order of Assassins, who generally recognised the Fātimide khalifate. Ismailis are still found in Persia and Syria. The moderate Shiism that has been the national religion of Persia since the native royal line of Safides ascended the throne in 1499 is more Koranic than Sunnism. It has Hadith and Sunna (see SUNNITES), but not those of the orthodox Muslims. It has its own modes of religious washing, and its own postures in prayer. Shiites, habitually ill-used in Arabia, absent themselves much from Mecca, and, unable to bless Abu-bekr and Omar, who are buried in Medina, go still less thither. But they do pilgrimage unhindered to the tombs of Ali and Hussein in the province of Bagdad, and to the tomb of Riza, one of their twelve imāms, in Meshhed, and to the tombs of Shiite saints. They keep the orthodox feasts and others, among which the Moharram feast, occupying the first ten days of the month of Moharram (q.v.), and commemorating the martyrdom of Hussein, is the chief. (For the Shiite cry of *Ya Hasan! Ya Hosain*, see HOBSON-JOBSON.) They detest Ayesha and the founders of the four orthodox schools, and hold all khalifs save Ali to have been usurpers. They own no khalifate nor imāmate; these have been dormant since the death of Mohammed, their twelfth imām, in 879, but shall be revived in him when he, the Hidden Imām, reappears as the Mahdi. Shiism, the ancient protest of Persian patriotism against Arabian ascendancy, has spread through Afghanistan into India, but toward the west has made no way. Toleration and

free thought are common in towns and among the more cultivated Persians, especially toward the north. In 1736 Nādir Shah tried but failed to restore the Shiites to orthodoxy. See KERBELA, NAJAF.

Shikarpur, an important trading town in the north of Sind, stands 18 miles W. of the Indus, on the railway leading to Quetta and Pishin. Before the opening of this railway it was a place of very considerable commercial importance, owing to its situation on one of the principal routes between India and Khorasan—viz. that by the Bolan Pass. It occupies a very low site, the adjacent country being often inundated, but the soil is extremely fertile, and yields heavy crops of grain and fruits. Carpets, coarse cottons, furniture, baskets, &c., are made in the town. Pop. (1921) 55,303.

Shikarry. See SHEKARRY.

Shilka. See AMUR.

Shillelagh, the cudgel carried by the conventional Irishman, with which he is supposed to delight to play upon the heads of his friends on occasion. The name is borrowed from the once famous oak-forest of Shillelagh in the south-west corner of County Wicklow, which in Rufus' day furnished 'cobwebless beams' for the roof of Westminster Hall. The railway station of Shillelagh, 16½ miles SW. of Aughrim, is the terminus of a branch-line.

Shilleto, RICHARD, the greatest Greek scholar of his day in England, was born in 1809, educated at Shrewsbury and Trinity College, Cambridge, and took the second place in the classical tripos in 1832. Shortly after graduating he married, and thus made himself ineligible for an ordinary fellowship. For some five and thirty years his best energies were given to 'coaching' or private tuition, and it was only in 1867 that he was elected Fellow of St Peter's College, and so obtained leisure to realise the great ambition of his life. This was an edition of Thucydides, of which he only lived to publish the first book, dying on 24th September 1876. He edited Demosthenes' *De Falsa Legatione* (1844).

Shillbeer, GEORGE (1797-1866). See OMNIBUSES.

Shilling (O.E. *scylling*), a coin whose name is most probably derived from a root *skil*, 'to divide,' apparently because it was deeply marked with an indented cross, so as to allow of its being easily broken in four. The old Saxon coin of this name was worth about 5d. The shilling in our sense was first coined by Henry VII. in 1504; milled shillings were first coined by Charles II. in 1662. The silver shilling is nominally worth the twentieth part of a pound sterling. But the silver of which shillings are made contains 11 oz. 2 dwt. pure silver to 18 dwt. alloy; and a pound by weight of this compound is coined into 66 shillings; so that each shilling contains 80·727 grains fine silver, and its value as bullion is very much less than its nominal value. The shillings in the old coinages of various north European countries had usually a much smaller value—e.g. the Danish copper *skilling* and the silver *schilling* of Hamburg were each worth less than 1d.

Shilluk, a Nilotic people inhabiting both banks (especially the left) of the White Nile in Egyptian Sudan. They are negroes with a strong Hamitic admixture. See W. Hofmayr, *Die Schilluk* (Mödling-bei-Wien 1925).

Shiloh, a town of the tribe of Ephraim, the first permanent resting-place of the Tabernacle (q.v.), the home of Eli and Samuel, and long the religious centre of Israel. The site is well ascertained—a ruinous village hidden among the hills 20 miles north of Jerusalem.

Shiloh, one of the most desperate battles of the American civil war, takes its name from a log meeting-house, 2 miles from Pittsburg Landing, which is on the Tennessee River, 8 miles above Savannah. Here, on Sunday 6th April 1862, the Confederates (40,000) under General A. S. Johnston attacked and surprised the Union army (33,000) under General Grant. The battle raged from dawn to sunset, the Federal troops being steadily driven back; but the effort to utterly crush Grant failed, and the next day he won back all the ground he had lost, and the Confederates retreated. On the 6th Johnston was killed while heading the charge of a brigade. The Southerners had 1728 killed, 8012 wounded, and 957 missing; the Northerners, 1754 killed, 8408 wounded, and 2885 missing.

Shimonoseki, a town of Japan (formerly called Akamagaseki), at the south-west extremity of the main island and the western entrance to the Inland Sea, was declared a seaport open to foreign traders in 1890. The batteries and a part of the town itself were destroyed during a bombardment by a combined English, French, Dutch, and American fleet in 1864. In 1895 a treaty of peace was concluded here between China and Japan. Pop. 72,000.

Shin, LOCH. See SUTHERLAND.

Shingles (probably derived from Lat. *cingulum*, 'a belt') is the popular name for the variety of *Herpes* (q.v.) which is known as *Herpes zoster*.

Shingles, flat pieces of wood used in roofing like slates or tiles. Such roofs are much used in newly-settled countries where timber is plentiful. The wood is chosen from among the kinds which split readily and straightly, and is usually some kind of fir. It is cut into blocks, the longitudinal faces of which are of the size intended for the shingles, which are then, in Germany, for instance, regularly split off in thicknesses of about a quarter of an inch, but in America are sawn out, somewhat thicker at one end than the other. In the United States shingles, usually some 6 inches wide by 18 long, are in common use, and their manufacture, especially in the Pacific states, has reached enormous proportions. Shaved—i.e. hand-made—shingles of Washington cedar fetch a somewhat better price than the sawn ones. Shingles are laid with one-third of their length (the thick end) to the weather.

Shintôism. See JAPAN.

Shinty, or CAMANACHD, an outdoor winter field game played with ball and stick. It is the national game of the Scottish Highlands, and *camanachd* is the Gaelic name. The field of play is rectangular (not more than 200 yards by 100 yards, nor less than 140 yards by 70 yards), and at each end is set a goal (12 feet wide and 10 feet high) known as a 'hail.' Two teams of twelve a side oppose each other, and the object of play is for one side to drive the ball through the hail of the other. The ball, 7½ inches to 8 inches in circumference, and 2½ ounces to 3½ ounces in weight, is of cork encased in worsted and with an outer covering of leather. The stick (Gaelic *camán*) curves upwards at the striking end, which is triangular in section with the sole as base. Any side of the stick may be used in hitting, play being thus both left-handed and right-handed. There is no restriction as to the height to which the stick may be raised in the course of a stroke. The players are arranged in opposing pairs as in Lacrosse (q.v.) and there is no off-side rule, though, to prevent the gaining of unfair scoring advantage, no player may enter the semicircular area ('10 yards' area) surrounding the enemy hail unless the ball be within that area. Hails may be scored from any

point of the field, either from within or from without the 10 yards' area. Shinty is of the family to which Irish hurley and Welsh bandy belong, and from that family Hockey (q.v.) derives, but as will be seen with important differences. The game is almost certainly one of the oldest still played in Britain. James IV. practised the sport. Formerly prescribed rules were lacking and games took the form of battles between parishes, sometimes between clans. Inspired by bagpipe music rivals also contended for prizes, as a keg of whisky shared in the end by both sides. After 1887, by the drawing up of rules, order was given to the game, and in 1893 was formed the Camanach Association by which the game has since been controlled and whose cup (first won in 1896) is the great trophy of the year. The present rules of play date from 1896. The game is entirely amateur in character.

Shipbuilding and Shipping. From crossing a river or lake on a floating log or raft, the first steps towards shipbuilding made by prehistoric man, were probably Canoes (q.v.) and Coracles (q.v.). The earliest Egyptian drawings show boats constructed of planks, and having sails as well as numerous oars. From ancient sculptures, the ships of Greeks and Romans appear to have been open, at least in the middle portion; built with keel, ribs, and planking; and strengthened crosswise by numerous benches on which the rowers sat. Ships continued to be of small draught, for they were beached every winter. The Romans built their vessels of pine, cedar, and other light woods; but their ships of war were of oak at the bows, clamped strongly with iron or brass, and having *rostra* or beaks, for use as rams (see *TRIEMES*).]

The hardy Norsemen had tempestuous seas and Atlantic swells to fight with, so their ships differed much from the stately galleys of the empire. A viking war-ship, unearthed in 1880 from a sepulchral mound at Sandefjord in Norway, and now preserved at Oslo, is clencher-built, 78 feet long, 17 wide amidships, and 5½ deep, drawing less than 4 feet of water. She had 32 oars, and one mast, 40 feet high, which probably carried a single square sail. The introduction of galleys by Alfred, pulled by forty and sixty oars, kept the viking war-ships in check; but these galleys were only fit for shore-service. Cnut undertook his final invasion with ships of moderate size, the average complement of each consisting of eighty men. The 'large ships' in which Richard Cœur de Lion in 1190 conveyed his forces to the Crusades were of small dimensions, but depended chiefly on sails for propulsion, not on rowers. The voyage to the Mediterranean was of itself the source of enlarged experience to the sailors, and led to the improvement and increase of British shipping. (The mediæval galley of the Mediterranean is described under Galley, q.v.). Columbus made his first voyage to the New World in the *Santa Maria*, a vessel of 90 feet keel and 29 feet wide, with two small undecked caravels. Henry V. during the early part of the 15th century ordered the construction of several large ships, the wonders of their time. One is recorded to have been about 165 feet extreme length, 112 feet length of keel, and 46 feet beam. Henry VII., and still more Henry VIII., did much to encourage ship-construction, both for war and commerce, the latter building the *Great Harry* (see *NAVY*, Vol. VII. p. 415). The year 1511 saw the construction in Scotland of the *Great Michael*, 'ane varie monstrous great schip,' 240 feet in length, said to have cost about £20,000 Scots.

At this period in the history of shipbuilding the main principles of wood construction were established; and subsequent development in size,

down to the beginning of iron shipbuilding, was mainly characterised by modifications in individual parts or arrangements. Scarcely any advance in the size of ships was made during the reign of Elizabeth, although this was pre-eminently the period of daring navigation. Much, however, was done by her successor to develop both the royal navy and the mercantile marine. He appointed commissions of inquiry into naval affairs; granted a new charter to the East India Company; and endeavoured to raise the standard of knowledge and practice amongst shipbuilders by granting a charter in 1612 to the Shipwrights' Company, and endowing it with jurisdiction over all shipbuilders in the kingdom. The first president of this body was Phineas Pett, master-shipwright of Woolwich Dockyard. To this eminent shipwright, and to his son Peter, and Sir Anthony Deane, naval architecture owed much during the 17th century. But this period of progress was followed by a century of almost utter stagnation in the application of science to shipbuilding. Skill and thoroughness in ship-carpentry as a craft were not wanting; but there was no adequate application of scientific principles to the evolution and improvement of naval architecture. The best scientific talent during this period, and well into the 19th century, was to be found in other countries—France, Spain, Sweden, and Denmark. The British ships produced—particularly ships of war, but also merchant-ships—were, for speed, size, and sea-behaviour, far surpassed by the ships of the countries named. System had become so stereotyped that glaring imperfections—such as the lack of longitudinal and transverse strength—were perpetuated. At length came a shipbuilder who had courage to break away from established practice, and introduce improved methods of construction. Sir Robert Seppings began his career as an apprentice shipwright in the dockyards, and rose to be surveyor of the navy, which position he held till 1832. To counteract longitudinal weakness

he associated with the transverse ribs, or frames, inner ties or riders arranged diagonally (see the section of a wood ship shown by fig. 1). A further modification was the introduction of fillings between the frames up to some distance above the bilges. These fillings, occupying the whole space between the ribs, were of great value as safeguards in the event of damage to the outside planking, and affording additional strength. A

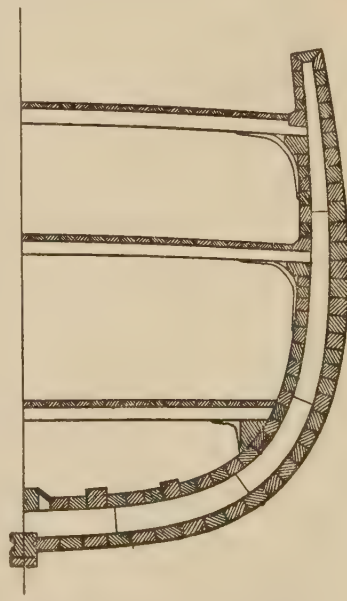


Fig. 1.—Section of a Wooden Vessel.

A third important change was in the mode of attaching the deck-beams to the frames at the sides of the ship. This bold shipwright also suggested and ultimately effected the reduction of the long

'beak-heads' and lofty square sterns which had for centuries characterised British war-ships. With Seppings' improvements the way was made clear for increase in the size and power of ships, and the results were exemplified in those three-deckers, long the pride and glory of the navy, and in the staunch and elegant merchantmen known on every sea. The *Thermopylæ*, built in

made great reputations and earned for their owners large fortunes about the middle of the 19th century, but steam appliances for managing the sails, anchor, &c., and for dealing with cargo in port, were no inconsiderable part of their equipment. In vessels like *La France* and *Maria Rickmers*, intended for long voyages, the need for such appliances was almost imperative. The incapacity

of sailing-vessels to make progress in a calm is one of their greatest drawbacks, so many of the larger vessels were fitted with auxiliary steam-engines for propulsion. The *Maria Rickmers* had triple-expansion engines of 600 indicated-horse-power, capable of propelling her, fully loaded in calm weather, about 7 knots. They were situated near the stern, and a feathering screw-propeller was used, adjusted by gearing from the engine-room, through

the hollow shafting. The disposition of the blades could be altered, so that they offered the least resistance to the vessel's progress while proceeding under sail alone.

The advent of the internal combustion engine has given the auxiliary sailing-vessel another chance of existence. A new *La France* was built, with oil engines for auxiliary propulsion. In 1921, the largest German auxiliary sailing ship, *Magdalene Vinnen*, was built by Krupp's. She is 329 feet length, 48·2 feet breadth, and has four masts. The gross tonnage is 3476, and the deadweight carrying capacity is 5200 tons. This vessel has four-cycle



Fig. 2.—Four-masted Vessel.

1868, and *Cutty Sark*, in 1869, are among the best known of many famous clipper-ships engaged in the China and Australian trades. (These, however, were composite-built vessels.)

Name.	Gross Tonnage.	Length.	Breadth.	Depth.
<i>Thermopylæ</i>	991	212 ft.	36 ft.	21 ft.
<i>Cutty Sark</i>	963	212·5 ft.	36 ft.	21 ft.

At the present day wood shipbuilding is mainly a matter of historic interest. It is of very small importance in British shipyards; though at a few ports a little wood shipbuilding is still carried on. Even in Canada and the United States, very little new shipping consists of wood.

Wood has been supplanted by iron, and latterly steel, in the construction of ships, and a corresponding change has taken place in the means for their propulsion. Steamships, and now oil-engined vessels, have made a wonderful transformation, and 'unbought wind' is now seldom used in speeding ships across the ocean. But before this, the size of steel sailing-ships and the extent of their rig had enormously increased. Full-rigged vessels in earlier times had only three masts, but four, and even five masts latterly became not uncommon. Fig. 2 shows a four-masted vessel, with rigging, spars, and sails. The illustration of *La France* (fig. 3), a five-master of 3784 tons, built in 1891, gives evidence of the increased size of hull and the great spread and intricacy of rigging in the colossal vessels of these times. Another and still larger vessel, the *Maria Rickmers*, of 3822 tons, built at Port-Glasgow in 1892, had 56,500 square feet of sail area. Not only were these sailing-vessels much larger than the famous China clippers, which



Fig. 3.—*La France*.

(From a Photograph by Messrs Adamson & Son, Rothesay.)

Diesel engines, of 550 b.h.p., by Krupp's. The largest British-built auxiliary sailing vessel is the *København*. She was built at Leith for the East Asiatic Co., of Copenhagen, by Ramage & Ferguson, Ltd., in 1921. Her dimensions are 369 feet length, 49·3 feet breadth, and her tonnage is 3901 gross, deadweight carrying capacity being 5300 tons. She has

five masts, and a sail area of 56,000 square feet. The engines are four-cycle Diesel, of 650 b.h.p., by Burmeister and Wain. But even the auxiliary sailing vessel, unless for some particular purpose, cannot compete with the steam or oil-engined vessel, for commercial purposes.

When the steam-engine came into use its suitability for ship propulsion occurred to many minds. The Spaniards claim that Blasco de Gary as early as 1543 attempted to propel a vessel by steam in the harbour of Barcelona. Denis Papin (q.v., 1647-1712) on 27th September 1707 employed a steam-engine to drive a model boat, with paddle-wheels, on the river Fulda, from Cassel to Münden. Jonathan Hulls in England patented in 1736 and described in 1737 a form of paddle-steamer resembling in many essential features vessels still in use. Other inventors proposed more or less feasible schemes for applying to ship-propulsion the crude forms of the steam-engine then known.

The real beginnings of practical steam-navigation, however, are to be found in the period 1780-90; and almost simultaneously, and probably with little knowledge of what was being done elsewhere, the pioneers of progress set to work in Britain, France, and America. The Marquis de Jouffroy (q.v., 1751-1832) produced a paddle-steamer at Lyons, which, on being tried for speed there on 15th July 1783, attained most encouraging success; but, ruined by the Revolution, he failed to bring his invention into practical use. About 1785 two American inventors—James Rumsey (c. 1743-92) and John Fitch (q.v.; 1743-98)—were independently engaged in steamship experiments. Rumsey in 1786 succeeded in driving a boat at the rate of 4 miles an hour, by jet-propulsion—i.e. steam-pumps forced a jet of water through the stern. Rumsey died in London just prior to trials being made on the Thames with another boat from his plans. Fitch began his experiments with paddle-wheels in 1785; but more successfully in 1787-88 with a series of paddles which had a motion resembling that of the Indian's paddle in canoe-propulsion. In April 1790 another of Fitch's boats made 7 miles an hour, and afterwards plied as a passenger-boat on the Delaware. Fitch disputed with Rumsey and others, the right to be considered the inventor of steam-navigation; but losing all hope of making headway in America, he went to France in 1793. Again in 1796 he was back in America experimenting with a little screw steamboat on a pond in New York. This led to no practical result, and Fitch, disappointed and broken down, retired to Kentucky.

For a number of years experiments with boats driven by paddle-wheels, worked by manual power, had been made by Patrick Miller (1731-1815), a retired Edinburgh banker, on a loch in his estate of Dalswinton, Dumfriesshire. On the suggestion of James Taylor, a tutor to his sons, Miller was led to think of applying steam as the motive-power—though the original idea is also claimed as his. Taylor introduced to him William Symington, a mechanic at Wanlockhead, who had already invented an engine for road locomotion. During the summer and autumn of 1788 the skill and ingenuity of Symington were exercised in constructing an engine after the pattern of his road-engine, for a boat 25 feet long by 7 feet broad, having twin-hulls with paddle-wheels between. On 14th October 1788, this small craft was propelled through the waters of the loch at the rate of 5 miles per hour, in presence of Robert Burns, Lord Brougham (then a boy), Nasmyth the painter, and other friends of Miller. A year later (October 1789) a larger and more powerful vessel was built, and engined for Miller at Carron Ironworks, and tried on the Forth and Clyde Canal, the speed attained

being about 7 miles per hour. Miller, as Carlyle tells us, 'spent his life and his estate in that adventure, and died quasi-bankrupt and broken-hearted.' Symington's pecuniary circumstances did not permit him to experiment further on his own account, and it was not until twelve years later that he had the opportunity of following up previous efforts with one still more successful. Meantime in America others were at work besides Fitch, amongst whom were Samuel Morley, Nathan Read, John Steven, Nicholas Roosevelt, Chancellor Livingston, and Robert Fulton. None of these, however, had materially advanced the cause of ship-propulsion by steam, when in 1801-2 Symington completed for Thomas, Lord Dundas of Kerse, a steam-vessel intended for towing purposes on the Forth and Clyde Canal. This was the *Charlotte Dundas*, the 'first practically successful steamboat ever built.' The engine was of Watt's double-acting type, turning a crank on the shaft of the paddle-wheel, which was situated at the stern. Early in 1802 she was launched on the canal at Grangemouth, and in March that year she towed two laden barges, each of 70 tons burden, a distance of about 20 miles in six hours against a strong headwind. After repeated trials, the proprietors of the canal were urged to adopt the new plan of towing, but, fearing injury to the banks of the canal from the wash caused by the paddles, they declined the proposal. The *Charlotte Dundas* was beached upon the canal bank, and gradually broken up; and Symington, thoroughly disheartened, turned his attention to other matters.

Amongst those who are said, on sufficiently credible authority, to have inspected the *Charlotte Dundas* were Robert Fulton (q.v., 1765-1815) and Henry Bell (q.v., 1767-1830), two enterprising spirits, afterwards destined—one in America, the other in Scotland—to achieve permanent success with steamships. Fulton went to Paris in 1797, and for some years was engaged experimenting with submarine torpedoes and torpedo boats. About 1801-2, jointly with Chancellor Livingston, then ambassador at the court of France, he built a steamboat on the Seine, the engine for which, proving too heavy for the hull, caused it to collapse and sink. Nothing daunted, Fulton recovered the machinery and placed it in a new and stronger boat, 66 feet long by 8 feet broad. On 9th August 1803 this boat was tried on the Seine, but attained only very limited speed. Fulton, returning to England in May 1804, remained for over two years; and there he ordered and saw completed by Boulton and Watt, a steam-engine which Livingston and he intended should be utilised in America. He sailed in October 1806, the engine following, and in August 1807 it was part and parcel of the *Clermont*, a vessel 133 feet long, 18 feet broad, and 9 feet deep, built to Fulton's order. Her first trip between New York and Albany, a distance of 142 miles, was made in thirty-two hours' steaming time, and the return journey occupied thirty hours. The *Clermont* was undoubtedly the first steamboat profitably employed—at least continuously—in useful service, and Fulton is accordingly entitled to the distinction of having been 'the first to make steam-navigation an everyday commercial success.'

America, with its enterprise and its great natural field for inland-navigation, was infinitely better prepared for the innovation than the old country, with its traditional achievements, conservatism, and prejudices. Yet Henry Bell's venture in 1811-12 is worthy of admiration. Henry Bell, by training a millwright, was proprietor of a hotel at Helensburgh on the Clyde. He long had convictions of the high place which the steam-engine would take

in ocean-navigation, and had knocked at the door of both the British and American governments for encouragement to prosecute his ideas. The ultimate result of his own financially unaided efforts was the renowned *Comet*, which was launched from the yard of John Wood, Port-Glasgow, in January 1812. She was 42 feet long, 11 feet broad, $5\frac{1}{2}$ feet draught of water, and her engine was of 3 horse-power. She plied on the Clyde from Glasgow to Helensburgh, and thence across the river to Greenock, her speed being about 5 miles per hour. After her immediate successor, the *Elisabeth*, and other steamers had been built and were running successfully, the *Comet* was lengthened to 60 feet, and fitted with a new engine and a single pair of paddles (at first there were two paddles a side), and attained a speed of 6 miles an hour.

The building of steamships was soon fairly established, and the Clyde took the lead in their construction. While most of them were intended for home, river, or coasting trade, not a few were built for service at distant ports. Of four passenger-steamers produced in 1814, *Marjory* was the first to ply upon the Thames, having been bought by a company of London merchants soon after her launch from the yard of William Denny of Dumbarton. She passed through the Forth and Clyde Canal from Bowling to Grangemouth, and reached the Thames six days after leaving the Forth. A notable trading steamer, *Industry*, was built by Fife the same year. Engineering received a forward impetus from the energetic genius of David Napier, already a well-known marine engineer, of Glasgow. He grasped the possibilities of steam-navigation in connection with coasting and over-sea traffic. In 1818 he established regular steam-service between Glasgow and Belfast with the *Rob Roy*, built by William Denny, and fitted with engines of his own make. She was the first regular sea-going steamship in the world, and, largely owing to the success of the *Rob Roy*, steamers were built and employed in service at other ports. In 1819 he established the first line of steamers between Glasgow and Liverpool, and during the subsequent twenty years he engined the most notable steamers produced by Clyde builders. On the Thames steamers began to ply between London and Margate in 1815-16; and in 1817 James Watt, whose double-acting side-lever type of engine (see STEAM-ENGINE) had played such an essential part in the movement, crossed over to the Scheldt in a steamer named the *Caledonia*, afterwards ascending the Rhine to Coblenz.

Ocean voyages by steamers were at first performed by vessels in which sail almost as much as steam was the power relied on. In this way the Atlantic was first crossed in 1819, by the *Savannah*, a vessel 100 feet long and of about 300 tons burden, the passage from Savannah to Liverpool occupying twenty-five days. In 1824 the steam-yacht *Falcon*, of about 175 tons, proceeded from England to India, for the most part relying on sails. In 1825 the *Enterprise*, 122 feet length of keel by 27 feet beam, and of about 470 tons burden, made a passage from London to Calcutta in 113 days, ten of which were occupied by stoppages.

The successful inauguration of transatlantic steaming is due to the *Great Western*, built for the Great Western Steamship Company by I. K. Brunel, whose bold genius controlled the affairs of the company, and gave to the maritime world several of its most notable steamships. She was 212 feet long, and registered 1340 tons. Her engines, on the side-lever principle, made by Messrs Maudslay, Sons, and Field, of London, were of 440 horse-power. On Sunday, 8th April 1838, the *Great Western* left Bristol on her voyage across the Atlantic, her completion and despatch being

hastened on account of the fact that, four days earlier, a vessel named the *Sirius* (taken from the service between London and Cork) had started on the same voyage. The *Sirius* was smaller and less powerful than the *Great Western*, and both vessels arrived at New York on the same day, Monday, 23rd April—the *Sirius* in the morning and the *Great Western* in the afternoon—the passage thus taking eighteen days and fourteen days respectively. Their arrival was hailed with immense acclamation by a vast concourse of spectators. The event was a triumph in steam-navigation, regarding the possibility of which much popular unbelief and some scientific doubt had been expressed; and it virtually reduced the distance between the Old World and the New by about one-half. The return passages of the *Great Western* and *Sirius* were even more successful than their outward, for time occupied and fuel consumed, but the undertaking commercially was far from satisfactory. Other steamers followed, but, with the exception of the *Great Western*, which was kept running at a loss, they were gradually withdrawn from the service.

A historical survey of the transatlantic service affords in itself a more complete and connected epitome of steamship development in all its essential aspects than any other service that can be instanced. The profiles of typical Atlantic steamers from the *Sirius* onwards for sixty years are reproduced here through the courtesy of the proprietors of *Engineering*. In 1839 Mr Samuel Cunard (q.v.) came over to England from Halifax, determined to establish on a secure and satisfactory basis a line of transatlantic steamships. He was brought into contact with Mr George Burns of Glasgow and Mr David Milver of Liverpool. The necessary capital was soon raised, and the celebrated 'Cunard' Company, backed by a handsome government subsidy for prospective mail services, was the result. Their first vessels were the paddle-steamers *Britannia*, *Acadia*, *Columbia*, and *Caledonia*, all of about the same dimensions—viz. 207 feet long, 1154 tons burden, and 740 h.p. The engines were of the side-lever type, by Robert Napier of Glasgow, return-flue boilers and jet-condensers being used. The *Britannia* inaugurated the mail service by sailing from Liverpool on Friday 4th July 1840, and arriving safely at Halifax after a voyage of twelve days ten hours. Her return passage was made in ten days; and the mail service thus instituted was thenceforth carried on by these four vessels with great regularity. The average speed then attained was about $8\frac{1}{2}$ knots, and by 1848, when longer and more powerful vessels were running, the average speed had been increased to $10\frac{1}{2}$ knots.

The substitution of iron for wood in the construction of ships' hulls commenced with barges and light craft built for canal and inland service. Amongst the first builders of iron boats were John Wilkinson, an iron-founder at Cartmel in North Lancashire, in 1787 or earlier; Thomas Wilson, on the Monkland Canal, Scotland, in 1818; and John Laird, founder of the Birkenhead firm, in 1829. The first iron steamer was the *Aaron Manby*, built at Horsely Ironworks, Tipton, in 1820-21, and named after her designer and builder. The first iron steamer constructed on the Clyde was the *Aglaia*, in 1832; the first on the Tyne, the *Prince Albert*, was built the same year. The distrust and opposition which this great change met with, not only from the public, but from shipowners, builders, and naval authorities, hindered its development for many years. The building of the *Great Britain* for the Atlantic service during the years 1838-44 was, therefore, a characteristically bold step on the part of Brunel and the company

for whom he acted. This remarkable vessel, the marvel of her day, was a striking exemplification not only of the natural evolution of steamship dimensions, but of the revolution in construction and propulsion. She was over 274 feet in length. Her hull was constructed of iron, and she was fitted with a screw-propeller. The employment of the screw in place of paddles was resolved upon in 1839 (the engines designed for paddle-wheels had been partially made) after painstaking study of the screw as already applied to smaller vessels.

The idea of employing the principle of the screw for ship-propulsion is known to have been entertained from a period as early as the application of steam power. But the subject is so beset with many intricate and conflicting contentions that it would be futile to attempt a satisfactory statement here.

Amongst the first, however, to convince the engineering profession of the practicability of screw-propulsion, were John Ericsson (q.v., 1803-89) and Sir Francis Pettit Smith (1808-74). The former with the *Francis B. Ogden* on the Thames in 1836 obtained encouraging success, and the latter with the *Archimedes*, a vessel of much larger size, in 1839, clearly demonstrated the practicability and value of screw-propulsion. The innovation in the case of the *Great Britain* was a success. But the great misfortune which overtook her on her fourth voyage from Liverpool to New York, stranding in Dundrum Bay, Ireland, through a misreckoning, interrupted her successful career as a steamship, although she was long afterwards employed in the Australian service. This misfortune, however, helped incalculably to further shipbuilding in iron.

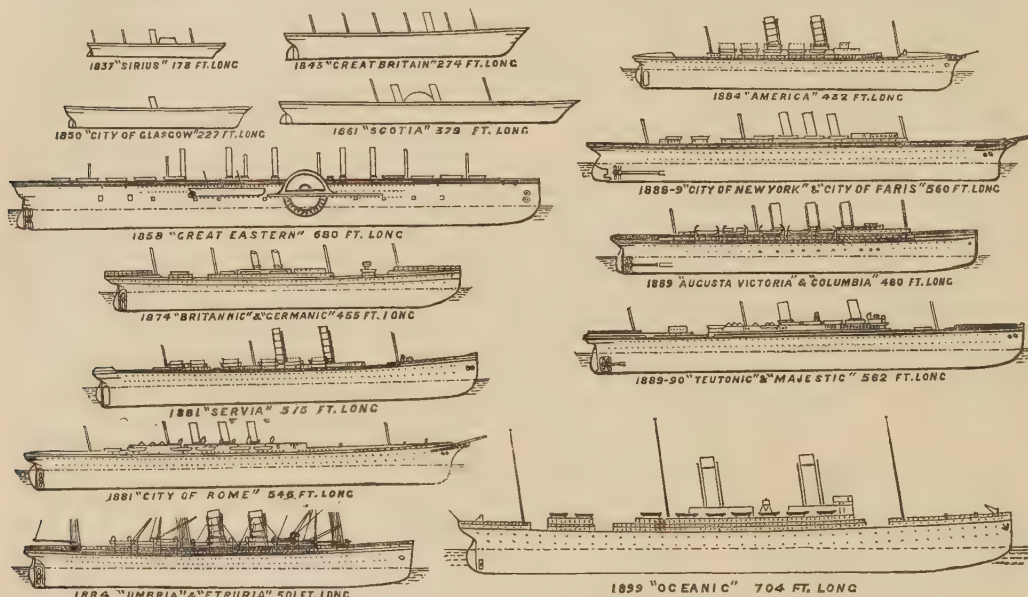


Fig. 4.—Comparative Sizes of Typical Atlantic Liners.

(From *Engineering*, 4th December 1891. The *Oceanic*, from drawing kindly furnished by Messrs Harland & Wolff.)

The vessel, after lying aground in an awkward situation for about eleven months, was successfully floated, and found to have sustained comparatively little damage. Many shipbuilders and owners who had hesitated about employing iron, paid visits to the stranded vessel, inspected her after docking, and felt entirely convinced of the suitability of iron for ship-construction. Although for some time longer the transatlantic service continued to be conducted by wooden vessels propelled by paddle-wheels, ocean-navigation by iron steamers was now placed on a thoroughly practical basis, and the superior efficiency of the screw for over-sea propulsion became accepted.

The advantages of the screw-propeller for ocean-steaming as compared with the cumbrous paddle-wheel were many. In smooth water, its efficiency was then not much greater than the paddle-wheel, but its position relatively to the body propelled, and to the water through which that body passes, made it vastly more efficient for sea-going purposes. Placed at the stern of the vessel, and fully immersed, it acts upon relatively undisturbed water. The rolling motions which so adversely affect the paddle, leave the screw almost uninfluenced and free from liability to damage. If the screw be well immersed, even the rising of the stern and dipping of the stem do not entail any

great loss of efficiency. Again, considerable variations in a ship's draught of water may take place and leave the screw efficient; whereas in the case of the paddle a small decrease or increase in the 'dip' of the floats, whether caused by draught of water or by wave-hollows, makes a very material difference.

The virtual monopoly of the Atlantic steamship service which existed for ten years in the hands of the Cunard Company was seriously assailed by opposition in 1850. There was established in that year the celebrated 'Collins' Line of paddle steamships, four in number, American built, of superior power and speed, and backed by a substantial subsidy from the United States government. The ultimate issues were greatly in favour of the Cunard Line, the Collins opposition ceasing in 1858 after the loss of two of the vessels and the refusal of further financial aid by the American government. With iron ships propelled by screws the Inman Company entered on Atlantic competition about the same time. Their first vessel was the *City of Glasgow*, followed by the *City of Manchester*, both built by Tod and M'Gregor on the Clyde. The Cunard Company in 1852 sent forth the *Arabia*, a wooden paddle-steamer of 2480 tons and 938 h.p. This was followed in 1855 by the *Persia*, the first iron vessel the company owned,

with which they maintained first place for speed. The next addition to the fleet—referred to at the time as the 'champion and model of a mercantile ocean steamship'—was the *Scotia*, built of iron, but she also had paddle-wheels. She measured 379 feet long, her gross tonnage being 4676. Her engines, by Napier, indicated at sea as much as 4200 h.p. Although her early performances surpassed those of any previous vessel, she was the last of the paddle-steamers built for the Atlantic by the Cunard Company. In the same year which gave her birth the government sanctioned the use of the screw-propeller in the mail-steamers of the company, and the screw-steamer *China* was the result. This vessel was followed during the next two years by four others, whose performances finally established the fact that the screw-steamer in point of efficiency and economy, especially with the improvements which had concurrently taken place in the marine-engine, far surpassed the paddle-steamer for deep-sea traffic.

With the triumph of iron construction and screw-propulsion development in size and power proceeded swiftly. Steam-navigation grew and flourished amazingly, and the employment of steamers on the longest of voyages and at high rates of speed was now thoroughly established. Additional companies were formed, and new steamships produced, for services having the widest ramifications.

The first mercantile steamship company to develop the trade of Britain with India by way of the Isthmus of Suez was the Peninsular Company, afterwards the renowned Peninsular and Oriental Company, their first services dating from 1837. The Pacific Steam-Navigation Company was established in 1847, and it was in vessels built for this company in 1856, engined by John Elder, that the compound principle, destined to prepare the way for the marvellous improvement gradually effected in the marine steam-engine, received its first satisfactory credentials. The subsequent general adoption of the surface-condenser and the cylindrical multi-tubular boiler enabled higher pressures of steam to be safely and economically produced and used.

The year 1858 witnessed the completion of the *Great Eastern* (q.v.)—Brunel, and Scott Russell's, stupendous creation—and also saw the modest beginning of the great fleet of the North German Lloyd. In 1861 the French Compagnie Transatlantique was inaugurated. About 1877 the Orient Steam-Navigation Company instituted a fortnightly service to Australia, and in 1879 added the *Orient*, and in 1882 the *Austral*, to their fleet, both from the stocks of the Fairfield Company, Glasgow. The *Orient* on trial attained 17 knots, and afterwards made the passage from Plymouth to Adelaide *via* the Suez Canal in 35 days 16 hours; and the same voyage *via* the Cape in 34 days 1 hour, steaming time. In a steamer built for the Australian service in 1881 by Napier & Sons—the *Aberdeen*, for G. Thomson & Co.—the merits of the triple-expansion engine were first decisively shown. The machinery of this vessel was from the designs of A. C. Kirk, of Napier's. The boiler pressure was 125 lb. per square inch, and expansions took place in three cylinders. On her first voyage from Plymouth to Melbourne, which occupied 42 days, her average i.h.p. was about 1800 and consumption of fuel less than 34 tons per day, a rate of 1·69 lb. per i.h.p. per hour. In 1883 the New Zealand Shipping Company instituted direct steamship service to New Zealand. In vessels employed in this service, a further extension of the principle of higher pressures and increased expansion—quadruple—was carried out with corresponding economic results.

A hotly sustained contest for the leading place

in the race across the Atlantic began in the year 1874 with the production of the *Britannic* and *Germanic*, of the White Star fleet, by Harland and Wolff, Belfast—each a considerable advance on anything then existing. Steamship after steamship proved more or less an advance on its predecessor in length, appointment, propulsive power, and consequent shortening of the passage time. Each increase in the high-speed Atlantic steamer represented the resultant of innumerable modifications—some minor, others radical—which engineering experience and skill and the constant improvement in contributory branches of art and manufacture suggested and rendered possible. For a time the White Star liners maintained first place in the matter of speed, being exceeded, however, in dimensions and tonnage by the *City of Berlin* of the Inman Line, in 1875 the longest vessel afloat next to the *Great Eastern*. The average time from Sandyhook to Queenstown in 1856 was 11 days 19 hours. Roundly stated, the *Britannic* reduced the passage to and from Queenstown and New York to 8½ days. In 1879 two fresh competitors were in the field, the *Arizona* of the Guion Line, built by the Fairfield Company, and the *Gallia* of the Cunard Company, built by J. and G. Thomson, Clydebank. During 1881 the Cunard Company added the *Servia* to their fleet, from the stocks of J. and G. Thomson; the Inman Company added the *City of Rome*, from the Barrow Company; and the Guion Company the *Alaska*, from the Fairfield yard. Then came the *Oregon* (Fairfield), for the Guion Line, in 1883; the *Aurania* (Clydebank), for the Cunard Company, in the same year; the *America* (Clydebank), for the National Line, in 1884. The *Umbria* and *Etruria* (Fairfield) were the last single-screw vessels built for the Cunard Company.

Twin-screws were soon found particularly suitable in steamers for coasting and cross-channel work, where depth of water is restricted, and in vessels of the navy, where manœuvring facility is a desideratum. In vessels of large power it was also recognised as inadvisable to transmit the total power through one line of shafting. Mishaps to the shafting or propellers of single-screw steamers were too frequent. With twin-screws, each driven by a separate set of engines and shafting, ships can, in the event of a break-down to one set of machinery, still pursue their voyage by means of the other set. The twin-screws can also be used to assist the steering in case of emergency.

The *City of New York*, *City of Paris*, *Majestic*, and *Teutonic* (1889) were the first twin-screw Atlantic liners. Of the same class were the *Normannia*, *Auguste Victoria*, *Fürst Bismarck*, and *La Touraine*, belonging to German and French firms. At Fairfield (1893) were built the twin-screw *Campania*, and *Lucania*, for the Cunard Company. In 1899 Harland & Wolff launched the *Oceanic*; and in 1902 the *Cedric*, both for the White Star Line and with twin-screws.

In later steamships of the largest dimensions and highest powers, triple and quadruple screw-propellers have become necessary. In 1900 the Hamburg-American twin-screw liner *Deutschland's* time was 5 days 7½ hours—an average speed of 23·38 knots. The Cunarders *Lusitania* and *Mauvetania*, quadruple-screw turbine steamers launched in 1906, inaugurated a new departure. Both vessels on their trial runs of 1200 miles attained a mean speed of over 26 knots. The *Lusitania* on 10th July 1908 completed the passage from Queenstown to New York in 4 days 19 hours and 36 minutes, the average speed being 25·01 knots. But the *Mauvetania* holds the blue ribband of the Atlantic, having on 6th October 1924 completed the voyage from New York to Plymouth in

4 days, 21 hours, 51 minutes, an average speed of 25·68 knots, although the crossing was rough. These huge vessels have been followed by even larger ones, such as the *Olympic*, built in 1911; *Berengaria* (German *Imperator*), built in 1912;

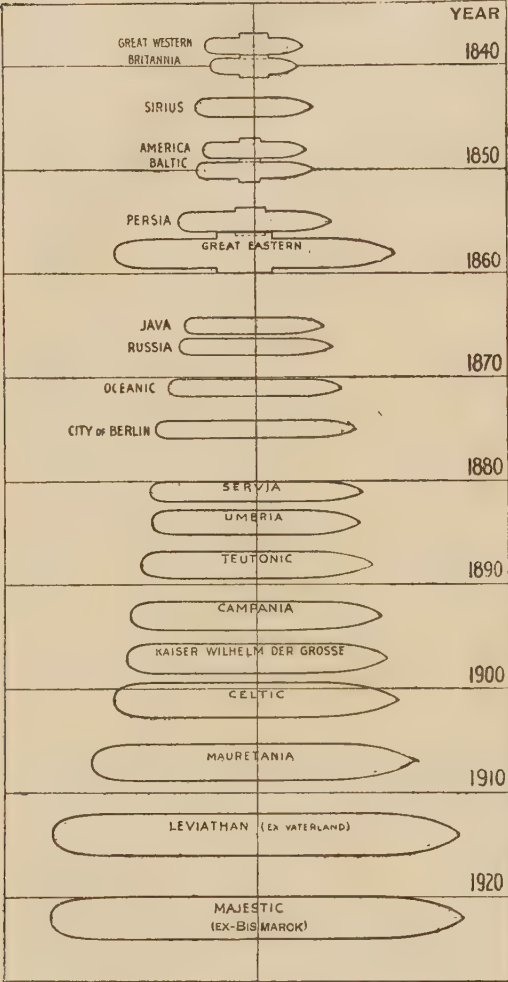


Fig. 5.—Comparative Sizes of Typical Steamships.

Aquitania, built in 1914; *Leviathan* (German *Vaterland*), built in 1914; *Majestic* (German *Bismarck*), built in 1921; and others not quite so large. The ill-fated *Titanic*, built in 1912, was 46,329 tons. A table giving a few particulars of representative vessels is appended.

The introduction of the steam-turbine was a great step forward in marine propulsion (see STEAM-TURBINE). In 1901-2 the passenger turbine steamers *King Edward* and *Queen Alexandra* were run on the Clyde, with an average speed of 20 knots. The Allan liners *Victorian* and *Virginian*, and the Cunard Company's *Carmania* (1905), followed, and the turbine soon became established for high powers. The Admiralty, after experiments on the cruiser *Amethyst*, adopted it for the *Dreadnought* (1906). (See NAVY.)

The latest development in steam propulsion is a very high pressure watertube boiler, in conjunction with Parson's geared turbines. A vessel with this type of machinery, *King George V.*, was built by Denny in 1926.

In recent years oil fuel has been largely used for marine steam boilers. By adopting oil fuel in place of coal, a number of steamships have attained an appreciable increase in speed.

The internal combustion engine has brought about an enormous change in ship propulsion within the last few years, and the Diesel engine is now acknowledged to be the most suitable for certain classes of vessels. Not only in cargo vessels but in passenger vessels this type of engine is being adopted. The first large motor vessel of the 'liner' type is the *Aorangi*, built in 1924 at Fairfield for the Union Steamship Co. of New Zealand. There are four propellers, and the machinery consists of four sets of 'Sulzer' two-stroke single-acting engines, each having six cylinders, giving a total of 13,000 b.h.p., and a sea speed of 17 knots. A speed of 18·23 knots was attained on the measured mile trial. She is running successfully on the Pacific. The *Gripsholm*, 17,300 gross tonnage, built by Armstrong in 1925, developed on her first voyage across the Atlantic a maximum speed of 16·95 knots for 24 hours. She has two propellers driven by Burmeister and Wain engines of the double-acting, four-stroke type, each having six cylinders. In the same year Harland and Wolff launched two passenger liners, *Asturias* and *Alcantara*, for the Royal Mail Steam Packet Company. These vessels are 22,000 gross tonnage. They have twin-screws, and engines of the Burmeister and Wain double-acting type, each having eight cylinders. At the Ansaldo Yard in Italy the largest motor vessel in the world—*Augustus*, 32,000 gross tonnage—was launched in 1926. She will have four engines of the M.A.N. double-acting type, each having six cylinders, developing in all 25,000 b.h.p., and a speed of 21½ knots is anticipated. Geared Diesel engines for marine propulsion have been used with success in Germany.

The employment of electrical energy for propulsive power has already met with considerable success, and it may be assumed that electricity will play a great part in propelling the 'ship of the future.' The greatest progress in the steam Turbo-electric system has taken place in America, and a passenger vessel of 22,000 gross tonnage is building for the International Mercantile Marine of America; 18,000 shaft horsepower is to be developed, and a speed of 18 knots expected.

Mild steel was first used as a building material in France, but soon attracted the attention of British naval authorities; and about 1875-76 home manufacturers supplied the steel requisite for the construction of the cruisers *Iris* and *Mercury*. In 1879 the Allan Line entrusted to William Denny and Bros. the building of the *Buenos Ayrean* (the largest vessel of their fleet up to that time), the hull of which was of steel with steel rivets. Almost from the first, mild steel found favour with the shipyard workers, being a material capable of much easier manipulation than iron; but its high cost and the exacting tests necessarily imposed restricted its use for some years. Improvements in manufacture and enlarged facilities for production gradually reduced its cost and established its reliability. Steel has many advantages. It is light—strength for strength—compared with iron. There is economy in labour through steel lending itself more than iron to being worked while in the cold state. It may be readily and safely flanged and joggled, thus dispensing with many bars, butt straps, &c., and it can be supplied in plates of greatly increased size. The change from wood to iron effected a saving of 30 to 40 per cent. in the weight of a ship's hull. The employment of steel made a further economy in weight of almost 15 per cent. Roughly, therefore, the steel ship of to-day is 50 per cent. lighter

than a wooden ship of former times of similar dimensions and tonnage. Finally, the greater safety of steel ships, and the diminished risk of heavy damage requiring repair, in the event of getting aground, commended steel to shipowners and marine insurance societies. Through the superior ductility of the material, steel ships have again and again come comparatively scathless out of ordeals which would have proved serious to ships built of iron.

A high tensile steel has been successfully used for many years, especially in naval vessels.

Recently a special quality steel, having a higher limit of elasticity than ordinary mild steel, has been introduced, and is approved by Lloyd's Register of Shipping.

Fouling and corrosion in service is a disadvantage attaching to steel as well as iron ships. The marine growth, which takes place more or less rapidly on iron and steel ships, especially in warm or tropical seas, has been a serious matter for the navigator and the shipowner. A few months in tropical waters may produce such an amount of fouling that the speed of the ship is considerably

REPRESENTATIVE STEAMSHIPS.

Year.	Name.	Tonnage Length.	Breadth.	Depth to Main Deck.	Gross Tonnage.	Horse-Power.	Speed.
		Feet.	Feet.	Feet.			Knots.
1838	<i>Great Western</i> . Wood. Paddles	212·0	35·3	23·25	1,340	750	8·5
1840	<i>Britannia</i> . Wood. Paddles	207·0	34·5	22·5	1,154	740	8·5
1843	<i>Great Britain</i> . Iron. Screw	274·0	48·2	31·5	3,270	1,000	9·0
1858	<i>Great Eastern</i> . Iron. Paddles and Screw	679·6	82·8	31·6	18,915	2,600	13·0
1862	<i>Scotia</i> . Iron. Paddles	379·0	47·8	37·7	4,676	4,200	15
1874	<i>Britannic</i>	455·0	45·2	26·2	5,004	5,500	16·0
1879	<i>Arizona</i>	450·2	45·4	35·7	5,164	6,300	17·0
1881	<i>Alaska</i>	500·0	50·0	38·0	7,142	10,500	18·0
1881	<i>City of Rome</i>	560·2	52·3	37·0	8,453	11,890	18·23
1883	<i>Oregon</i>	501·0	54·2	38·0	7,375	..	18·30
1884	<i>Umbria</i>	501·6	57·2	38·2	8,128	14,321	19
1889	<i>City of Paris</i> . Twin Screws	527·6	63·2	39·2	10,499	20,605	21·8
1889	<i>Ten-tonic</i> . Twin Screws	565·8	57·8	39·2	9,984	18,000	21
1890	<i>Fürst Bismarck</i> . Twin Screws	504·4	57·6	34·1	8,430	16,412	20·7
1893	<i>Campania</i> . Twin Screws	601·0	65·2	37·8	12,950	30,000	23
1899	<i>Oceanic</i> . Twin Screws	685·7	68·3	44·5	17,274	..	21
1900	<i>Deutschland</i> . Twin Screws	662·7	67·0	40·4	16,502	..	23·5
1903	<i>Cedric</i> . Twin Screws	680·9	75·3	44·1	21,073	..	17
1905	<i>Empress of Scotland</i> (ex <i>Kaiserin Auguste Victoria</i>). } Twin Screws. }	677·5	77·3	50·2	25,128	..	17·5
1907	<i>Mauretania</i> . Quadruple Screws. Turbines	762·2	88·0	57·1	30,696	78,000	26·0
1911	<i>Olympic</i> . Triple Screws. Turbine and Reciprocating. }	852·5	92·5	59·5	46,439	55,000	23
1912	<i>France</i> . Quadruple Screws. Turbines. }	689·2	75·6	48·5	28,666	..	24
1912	<i>Berengaria</i> (ex <i>Imperator</i>). Quadruple Screws. }	883·6	98·3	57·1	52,226	65,000	23·5
1914	<i>Leviathan</i> (ex <i>Vaterland</i>). Quadruple Screws. }	907·6	100·3	58·2	59,957	82,200	23
1914	<i>Aquitania</i> . Quadruple Screws. Turbines	868·7	97·0	49·7	45,647	62,000	24
1921	<i>Giulio Cesare</i> . Quadruple Screws. Turbines. Geared }	602·4	76·5	46·3	21,657	..	20
1921	<i>Majestic</i> (ex <i>Bismarck</i>). Quadruple Screws. Turbines. }	915·5	100·1	58·2	56,551	84,155	26
1921	<i>Paris</i> . Quadruple Screws. Turbines	735·4	85·3	59·1	34,569	..	22
1922	<i>Columbus</i> . Twin Screws. Reciprocating	749·6	83·1	49·4	32,354	..	20
1922	<i>Homer</i> . Twin Screws. Reciprocating	751·0	83·3	48·6	34,351	..	18·5
1923	<i>Duilio</i> . Quadruple Screws. Turbines	602·4	76·3	46·3	28,228	..	18·5
1923	<i>Maloja</i> . Twin Screws. Quadruple. Reciprocating. }	600·8	73·4	48·6	20,837	..	17·0
1923	<i>Franchon</i> . Twin Screws. Turbines. Double Gear. }	601·3	73·7	40·6	20,158	..	17
1924	<i>Orama</i> . Twin Screws. Turbines. Geared	632·0	75·3	33·0	20,000	..	19·0

REPRESENTATIVE DIESEL SHIPS.

					B.H.P. (approx.)	(Approx.)
1924	<i>Aorangi</i> . Quadruple Screws	580·1	72·2	43·4	17,491	13,000
1925	<i>Gripsholm</i> . Twin Screws	553·0	74·4	37·7	17,993	13,500
1925	<i>Asturias</i> . Twin Screws	630·5	78·5	40·5	22,071	18,000
1926	<i>Saturnia</i> . Twin Screws	599·0	79·5	46·5	25,000	20,000
1926	<i>Augustus</i> . Quadruple Screws	666·3	82·8	47·2	38,000	25,000

reduced. Copper-sheathing formed from a very early date an essential item in the proper fitment of a wooden vessel for sea. Its anti-fouling properties were so advantageous that long after iron had supplanted wood generally, the 'composite' system of construction was in many cases followed. A ship built on this system resembles an iron ship, except that wood is used for the keel, stem, stern-post, and planking, thus enabling the bottom to be sheathed with copper. For a considerable period the composite system of construction found favour in ships of war and mercantile ships intended to keep the sea for long periods and to maintain their speed. The China clippers formerly employed in the tea trade, whose annual races home excited so much interest, were built on this system. There have been innumerable attempts to prevent the fouling of iron and steel ships, but in spite of countless specifics proposed, frequent docking and

careful coating of the hull with paints and anti-fouling compositions are the best methods.

The employment of iron in place of wood for constructional purposes, and the simultaneous extension of the use of machinery, revolutionised the art of shipbuilding. The manipulation of this malleable material and of its still more ductile successor, mild steel, is simplicity itself compared with the elaborate hewing and fashioning of timber requisite in wood shipbuilding. Take, for example, one of the important parts of a ship's structure, the rib or frame. In a wooden vessel it was a matter of careful and skilful workmanship to saw and hew from rough logs the curved timbers, many of which had to be combined to form a single rib. In a steel ship, angles or other sections used for frames are simply heated in a furnace and then bent to the required curve. Each frame in its complete form consists

of the simplest possible combination of angles or other bars and plates. Further, the manufacturer supplies the material approximately of the dimensions in which it enters into the structure, thus reducing the work of cutting and preparation to a minimum. Machinery, too, has assisted handicraft in the shipbuilding yard. Plates and bars are

tradesmen aiding in the fittings and equipments; whereas in steel shipbuilding there is no correspondingly prominent artificer of the 'all-round' type, the work being apportioned among machine-aided ironworkers, carpenters, and joiners. Shipbuilding may, in these respects, be said to have lost dignity as an art. But there is a great

gain to steel shipbuilding as an industry, and the modern vessel as a product of science. The rate of production is accelerated tenfold compared with what it was even in the palmiest days of wood shipbuilding; and in size and perfection of equipment the mail-steamers and ironclads produced from the yards of our shipbuilding centres dwarf the achievements of former times.

Sub-division of the hull of a vessel by strong water-tight Bulkheads (q.v.) is essential, to guard against foundering through collision or grounding. Should the shell be penetrated and an inrush of water take place, the inflow is confined to the space between two bulkheads, and there is enough buoyancy in the remaining compartments to keep the vessel afloat. Many ships are now compelled to be so subdivided that if any two compartments be laid open to the sea the vessel would not sink. In most vessels commercial and other conditions restrict the degree and nature of subdivision to only such as the law demands. The principle of subdivision has been extended in another part of the hull structure, viz. throughout the bottom. The carrying of water-ballast has for very many years been rendered necessary for vessels compelled by exigencies of service to proceed to sea light, or partially loaded; and this need, associating itself with structural requirements arising from the growth in ship's dimensions, has resulted in the general adoption of double bottoms, on the 'cellular' principle. This internal feature of a ship's structure dates from before the time of the *Great Eastern*, in which, as well as in previous smaller ships built by Scott Russell, the cellular system was adopted, although not associated with water-ballast. It contributes to the security of a vessel grounding or striking sunken obstacles, because the top of the cellular bottom or 'inner shell' is water-tight. Through the courtesy of William Denny and Bros., Dumbarton, who did much to improve the cellular system, a midship section is reproduced of an early example, the steamship *Scot*. The longitudinal strength obtained by the girders and inner plating is combined with the transverse 'deep-floor' principle, and the whole util-

ised for carrying water-ballast. The project for a new vessel originates generally with the shipowner, and from his experience he submits to the professional marine architect the main regulating conditions of design—e.g. the proposed dimensions, the type, the cargo to be carried, and the speed to be attained on a given draught of water. From these and other fundamental data the architect is able to prepare a suitable design and a detailed specification,

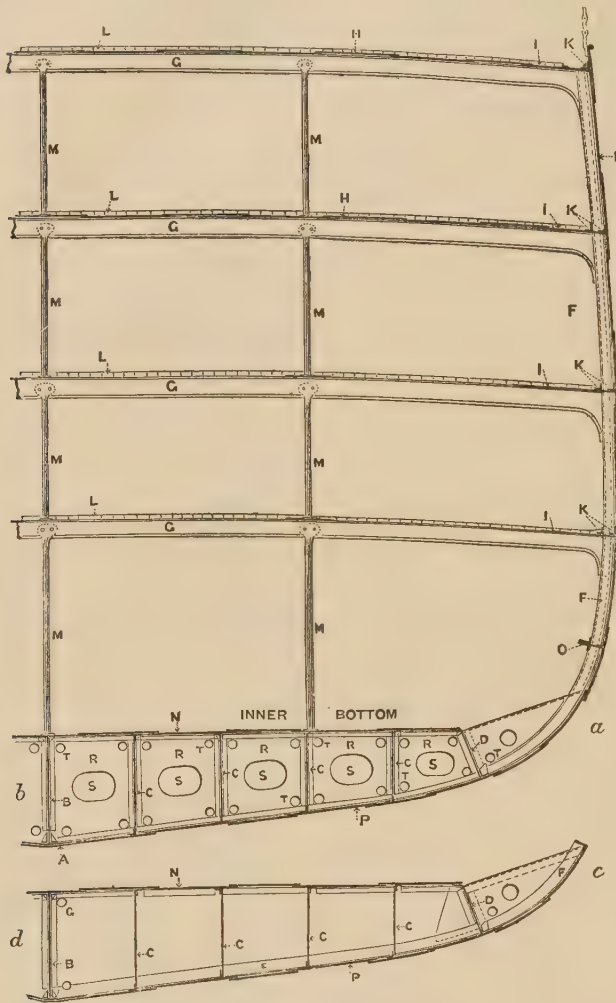


Fig. 6.—Midship Section of ss. *Scot*, illustrating the Cellular Bottom System of Construction:

a, b, arrangement on every frame under engines, and on alternate frames elsewhere; c, d, alternate frames in holds.

A, keel-plate; B, centre longitudinal; C, side longitudinal (analogous to keelsons in vessels with ordinary bottoms); D, wing-plate; E, bottom frame; F, side frame (reverse frame dotted); G, deck-beams; H, deck-plating; I, deck-stringers; J, stringer-angles; L, deck-planking; M, hold stanchions; N, tank top or inner bottom-plating; O, bilge keelson; P, shell-plating; R, deep-floor plates (analogous to solid floors in vessels with ordinary bottoms); S, man-holes; T, air and limber holes.

punched, sheared, drilled, planed, and bent by simple and suitable machines. One or two skilled workmen, assisted by several unskilled labourers, can rapidly perform operations corresponding to those which in wood necessitated the handicraft skill and prolonged efforts of many trained shipwrights. Division of labour also enters into the economy of modern shipbuilding to a much greater extent than in wood shipbuilding. The shipwright, as his name implies, really built the wood ship, other

which the owner can lay before one or more builders and obtain prices for constructing the vessel. After the contractor has been selected there remains a goodly amount of designing to be done in details, and the preparation of working-drawings to guide the workmen in the shipyard.

The building of a modern vessel is usually undertaken by one firm of shipbuilders who are also marine engineers. The first step is the preparation of plans, showing by a series of curved and straight lines the form of the ship's hull, on three distinct planes: (1) the 'sheer-plan' or longitudinal elevation, showing the lines of length and height; (2) the 'half-breadth plan,' showing the lines of length and breadth; (3) the 'body-plan,' showing lines of breadth and height.

Following the design of the form is the preparation of a 'midship section' showing the transverse shape of the vessel amidships and the

helps the owner in all subsequent negotiations connected with insuring the vessel and her cargo. Elaborate classification rules and scantlings have been formulated and are issued annually by Lloyd's Register and other societies.

From the design a wood half-model, which is a small-scale representation of the hull, is prepared for various constructional purposes. On its surface are marked vertical lines from keel to upper deck representing the frames. These are spaced at equal distances apart from the stern-post to the stem. Across these, in a longitudinal direction from stern to stem, lines are drawn representing the edges of the shell-plating, arranged in 'strakes,' each strake being divided throughout by 'butts' into uniform lengths of plates. Lines representing the decks, transverse bulkheads, side-ports, and other details are also drawn thereon. From the model thus prepared, and from plans, of decks, bulkheads, keelsons, and floors, the draughtsman measures and orders the bars, plates, and butt straps. Meanwhile the vessel's lines have been 'laid off' on the mould-loft floor full size, in which process inaccuracies due to the small-scale drawing are eliminated. When the mould-loft lines are accurately 'faired,' moulds and templates of several parts of the ship's structure are prepared for the workmen in the shipyard. The most important item thus prepared is the 'srieve-board,' a stout wood flooring on which the frame curves and other details are drawn full size by sharp lines cut or 'srieved' in the smooth surface. This board is then placed convenient to the furnace and the 'bending-blocks,' massive cast-iron slabs on which the frames are bent. On these blocks the form of a frame is marked from the srieve-boards. All over the blocks are round holes, closely spaced, and into those which fall within the line of the frame curvature pins are placed with their

upper ends projecting. A bar properly heated is drawn from the furnace and speedily bent by special hand appliances, and held by the pins and dogs to the form required, and it is also bevelled. Each half-frame of a ship is thus fashioned to the proper curve in little more time than it takes to describe the process. It is allowed to cool and then taken to the srieve-board to be finally adjusted. This along with a 'reverse frame' and a 'floor' plate makes one of the ship's ribs or frames in its complete form. These three items first bolted together are then riveted together by hand or hydraulic power, the holes for the rivets having been punched by machine, partly before and partly after bending. Beams and other parts are similarly furnaceed and shaped. The keel has in the meantime been prepared and laid on heavy blocks of wood or moulded concrete—about 4 to 6 feet apart and 3 to 4 feet high—their tops lying in a plane inclined to the horizon about $\frac{1}{8}$ inch per foot. The completed frames are hoisted up in their places and kept in position by shores and ribbons. The stem and stern-post are also set up, and soon the work becomes general all over the vessel. The deck-beams are put up, the bulkheads, stringer-plates, and keelsons are added in due succession, and the outside shell-plates are curved, fitted, punched, temporarily fastened with bolts, and then riveted.

In vessels built on the cellular double-bottom

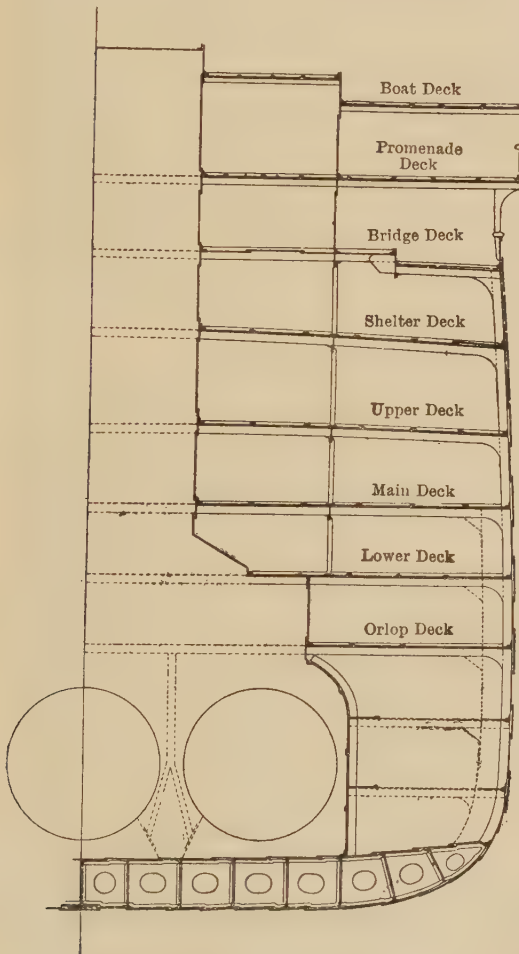


Fig. 7.—*Aquitania* Midship Section.
(From the *Trans. of the Inst. of Nav. Archit.*)

sizes, or scantlings, of the various parts which constitute the structure (see specimen midship sections, figs. 6 and 7). If the vessel is to be 'classed'—as the majority of vessels at the present day are—this 'midship section' is submitted to Lloyd's Register of Shipping or other registration society for approval. The practice of classing at Lloyd's (q.v.) is advantageous in several ways, and it

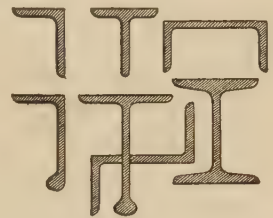


Fig. 8.—Section of Bars.

principle the order of procedure is somewhat different from the foregoing in the earlier stages. The frames are usually in three parts. One part forms the bottom of the vessel, each side of a centre longitudinal, to which it is securely attached, and ends against a wing-plate at each bilge. The two remaining parts form the sides, and are superimposed upon the wing-plates and firmly bracketed to them. In construction, therefore, a centre longitudinal plate fixed vertically, and a flat keel plate are first erected; the bottom sections of the frame are then fixed in place, and the whole system of longitudinal and deep-floor plates completed before the side portions of the frames are erected. In other respects the procedure does not materially differ from that above outlined. These methods are called transverse framing, and there are many modern modifications.

There are other methods of 'framing.' Vessels are frequently built on a longitudinal system, the *Great Eastern* being the earliest outstanding example of the kind.

The steel work entering into the structure is fastened together by rivets. Holes are punched or drilled in the plates and bars in most cases before they are put together. The holes having been made exactly to fit over each other, and the plates held closely together, a red-hot rivet is inserted

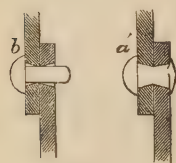


Fig. 9.

through them, as in *b*. A workman holds the head of the rivet forcibly in place with a heavy iron tool, while two riveters on the other side of the plate strike its point rapidly with their hammers until hammered down almost flush with the plating. It is then finished off as shown at *a*. The contraction of the rivet in cooling causes it to

draw and hold the two plates still more tightly together. In modern practice much of the riveting is done with hydraulic and pneumatic tools.

The outside shell of the vessel, also the bulkheads and other necessary parts, are made watertight by 'caulking'—i.e. forcing the edge of one thickness of plating against the surface of the other by blows from a hammer on a chisel-like tool. With the completion of the riveting and caulking of the shell, the laying of decks, and the concurrent advance of other features, the vessel is prepared for launching. Launching 'ways' of heavy timber are laid down parallel to the keel at some distance on each side of it, under the bilges of the vessel, and extending into the water below high-water mark. A 'cradle' is then built under the ship, the bottom of which is formed of smooth timbers, or 'sliding ways,' resting upon the fixed launching ways. Before launching, the rubbing faces of both of the ways are well greased, and gradually, by wedging, the weight of the ship is transferred from the building 'keel-blocks' and bilge-blocks to the cradle and ways. By a locking arrangement of the two ways the tendency of the ship and cradle to glide down the lubricated pathway is prevented until the proper moment. When this arrives (at high-water usually) the ceremony of naming the vessel takes place, the locking arrangement or 'dog-shore' is released, and the vessel glides down the ways with gradually increasing velocity until checked by the resistance of the water, or by chains and drag-weights on shore. As soon as the vessel is 'water-borne' the cradle floats apart in pieces, which are afterwards towed back to the shipyard. The engines and boilers have of course been under construction since the date of the order, and their erection and fitting devolve on the engineering department.

Although the vessel is now afloat much may

remain to be done. Frequently a considerable part of the deck-planking has to be laid and caulked after the machinery has been put on board, and the cabin appointments and other interior and deck fittings have to be completed; the masts have to be put on board and rigging fitted. The engines, boilers, shafting, and the various items of auxiliary and deck machinery have to be placed and properly secured on the seatings provided for them. All is at last complete: the numerous deck-fittings, the furnishing of the rooms, the fitting of electric light, the heating and refrigerating plants, the cooking appliances, the sanitary fittings and ventilation, the completion of the network of piping, the fitting of the steering gear, the placing of the compasses, the life-saving appliances, and the thousand-and-one other items which go towards the thorough equipment of the vessel for sea. When the vessel glides out of the dock of her builders and proceeds on her trial trip, and to adjust compasses, there ensues what is not infrequently a most anxious period for the builders and engineers. In vessels where high speed, together perhaps with carrying capability on a given draught of water, is the regulating condition of design, the speed trials are often most exacting. The 'measured mile'—i.e. the nautical mile of 6080 feet determined by fixed marks on a straight length of coast-line—is usually the means by which a vessel's speed is ascertained; but in addition to running the mile most high-class vessels have to undergo continuous tests over long distances. Two or more runs are made over the mile, with and against the tide, the object being to eliminate the tide's influence from the results. The time taken to each run enables the builder to compute the rate of speed per hour of which the vessel is capable.

Speed, power, and dimensions must not be gained at the expense of stability, strength, and safety, and these qualities are duly balanced in the magnificent ships traversing the Atlantic and other oceans. In the paddle and screw vessels employed in other kinds of service—such as river, lake, and cross-channel passenger work—practical skill and scientific knowledge are equally exemplified. In the purely cargo and freight-carrying vessels, while fundamentally the same conditions obtain, there are other influences and restrictions, due to the exigencies of commerce and of economic service, which affect the balance of qualities. Speed may be subordinated to economic consumption of fuel; stability may be regulated less by the ship's form and weight-distribution in the hull structure than by the amount and distribution of cargo when the ship is fully loaded. The present-day designer is concerned not so much with attaining great success in any one direction, as with fulfilling various and conflicting conditions of service at moderate outlay.

The attention of the shipping world has frequently been called to novelties in ship design and construction, but commercial and industrial caution have hitherto kept their balance, and the ultimate effect has been to illumine and make clear the safest line of advancement. That ships of certain types will continue to increase in size and speed may be taken for granted. But the future dimensions of ships depend largely on the provision of deeper entrances to the principal harbours in the world, and larger dry docks and port facilities.

With the development of propulsion by engines instead of sails, the shipbuilding industry not only flourished in the United Kingdom, but became general in countries which are favoured as repositories of natural wealth in the form of coal and ores. The other leading countries are the United

States, Germany, France, and Italy. Germany and the United States have made great strides in the race for the world's shipping trade. Germany in 1900 launched the *Deutschland*, the largest and fastest vessel of that time, and in 1914 the *Vaterland* (now *Leviathan*) the largest vessel yet built. In the United States shipbuilding began with fishing-boats. In 1640 a vessel of 300 tons was built at Salem; and soon shipbuilding was a prosperous industry in several New England ports. The revolutionary war was fatal to the industry; but from 1812 to 1850 wooden shipbuilding prospered exceedingly, and the American sailing-vessel reached perfection. The first China clipper was built by Webb at New York in 1841; and the first three-decker by the same builder in 1849. The building of whalers, once a great New England occupation, is almost extinct. The share of the United States in the introduction of steam-power has been already recorded. America is specially famous for her river and lake steamers, the first stern-wheel paddle-boat being built by Fulton and Livingston at Pittsburgh in 1811. The first great lake steamer was built at Sackett's Harbor in 1816; and the first iron boat was built in Pennsylvania for service on the Susquehanna. Shipbuilding in the United States has been handicapped on account of high costs. However, by improvements in the manufacture, Americans were able to make steel plates cheaper than any other makers; hence in 1900 an impetus was given to the industry, many large steamers were built, and new building yards were established not only on the seaboard but on the great lakes (access to the sea being by the St Lawrence). Since 1914, owing to the Great War, the building capacity of every country has been enormously increased.

See also the articles on Boat, Bottomry, Brig, Caulking, Cunard, Deck, Dock, Dockyards, Galley, Great Circle Sailing, Insurance, Lighthouse, Log, Navy, Peninsular and Oriental Company, Plimsoll, Privateer, Rule of the Road, Sails, Salvage, Schooner, Signaling, Slip, Steering, Timber, Tonnage, Wrecks, Yacht, &c. On the general subject of ships and steam-navigation, see Lindsay's *History of Merchant Shipping and Ancient Commerce* (1883); *Ocean Steamships*, by Commander Chadwick and others (Murray, 1891). On the art and science of shipbuilding, see Scott Russell's *Modern System of Naval Architecture* (1860); Rankine's *Shipbuilding, Theoretical and Practical* (1866); Reed's *Shipbuilding in Iron and Steel*; White's *Manual of Naval Architecture*; Thearle's *Naval Architecture, Practical and Theoretical*; Reed's *Stability of Ships*; Barnaby's *Marine Propellers*; Meade, *Naval Construction* (Phila. 1869); Griffiths, *The Progressive Shipbuilder* (New York, 1875); Varney, *The Shipbuilder's Manual* (New York, 1878); Henry Hall, *The Shipbuilding Industry of the United States*; Pollock's *Modern Shipbuilding and the Men engaged in it* (1885); A. J. Maginnis, *The Atlantic Ferry* (1892); Cecil Torr, *Ancient Ships* (1894); also the *Transactions of the Institute of Naval Architects* and other technical societies; E. L. Attwood, *Text-Book of Theoretical Naval Architecture*; Sir J. H. Biles, *Design and Construction of Ships* (2 vols.); P. A. Hillhouse, *Ship Stability and Trim*; G. Nicol, *Ship Construction and Calculation*; W. J. Lovett, *Applied Naval Architecture*; J. E. Steel, *Naval Architecture*; J. J. Welch, *Text-Book of Naval Architecture*; W. Gray, *Naval Architecture*.

Shipka, a pass in the Balkans, 50 miles NE. of Philippopolis and 87 miles SW. of Rustchuk on the Danube, was stoutly held by the Russians, in an entrenched camp, against the desperate assaults of Suleyman Pasha (21st to 26th August and 9th to 17th September) in the war of 1877.

Ship-money, an impost levied by Charles I. in 1634-37, which led to fierce opposition on the part of Hampden and the parliament. In old English days royal navies were raised by the levy-

ing of ships; and under the early Norman kings the ports and the counties on the coast were called on from time to time to provide ships and men to strengthen a naval force paid for by the kings. In 1626 Charles's expedition to Cadiz was largely made up of merchant-ships pressed into the royal service; but it was in 1634, when the Dutch and French navies were well able to dispute England's sovereignty of the sea, that Charles set himself seriously to the work of greatly strengthening the English navy. By the advice of Noy, the attorney-general, he issued writs to the port towns to furnish ships, but agreeing to provide the ships if the towns would equip and man them. In 1635 he demanded the like from maritime and inland counties also; agreeing as before to find the ships if money for manning and equipment were provided by the counties. Thus a strong fleet was raised and manned with money which was not sanctioned by any parliamentary grant; and much grumbling was the result. In 1637 Charles consulted the judges, and ten out of twelve declared that the king had a right to do what was necessary for the defence of the kingdom in times of danger. It was agreed that no tax could be levied without parliamentary sanction; but Charles maintained that ship-money was not a tax, but money paid in lieu of the performance of the duty incumbent on all Englishmen of defending their country. John Hampden refused to pay the 20s. levied on his estate in Buckinghamshire, and his case was dealt with by the Exchequer Chamber (for the issue, see HAMPDEN). The Long Parliament in 1640 and 1641 pronounced the levying of ship-money illegal; and the bill to this effect received the king's assent, 7th August 1641.

Ship of Fools. See BRANDT; also BARCLAY (ALEXANDER).

Shipton, MOTHER, a famous prophetess of popular English tradition, whose story has at any rate the weight of a considerable antiquity. S. Baker published in 1797 her prophecies, together with those of the Cheshire prophet Nixon, and here we gather the following circumstantial details. Ursula Shipton was born near Knaresborough in Yorkshire, in July 1488, was duly baptised as Ursula Southiel by the Abbot of Beverley, at twenty-four married Tony Shipton, a builder, and departed this life with much serenity at over seventy years of age. However, a book (1684) by the notorious Richard Head is the real source of most of the fables about her. Here we are told how Agatha Shipton was carried off and married by the devil, how she bore him an ugly impish child, enjoyed power and knowledge beyond the measure of mortals, and left many prophecies behind her. Of these the earliest known record is a pamphlet of 1641, containing formal prophecies of the death of Lord Percy and of Wolsey—her prophecy that Wolsey should never reach York was long current, is given by Baker, and was claimed as fulfilled by the fact that Wolsey was arrested at Cawood, a few days before his formal installation as Archbishop of York. In W. Lilly's *Collection of Ancient and Moderne Prophecies* (1645) occurs 'Shipton's prophecy,' and from it we see that all her prophecies were considered as already fulfilled. Again, an extant comedy on the subject dates from about 1660. A prophecy in doggerel verse under her name was put into circulation about 1862 by Charles Hindley, on his own confession (*Notes and Queries*, April 26, 1873). These wretched lines concluded with a prophecy that the world should come to an end in 1881, which caused great anxiety amongst a few very ignorant persons in corners of England. See William H. Harrison's *Mother Shipton Investigated* (1881), in which all the facts available are

excellently set forth. He points out, moreover, the striking likeness between the traditional Mother Shipton represented on the chap-books and the conventional Punch.

Ship-worm. See TEREDO.

Shipwrecks. See WRECKS.

Shiraz, a city of Persia and capital of the province of Fars, much celebrated in Persian poetry for its climate, its wine and roses, and its beautiful gardens, is situated in a broad plain, 115 miles ENE. of Bushire and 35 miles SW. of the ancient Persepolis (q.v.). It is enclosed by ruined walls, and previous to the earthquakes contained many splendid mosques, bazaars, caravanserais, and other public buildings. The place has now a mean and ruined appearance, and is greatly neglected. The wine of Shiraz, which is very strong and resembles Tokay, is, however, still famous throughout the East. Rose-water is prepared in large quantities. Inlaid articles in wood and metal, glass, and woollens are made here. The city was founded in the 8th century, and from its beautiful situation and charming climate became a favourite resort of the Persian princes. In 1812 a destructive earthquake laid a large portion of it in ruins, and another in 1824, which cost the lives of 4000 of the inhabitants, completed the wreck of its prosperity. It was, however, rebuilt, and numbered 40,000 people, when a third and more terrible visitation, in April 1853, laid almost the whole town again in ruins, and caused the death of 10,000 people. It has since been partially rebuilt in a somewhat inferior style, and its pop. is now estimated at 50,000. The tombs of the poets Hafiz and Sâdi, both natives of the town, are in the neighbourhood.

Shire. See COUNTY.

Shiré, a river of East Africa, which, after a southerly course of 370 miles, joins the Zambezi. Until the hydrographic changes at the beginning of this century, the Shiré flowed out of Lake Nyasa, which now fails to discharge. Consequently, the upper channel of the river has become clogged with sand and vegetation, but it has been proposed to dredge it, making the Shiré navigable for lake steamers as far as Matope. It was discovered by Livingstone during the Zambezi expedition (1858-63). Navigation is obstructed by cataracts (Murchison Falls, &c.) for 35 miles, in which the Shiré falls 1200 feet, and elsewhere by increasing shallowness. The river passes through the heart of the Shiré Highlands, where live most of the European inhabitants of Nyasaland. It is proposed to extend the railway from Blantyre through this region to the south-western arm of Lake Nyasa. See NYASA.

Shirley, JAMES, dramatist, was born in London, 18th September 1596, and went at twelve to Merchant Taylors' School, whence he passed in 1612 to St John's College, Oxford. Wood tells us that Laud esteemed him highly, but deterred him from seeking holy orders because of the large mole on his left cheek. He migrated, however, to Catharine Hall, Cambridge, took his B.A. in 1617, was promised in 1618 and obtained in 1621 the mastership of St Albans grammar-school. In 1624 he was one of the proctors for St Albans in convocation, though Wood says he was already Roman Catholic. Finding his mastership 'uneasy to him,' says Wood, 'he retired to the metropolis, lived in Gray's Inn, and set up for a play-maker.' He worked hard in his vocation, being a diligent student of his great predecessors, and Shakespeare alone has bequeathed us a larger number of regular five-act plays—there are as many as thirty-three printed in the edition of Gifford and Dyce. In 1636 or 1637 he went to Ireland, probably under the protection of Lord Kildare, but soon returned to London,

where the suppression of stage-plays in 1642 ended his livelihood. For some time he attended on the Earl of Newcastle, then returned to London again to earn his bread by teaching. He contributed the address 'To the Reader' to the first folio of Beaumont and Fletcher (1647). The Restoration revived his plays, but brought him no better fortunes; and Wood tells us that he and his second wife died on the same day, distracted by the Great Fire, and were buried in the same grave, October 29, 1666.

For his plots Shirley drew upon his own inventiveness, and Dyce points out that not one, if we except that extraordinary failure, *St Patrick for Ireland*, is founded upon events of British history. Beaumont and Fletcher were his models, even more than Ben Jonson, his 'acknowledged master,' but it must be owned he has but little of the grand Elizabethan manner. Most of his plays are tragicomedies, and his best work is ever the tragic and pathetic portions. He is chaste by comparison with his contemporaries, and his plays breathe throughout a pensive and tender beauty that touches a sympathetic reader with a charm of its own. Bright and playful fancy, sweet and flowing dialogue, honest emotion and unwrought pathos—these are the threads out of which his magic robe is woven.

His chief plays were *Love Tricks*, a bright but ill-constructed comedy, though Pepys calls it a 'silly play' (1625); *The Maid's Revenge*, a poor tragedy (1626); *The Brothers*, a comedy (1626); *The Witty Fair One*, an excellent comedy (1628); *The Wedding*, a charming and indeed exquisite comedy (1628); *The Grateful Servant*, a fine tragi-comedy, prefaced by eleven copies of verses by various friends, including Massinger (1629); *The Traitor*, his finest and also his strongest tragedy (1631); *The Changes, or Love in a Maze*, a comedy (1632); *The Bird in a Cage*, a comedy (1632, printed next year with a sarcastic dedication to Prynne, then suffering his cruel punishment); *Hyde Park*, a bright comedy, branded by Pepys as 'a very moderate play' (1632); *The Young Admiral*, specially commended by the Master of the Revels as free from oaths (1633); *The Gamester*, an admirable comedy, revived by Garrick in 1758 (1633); *The Example*, an excellent comedy, Sir Solitary Plot a happy imitation of Ben Jonson's characters of *humour* (1634); *The Opportunity*, an amusing though improbable comedy (1634); *The Lady of Pleasure*, the most brilliant of his comedies (1635); *The Imposture*, a tragi-comedy (1640); and *The Cardinal*, to the author himself 'the best of his flock,' a tragedy coloured by Webster's *Duchess of Malfi* (1641). In 1646 he printed a volume of his poems, including his masque of *The Triumph of Beauty*. As a writer of masques he is second only to Ben Jonson. Among his best was *The Triumph of Peace*, presented by the Inns of Court before the king and queen in 1633. Another, *The Contention of Ajax and Ulysses* (1659), contains the noble and solemn lyric, 'The glories of our blood and state are shadows, not substantial things.' Almost as good is the ode, 'Victorious man of earth,' in *Cupid and Death* (1653), or that beginning 'Ye virgins that did late despair' in his dull play, *The Imposture*. The only complete edition is by Gifford and Dyce (6 vols. 1833). There is a selection, with *The Triumph of Peace*, by Gosse (1888). See biographical and critical studies by Schipper (1911), Forsythe (1915), and (for sources) Nason (N.Y. 1915).

Shirwa, a lake of south-east Africa, 45 miles SE. of Lake Nyasa; length, 40 miles; breadth, 15 to 20 miles; and 1970 feet above sea-level. On the west, between the lake and the river Shiré, Mount Zombarises to 7000 feet. It was proved by O'Neill in 1884 to have no connection with the river Lujenda, a right-hand tributary of the Rovuma.

Shishak (in hieroglyphs, *Shashank*, the *Susak* or *Susakim* of the Septuagint, the *Shishak* of the Hebrew version, the *Sesonchosis* or *Sesonchis* of Manetho), the name of several monarchs of the 22d or Bubastite Egyptian dynasty (see EGYPT).

Shishak I.'s name is found in the portico built by the Bubastite dynasty at the great temple of Karnak, and on several statues of the goddess Sekhmet, which probably came from Luxor. Jero-boam fled to Shishak from the pursuit of Solomon, who wished to kill him, and on Solomon's death quitted Egypt, and contended with Rehoboam for the possession of the crown. This struggle caused the division of the kingdom of David into two states, those of Israel and Judah. In the fifth year of Rehoboam Shishak marched to Jerusalem with an army of 12,000 chariots, 60,000 cavalry, and an innumerable number of infantry, composed of Troglodytes (?), Libyans, and Ethiopians. He took the city, the treasures of the temple, and all the gold bucklers which Solomon had made. His conquests are recorded on a wall of the temple of Karnak. The god Amon is represented presenting to him lines of prisoners, inscribed with various names of places, amongst which are the Field of Abram, Beth-shean, Megiddo, Aijalon, Mahanaim, and numerous other towns ostensibly taken by him.

Shittim-wood, the name in the Old Testament for a common and durable wood, believed to be that of some kind of acacia—probably *Acacia Seyal*.

Shoa, a country of Africa, lying to the south of Abyssinia proper, and watered by the Blue Nile and the Hawash, but usually accounted one of the three divisions of the Abyssinian state. Area, approximately 26,000 sq. m. In physical characteristics it closely resembles the rest of Abyssinia (q.v.). The highest point in the Guraghe Mountains reaches 12,790 feet. The people, who are partly Abyssinians and partly Gallas, number about $1\frac{1}{2}$ million. The present capital of Shoa and of Abyssinia is Addis Ababa (60,000); another important place is the former capital, Ankobar (q.v.). This country was conquered by King Theodore of Abyssinia shortly after his accession (1885). On the death of Theodore's successor (John II.) in 1889 the king of Shoa, Menelek, was made king of all Abyssinia; and Shoa naturally became more fully incorporated with the rest of Menelek's dominions.

Shock. It is well known that some forms of injury, as, for example, a blow on the pit of the stomach, may occasion death without leaving any visible trace of their operation in the body; and, indeed, life may occasionally be destroyed even by sudden and powerful mental emotions. In such cases as these death is said to result from *shock*, the actual cause of death being the sudden arrest of the heart's action, consequent on the violent disturbance given to the nervous system. The effects of shock may be manifested in all degrees from the transient feeling of faintness (see FAINTING) or sickness produced by a sudden emotion, or an unexpected and unpleasant sight, &c., to death. In cases of moderate severity the condition known as *collapse* is induced, in which the patient lies in a state of utter prostration, and apparently on the verge of dissolution. The face, and even the lips, are pale and bloodless; the skin is cold and clammy, and drops of sweat are often seen on the forehead. There is great languor and extreme muscular debility, and the sphincter muscles sometimes relax, so that there is involuntary discharge of the contents of the bowels and the bladder. The pulse is quick, and so feeble as often to be almost imperceptible, the blood-pressure in the arteries is extremely low, and the respiratory movements are short and weak, or panting and gasping. The patient is in some cases bewildered and incoherent, in others drowsy, and sometimes almost insensible. In less severe cases nausea and vomiting, with hiccup, are not unfrequent symptoms; and in the case of children convulsions are often present.

When a person recovers from a state of collapse he passes into a condition termed *reaction*, which often lasts for several hours. The first symptoms of this favourable change are improvements in the state of the pulse and the respiratory actions, recovery of the power of swallowing, an increased temperature, and an inclination to move from the supine position to one side. A slight degree of feverishness then often ensues, after which the skin becomes moist, the patient falls asleep, and awakes convalescent. As a general rule, the longer the symptoms of reaction are delayed the greater is the danger, and if several hours pass without any sign of the commencement of reaction there is little hope of recovery.

The principal causes of shock in its severer forms are sudden and severe or extensive injuries, whether due to accident or operation, particularly if they involve any of the viscera, joints, or other organs abundantly supplied with nerves. 'Pain alone, when intense and protracted, has proved fatal in this way; and it appears in a case related by Sir A. Cooper that sudden relief from great agony was attended by the same untoward result. Certain poisons operate in this manner, depressing the system so suddenly and severely as to produce a state of collapse; tobacco, for example; and drastic purgatives have in some cases induced a similar condition.'

The effects of shock are aggravated by loss of blood; and hæmorrhage alone, if sudden and profuse, will produce collapse. General debility and old age favour the influence of the shock, and much depends upon the idiosyncrasy of the patient; an injury which will produce no apparent effect on one man often producing a serious and persistent impression on another.

The following are the most important points in regard to treatment: The patient should be kept in a horizontal position, with the head on the same level as the body, and he should not be raised till decided symptoms of reaction appear. The best stimulants are brandy, given in the form of hot brandy and water, and pituitrin, which raises the blood pressure. At the same time heat should be applied to the pit of the stomach and the extremities, by means of hot flannel, hot-water tins, or, in their absence, bottles containing hot water, and other appliances. The administration of alkaline drinks in large quantity is also important. In severe cases of bleeding, transfusion of blood if available or the infusion into the veins of alkaline fluid or of gum solution is frequently carried out with benefit.

Shoddy (a provincial word, 'that which is shed') formerly meant only the waste arising from the manufacture of wool, but it has acquired a wider and much more important signification. Clippings of woollen and worsted stuffs and rags of any kind of fabric made of wool are now carefully utilised. Cuttings of new flannels, worsted cloths, and knitted textiles receive the name of *new shoddy*, and when articles made of these are worn out they are termed *old shoddy*. On the other hand tailors' clippings of milled cloths are called *new mungo*, while the material of old clothes and rags of this woollen cloth is styled *old mungo*. Both shoddy and mungo, which were formerly, to a large extent at least, waste materials, are now 'ground up' as it is termed—i.e. they are put into a machine with a revolving cylinder armed with iron spikes and having toothed rollers moving in an opposite direction. This *willy* or *devil*, as it is called, reduces the rags or clippings to short wool, which, when cleaned, oiled, and mixed with some fresh wool, is remanufactured into many different kinds of cheap fabrics, such as rugs, druggets, friezes, flannels, inferior milled cloths, &c. These, though service-

able while they last, are of course not so durable as when made of new wool. See RAGS, and WOOL.

Shoebill. See BALÆNICEPS.

Shoeburyness, on the coast of Essex, and at the mouth of the Thames, faces the Nore, 3 miles E. of Southend and 45 of London. Its dreary marshland, purchased by government in 1842-55, has since been the seat of a school of gunnery, with artillery barracks, batteries, targets, and other appliances for experimenting on cannon. Pop. of urban district, 6500. See GUNNERY.

Shoes. See BOOTS AND SHOES, HORSESHOEING.

Shola, or SOLA, the white pith of the leguminous plant *Eschynomene aspera*, a native of India. With this substance, which is exceedingly light, the natives of India make a great variety of useful articles, especially hats, which being very light and cool are in great request. Helmets made of shola are much used by the British in India.

Sholapur, a town of British India, presidency of Bombay, 150 miles by rail SE. of Poona, with important silk and cotton manufactures. An old fort and ruined walls (in part) still exist. Population (1921) 119,581.—The district has an area of 4556 sq. m. and a pop. (1921) of 742,010.

Shooter's Hill, an eminence (446 feet) in Kent, near Greenwich and Woolwich, which commands a splendid view of London.

Shooting. See GUN, GAME-LAWS, POACHING, GROUSE, DEER-FORESTS, BATTUE, PIGEON, &c.

Shop Acts, a series of acts (1892-1911) consolidated in 1912 and amended in 1913, requiring that on one day a week shop assistants be not employed after 1.30 P.M.; that persons under 18 be not employed more than 74 hours (including meal times) in any week; that shops (with certain exceptions) be closed once a week not later than 1 P.M.; that seats be provided for female assistants; besides providing for meal-hours and for the fixing of closing hours by local authorities. The Shops (Early Closing) Act 1920, amended 1921, requires that (with certain exceptions) shops be closed not later than 9 on Saturdays, and 8 on other nights.

Shore. See SEASHORE.

Shore, JANE, the famous mistress of Edward IV., was born in London, and was well brought up, and married at an early age to William Shore, an honest citizen, traditionally a goldsmith. After her intrigue with the king began her husband abandoned her, but she lived till Edward's death in the greatest luxury, enjoying great power through his favour, yet 'never abusing it,' as More tells us, 'to any man's hurt, but to many a man's comfort and relief.' Her beauty was more that of expression than of feature, and her cheeks somewhat pale, yet her face was fair beyond others, and 'there was nothing in her body that you would have changed, but if you had wished her somewhat higher.' But her greatest charm was her bright and playful wit. After the king's death she lived under the protection of Hastings, and on his death, it is said, of the Marquis of Dorset; but King Richard III., out of a pretended zeal for virtue and to make his brother's life odious, plundered her house of more than two thousand merks, and caused the Bishop of London to make her walk in open penance, taper in hand, dressed only in her kirtle. More tells us that Richard had first tried to charge her with bewitching him, literally rather than in the sense in which she had done his brother, and the reader will remember the use that Shakespeare has made of this in his tragedy of *Richard III.* Jane Shore survived her penance more than forty years, dying in the 18th year of Henry VIII. The additional horrors that she died in a ditch since

called Shoreditch, and that a man was hanged for succouring her contrary to Richard's command, are completely unhistorical, however positive their ballad authority.

Percy printed from the Pepys collection 'The woeful lamentation of Jane Shore,' in wretched doggerel, ascribed to Thomas Deloney. Thomas Churchyard also wrote a poor ballad on the story, inserted in the *Mirror for Magistrates*, and Drayton has in his *England's Heroical Epistles* one from her to her royal lover. Deloney's ballad is printed also in the *Collection of Old Ballads* (1723), with a miserable burlesque song on the same subject. See Mark Noble, in Brayley's *Graphic Illustrator* (1834); and Sir Thomas More's *History of Richard III.* Rowe's drama dates from 1714.

Shorea, a genus of Dipterocarpaceæ (q.v.), about a hundred species of trees ranging from India to the Philippines. From this genus come the woods known as Mercanti and Säl (q.v.), Borneo tallow, and some kinds of Dammar (q.v.).

Shoreditch, a metropolitan and parliamentary borough of London, with two members till 1918, thereafter one; pop. (1921) 104,308. See TOWER HAMLETS, LONDON.

Shoreham, NEW, a seaport of Sussex, at the mouth of the Adur, 6 miles W. of Brighton. It arose when the harbour of Old Shoreham, now a mile inland, became silted up; it has a tidal harbour, whose piers were erected in 1819. Charles II. embarked here after Worcester for Normandy. The suspension bridge and the Norman and Early English parish church may be noticed. The parliamentary borough of New Shoreham, including from 1770 the Rape of Bramber (177 sq. m. and 42,442 inhabitants in 1881), and returning two members, was merged in the county in 1885. Old Shoreham also has a Norman church. Pop. of Shoreham-by-Sea urban district (1921) 7270.

Shorncliffe, in Kent, 2½ miles W. of Folkestone, the seat of a military camp during the Peninsular war, and since the Crimean war of a permanent one for 5000 men.

Shorthand. The problem which inventors of systems of shorthand have attempted to solve is thus formulated by Peter Bales (c. 1547-1610), a writing-master and stenographer—'to write as fast as a man speaketh treatably.' 'This,' he says, 'may in appearance seem difficult; but it is in effect very easy, containing a many commodities under a few principles, the shortness whereof is attained by memory, and swiftness by practice, and sweetness by industry.' Although three hundred years have elapsed since this assertion was made, it has not yet been realised to the extent anticipated.

The so-called shorthand of the Romans, practised by Tiro, first the slave and afterwards the freed-man of Cicero, was really an abbreviated longhand. The Roman letters were shorn of their just proportions, initial letters often served for whole words, and terminations, in which Latin abounds, were either abbreviated or omitted. By systematising these mutilations Tiro constructed a system of swift writing, which served him as Cicero's amanuensis in good stead, and doubtless we owe to it much of what remains to us of the writings of Cicero. Tiro's system, or a modification of it, survived far into the Middle Ages.

The history of shorthand properly so called, with an alphabet of simple signs as substitutes for the ordinary letters, dates from the reign of Elizabeth. Dr Timothy Bright (c. 1551-1615), a learned man, the author of several medical works and the compiler of an abridgement of Foxe's *Book of Acts and Monuments of the Church*, in the year 1588 published *Characterie; an Arte of Shorte, Swift, and Secrete Writing by Character*. In this ingenious work Bright claims the invention of the art of shorthand.

His claim may justly be disputed, for his system is not shorthand in the present sense of the word. It is not based on a shorthand alphabet, but is a

system of arbitrary marks for words: thus
abound, \ about, | accept, | accuse, | advance, &c.

Two years after the appearance of this work Peter Bales published *The Writing Schoolmaster*. This system also was composed of arbitrary characters. In the year 1602, a little above threescore years before Wilkins published his celebrated *Essay towards a Real Character and a Philosophical Language* (1668), appeared *The Art of Stenography, or Short Writing, by Spelling Character, invented by John Willis, Bachelor in Divinity*. The author intimates in the title of the work the grand distinction between it and the previous attempts that had been made in the art by describing it as 'spelling character,' the others having been verbal character. John Willis's alphabet is:

a b c d e f g h i j k l m n o
^ n | r | < L | o < > r > u \ (

p q r s t u v w x y z
/ o - | (r v) > x z

The inadequacy of this alphabet is proved by the fact that not one of its letters was used in the same sense by the inventors of systems in the following century, when shorthand began to be popular. Sixteen years after the publication of John Willis' system Edmund Willis published *An Abbreviation of Writing by Character* (1618). This system exhibits a considerable improvement in its alphabet, and 15 of its letters were adopted by subsequent shorthand authors.

The next name on the roll of shorthand authors deserving of mention here is that of Rich, 1654-69. His system was used by Dr Doddridge, who reprinted it for the benefit of his theological students, and strongly recommended its adoption by young persons. Mason followed in 1672-1707. The alphabet had now become much simplified. Mason's system was adopted by Thomas Gurney in 1750, and has since been known as Gurney's shorthand.

The principal shorthand authors of the 18th century who followed conventional spelling more or less, were Macaulay, 1747; Angell, 1758; Byrom, 1767; Taylor, 1786; and Mavor, 1789; and in the early part of the 19th century, Clive, 1810; Lewis, 1815; Moat, 1833; Fancutt, 1840; Bradley, 1843. In the 18th century three systems were published, by Tiffin, 1750; Lyle, 1762; and Holdsworth and Aldridge, 1768; and in the 19th century five systems, by Row, 1802; Towndrow, 1831; Pitman, 1837; De Staines, 1839; and Bell, 1857, all based on the phonetic principle. Of the orthographic systems Taylor's gained most popularity. The following is Taylor's alphabet, with the vowels of Harding's adaptation. Taylor represented all vowels alike by a dot in any position.

b c d f g h j k l m n
/ - - / \) /) - / - -

p q r s t v w x y z
| - / - | - / - / - / -

ch sh th
(- |

a - o
e - u
i -

The legibility of Pitman's shorthand has led to very general use. A vigorous propaganda and instruction books at low prices have almost blinded the public to the existence of other systems.

The alphabet of Pitman's phonography is:

CONSONANTS.

p b t d ch j k g
f v th th s z sh zh
(thin) (then)

(up) l r m n ng w y h

VOWELS.

Long. ' ah, ' eh, . ee, - aw, - oh, - oo
palm pate peat pall bone pool

Short. ' ä, ' ë, . i, - ö, - ü, - öö
pat pet pit poll bun pull

DIPHTHONG AND TRIPHTHONG.

v | ei, ^ | eu, ^ | ou, ' | ai, ' | oi, ' | wi
pine new now ay (yes) boy wide

By adding a hook or small circle to the consonants, by halving, and by lengthening, double and treble letters are produced on the following plan:

p pl pr sp spr pf pn ps pns pt

Important among later systems are those of Everett, Pocknell, Sloan, Callender, A. H. Browne, James, Guest, and Gregg.

An average speaker may pronounce 120 words a minute; a rapid speaker 180, 200, or more. It is impracticable, therefore, for a shorthand reporter to write down every sound uttered. As a rule, a word may be recognised by its consonants alone. Many systems, therefore, adopt the device of omitting vowels except to avoid ambiguity; and in order that the vocalised and unvocalised forms of the same word should not be too unlike, the consonants are contrived to form a framework or 'outline,' to which vowel dots and dashes can be added at pleasure, very much as in the pointing of Semitic writing. Examples are shown above in Harding's and Pitman's vowel-systems; in both cases the position in relation to a consonant determines the value of the vowel-sign. Instead of this, or in supplement to it, other devices are used—as writing the word above, on, or through, the line, according to the class to which its principal vowel belongs; or, as in Pocknell's system (1881), modifying the form of the consonant to indicate a preceding or following vowel. Many systems attempt, but not very consistently, to indicate similarity of sound by similarity of shape. Thus, most of the dental consonants in Pitman's have vertical signs. Voiced and voiceless pairs of consonants may have the same form, written thick and thin (Pitman), long and short (Pocknell), and so on. There has been a tendency in later shorthands to depart from geometrical forms in favour of something more resembling ordinary script. To this class belong Gregg's (1888), Callender's (1889), Sweet's (1892). By including vowels in the word-outline, as is common in script systems, it becomes necessary to omit the end of the word; but, indeed, for reporting purposes, shorthand systems in general find much conventional contraction necessary.

The best-known French systems are those of Prévost and Duployé. Germany has lately adopted for official use the 'Deutsche Einheits Kurzschrift,' based on Gabelsberger and Stolze.

See Isaac Pitman's *History of Shorthand* (new ed. 1918), which describes the ancient systems and 250 English systems; Thomas Anderson's *History of Shorthand* (1882), including the Continental and leading English systems, and his *Shorthand Systems* (1884); and works by Dr Westby-Gibson (1882), J. E. Rockwell, J. W. Zeibig (Dresden, 1878), and H. Moser (Leip. 1889 *et seq.*).

Shorthouse, JOSEPH HENRY, was born at Birmingham in 1834, was educated at private schools, and settled as a manufacturer in his native city. In 1881 the extraordinary popularity of his romance, *John Inglesant* (previously printed for private circulation), carried his name over England. The book was written in fine, delicate English, and revealed a subtle and sympathetic insight into old-world phases of the spiritual mind, but was invertebrate in structure, its second half at any rate anything rather than a novel. It showed, or rather concealed, a consummate skill in adapting and incorporating sentences, sometimes whole pages, from 17th-century books. It was followed by *The Little Schoolmaster Mark: a Spiritual Romance* (1883-84); *Sir Percival: a Story of the Past and the Present* (1886); *A Teacher of the Violin* (1888); *The Countess Eve* (1888); and *Blanche, Lady Falaise* (1891); but none of these stories awoke the same interest as the *magnum opus*. Shorthouse, who (while continuing to manufacture sulphuric acid) wrote also an exquisite introduction to George Herbert's *Temple*, an essay on *The Platonism of Wordsworth*, and a preface to a translation from Molinos, died 4th March 1903. See his *Life, Letters, and Literary Remains* by his wife (1905).

Short-sightedness. See EYE.

Shoshone Falls (pron. *Shoshonee'*), on the Snake (q.v.) River, in southern Idaho, about 950 feet wide, and with a clear leap of 210 feet (that of Niagara is under 170 feet). The river runs in a deep gorge between walls of volcanic rock, 1000 feet high at the foot of the falls, and the head of the falls is in the form of a semicircle. Four miles higher up are the Little Shoshone Falls, two nearly equal cataracts divided by a great rock, and falling 182 feet.

Shoshones, a family of American Indians, also known as Snakes, living, since 1805 at least, to the west of the Rocky Mountains; they are now on three reservations, two in Idaho, one in Wyoming—and scattered through Nevada, Utah, and north-western Idaho. Though most are inoffensive, some of the bands are fierce and warlike, and hostilities ceased only in 1867, after an expedition had destroyed a great part of their braves and stores.

Shoshong, once capital of Khama, chief of the Bamangwato in the Bechuanaland Protectorate, near the telegraph and the railway to Mashonaland, was in 1892 superseded by Palapwe or Palapye, 60 miles to the NE. Shoshong, now deserted by most of its population, was long the largest native town in South Africa, and a great trade centre for ostrich-feathers, ivory, and skins.

Shot is the term applied to all solid projectiles, and more generally to any projectile without a bursting-charge. Although shell-fire from mortars had been used at least as early as 1543, and shell-fire from guns had been tried at various times—notably at the siege of Gibraltar in 1779—the use of shell in guns was not general until, at earliest, the second decade of the 19th century, owing to the lack of a reliable fuse. Consequently the greater

part of artillery warfare on land, and the whole of that at sea (with the rare exceptions when 'bomb' vessels carrying mortars were used in the sieges of sea fortresses), was carried on, up to the date named, with shot of varying kinds—by plain round-shot and case-shot on land; and by plain round-shot (which were often fired red hot), bar-shot, chain-shot, grape-shot, case-shot, and bags of nails or scraps of old iron, at sea. Bar-shot (two round-shot joined by a bar) and chain-shot (two round-shot joined by a chain) were specially used for attack on masts, spars, and rigging. A grape-shot consisted of a number of small round-shot grouped in layers round a spindle and separated by plates, in order to make a convenient package for loading. It broke up on firing, giving a small shower of balls. Of all these shot, only case-shot is still used. It consists of an iron cylinder full of bullets. The cylinder breaks up on firing and lets the bullets loose. It is used for repelling attack at close quarters. Solid elongated armour-piercing shot has been used for rifled guns, but has been generally abandoned, and the only elongated shot of this kind now used is made of cast-iron, and used for practice. Small shot for sporting purposes is made of lead hardened with antimony or arsenic. The lead is melted and poured through colanders, with holes of varying size, from a great height into water.

Shotts, or SHATS. See ALGERIA; SAHARA.

Shoulder-joint, an enarthrodial or ball-and-socket joint. The bones entering into its formation are the humerus or arm-bone (see ARM) and the scapula or shoulder-blade. The former has already been described: the latter is a flat triangular bone which is indirectly attached to the trunk by articulation with the clavicle. When the arm hangs by the side the scapula covers the ribs posteriorly from the second to the seventh or eighth inclusive. It presents a posterior surface or *dorsum*, an anterior surface or *venter*, three borders, three angles, and certain outstanding processes.

The figure represents a posterior view of the scapula. It is divided into two unequal parts, the supra-spinous fossa (1) and the infra-spinous fossa (2), by the spine (10), a crest of bone commencing at a smooth triangular surface (11) on the internal border, and running across to-

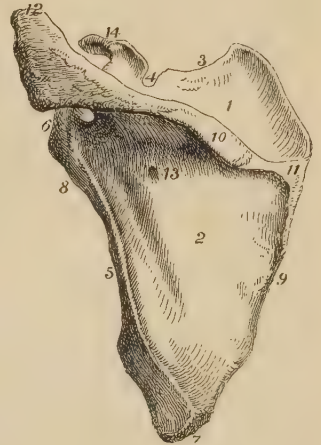


Fig. 1.—Posterior View of the Left Scapula:

The parts designated by the figures 1, 2, 4, 6, 8, 10, 11, 12 are sufficiently described in the text; 3 is the superior border; 5, the external or axillary border; 7, the inferior angle; 9, the internal or vertebral border; 13, one of the nutrient foramina; 14, the coracoid process.

wards the upper part of the neck of the scapula (8), after which it alters its direction, and projects forwards so as to form a lofty arch, known as the acromion process (12), which overhangs the glenoid cavity (6), or receptacle for the head of the humerus. The acromion obviously serves to protect the shoulder-joint, as well as to give great leverage to the deltoid muscle which raises the arm. From

the upper part of the neck (8) there proceeds a curved projection termed the coracoid process; it is about 2 inches long, and gives attachments to several muscles. The upper border of the scapula presents a notch (4), which in the recent state is bridged over by a ligament, and gives passage to the supra-scapular nerve.

The large globular head of the humerus is received into the shallow glenoid cavity of the scapula, an arrangement by which extreme freedom of movement is obtained, while the apparent insecurity of the joint is guarded against by the strong ligaments and tendons which surround it, and above by the arched vault formed by the under surface of the acromion process. As in movable joints generally, the articular surfaces are covered with cartilage, and there is a synovial membrane which lines the interior of the joint. The most important connecting medium between the two bones is the capsular ligament.

The shoulder-joint exhibits the following varieties of motion: (1) flexion, to a great extent; (2) extension, in a much more limited degree; (3) adduction, in an oblique direction, forwards and inwards; (4) abduction very freely; (5) circumduction; and (6) rotation slightly.

The morbid affections of the shoulder-joint may be divided into those arising from disease and those dependent on an accident. The most common diseases are acute and chronic inflammation of the joint, which often terminate in its ankylosis or immobility. The principal accidents are fractures and dislocations. There may be fracture (1) of the acromion process, or (2) of the coracoid process, or (3) of the neck of the scapula, or (4) of the superior extremity of the humerus; or two or more of these accidents may be associated. Again, the head of the humerus may be dislocated from the glenoid cavity as the result of accident in three different directions—viz. (1) downwards and inwards into the axilla, which is by far the most common form; (2) forwards and inwards; and (3) backwards on the infra-spinous fossa, or the dorsum of the scapula. The first of these varieties is of very common occurrence, and everybody should know how to recognise, and even (in an emergency) to treat it. The bones are in the position shown in the figure; the arm is lengthened; a hollow may be felt under the acromion, where the head of the bone ought to be; the shoulder is flattened; the elbow sticks out from the side, and cannot be made to touch the ribs; and the head of the bone can be felt if the limb be raised, although such an attempt causes great pain and weakness. The methods of treating such a case are discussed at DISLOCATION. The scapula may also be fractured in any of its parts as the result of direct violence, and its inferior angle may slip from its natural position.

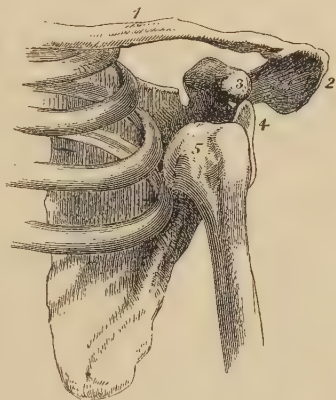


Fig. 2.—Dislocation of the Shoulder-joint downwards:

- 1, the clavicle; 2, the acromion process; 3, the coracoid process; 4, the glenoid cavity; 5, the head of the humerus lying in the axilla.

Shovel, SIR CLOUDESLEY, a brave but ill-fated admiral, was born of poor parents, about 1650, most probably at Cley, a Norfolk fishing-village. Here he was apprenticed to a shoemaker, but he ran away to sea, and soon rose by his remarkable ability and courage through the grades of cabin-boy and seaman to the quarter-deck. He served as lieutenant under Sir John Narborough in the Mediterranean (1674), burned four pirate ships under the walls of Tripoli, commanded a ship at the battle in Bantry Bay (1689), and was soon after knighted for his conduct. In 1690 he rose to be rear-admiral of the blue, and took an active part in the battle off Beachy Head; two years later, as rear-admiral of the red, he supported Admiral Russell heroically at La Hogue, and himself burned twenty of the enemy's ships. He was sent to Vigo in 1702 to bring home the spoils of Rooke, next served under that hero in the Mediterranean, and led his van at Malaga. In January 1705 he was made rear-admiral of England. That year he took part with Peterborough in the capture of Barcelona, but failed in his attack on Toulon in 1707. On the voyage home his ship, the *Association*, struck a rock off the Scilly Isles, on the foggy night of the 22d October 1707, and went down with 800 men on board. Three other vessels of his squadron perished with a loss of over 2000. Sir Cloudesley Shovel's body was washed up next day, and buried in Westminster Abbey.

Shoveler (*Rhynchaspis* or *Spatula*), a genus of birds of the duck family, Anatidæ, having the hind-toe small, free, and unlobed; and remarkable for the expansion of the end of the mandibles in adult birds, particularly of the upper mandible.



The Common Shoveler (*Rhynchaspis clypeata*), male and female.

The lamellæ of the mandibles are long and very delicate. The legs are placed near the centre of the body, so that these birds walk much more easily than many of the ducks. The Common Shoveler (*R. clypeata*) is smaller than the wild duck, but rather larger than the widgeon. The shoveler is a visitant to the British Isles, especially during cold weather. A few remain all the year. It is widely distributed over North Africa, Europe, Asia, and North America. It is reported as having been found in Australia. Its nest is made of fine grass, with a lining of down, on dry ground on the borders of rushy lakes. The eggs, from eight to fourteen in number, are of a pale greenish buff colour. Its food consists of grasses, worms, slugs, snails, insects, and small crustaceans. Its flesh is well flavoured and very highly esteemed. The bird is often called Broad-bill.

Showers of Fishes occasionally fall in different parts of the world, exciting great aston-

ishment. Instances of this kind have occurred in Britain. On one occasion a shower of small three-spined sticklebacks fell near Merthyr-Tydvil in Wales, sprinkling the ground and housetops over a large area. If caught up by a whirlwind from any of the brackish ponds near the sea, in which this species of fish abounds, they must have been conveyed through the air a distance of almost thirty miles. Another similar instance occurred at Torrens, in the Isle of Mull, in which herrings were found strewn on a hill five hundred yards from the sea, and one hundred feet above it. Such downfalls are more common in tropical countries. In India a shower of fishes varying from a pound and a half to three pounds in weight has been reported. Sometimes the fishes are living, more frequently they are dead, and sometimes dry or putrefying. They are always of kinds abundant in the sea or fresh waters of the neighbourhood. The occurrence of the phenomenon is readily explained by the partial vacuum and strong up-draught produced in the centre of a whirling column of air like that of a Tornado (q.v.). Such a whirling column in passing over the surface of a lake or river or of the sea may suck up a considerable quantity of water along with any living creatures that may be in it. This may be carried for a considerable distance, and is discharged as a waterspout or cloudburst when the rotational energy of the whirl is expended. Showers of frogs (when authenticated) are a similar phenomenon. Showers of dead flies have also been reported. The analogous showers of 'sulphur' or of 'blood' are produced by wind-borne pollen from pine-trees, or minute organisms of fungoid nature and bright red colour. In the latter cases the organic particles probably play the part of dust in causing the rain-drops to form. See BLOOD-RAIN.

Shrapnel, LIEUTENANT-GENERAL HENRY (1761-1842), invented the Shell (q.v.) named after him.

Shreveport, a city of Louisiana, on the west bank of Red River (here spanned by an iron bridge of 1200 feet), and 328 miles by rail NW. of New Orleans, with which it has also regular steamboat connection. It contains oil refineries, iron-works, machine-shops, and has a large export trade in cotton. The cattle trade is also important, and there is some lumbering. Pop. 44,000.

Shrew (*Soricidae*), a family of insectivorous mammals closely resembling, in general form and appearance, the true mice and dormice, but in reality widely differing from and not to be confused with those rodents. The shrews have the head small, muzzle long and pointed, eyes small but well developed, external ears usually small; body mouse-like, covered with hair; limbs short, nearly equal in size, the feet not adapted for digging; tail nearly naked and scaly. The teeth vary in number from twenty-eight to thirty-two; the formula $i. \frac{1}{2} c. \frac{1}{2} p. \frac{1}{2} m. \frac{3}{2}$ shows the numbers of teeth so far as they are constant, *v* meaning that the incisors and premolars in the upper jaw vary in different species. Along the sides of the body, or at the root of the tail, are peculiar glands, which secrete a fluid of a very strong odour. The shrews are very widely distributed, being found over North America and the whole of the eastern hemisphere except Australia. The Oriental region has twenty-eight species, the Nearctic twenty-four, the Ethiopian eleven, and the Palearctic ten. The classification of the shrews is a matter of extreme difficulty. The family is said to consist of one genus, eleven sub-genera, and about sixty-five species.

The Common Shrew (*Sorex vulgaris*), found in the British Isles and over the whole continent of Europe, has a body about $2\frac{1}{2}$ inches long, the fur being generally reddish gray above and grayish below, and a tail about $1\frac{1}{2}$ inch long, four-sided with the angles rounded off, and not tapering. It abounds in dry fields, gardens, and hedge-banks, feeding chiefly on insects, worms, and slugs. It burrows and makes long runs just under the surface of the ground. It is very pugnacious, and two shrews rarely meet without one of them being killed and eaten. Its natural enemies are weasels and owls. It is saved from some by an unpalatable secretion from a row of glands along each side of the body. Great numbers of shrews are often



The Common Shrew (*Sorex vulgaris*).

found dead in autumn, and it is believed by some naturalists that the normal length of life is little over a year. The shrew breeds in spring; the female brings forth five to seven young in a nest of soft dry herbage in a hole in the ground. Though harmless and inoffensive, the shrew has long been regarded with dread and aversion (see White's *Natural History of Selborne*, Letter xxviii.). The Lesser Shrew (*S. pygmaeus*), another British species, closely allied to the common shrew, but with a proportionately longer tail and white on the under parts of the body, is the smallest British mammal. The Water Shrew (*Crossopus fodiens*), larger than the common shrew, is not known to occur in Ireland, but is found in Great Britain and over the whole continent of Europe as far north as the shores of the Baltic. Though not absolutely confined to the water-side, it prefers to live there, where it forms its dwelling as a burrow in a soft bank. It feeds chiefly on aquatic insects, molluscs, and crustaceans. The Garden Shrew (*Crocidura aranea*) is common over almost the whole of Europe, but does not occur in Sweden or in the British Isles. The Tuscan Shrew (*C. etrusca*), found in the south of Europe, from France to the Black Sea, and also in the north of Africa, has a body only about an inch and a half long and a tail about an inch, and is the smallest living mammal. The Rat-tailed Shrew (*C. myosura*), known in India as the Musk-shrew or Musk-rat, is about 6 inches long, and has a strong musky odour. The Musk-rat of Ceylon (*Sorex kandianus* or *serpentarius*), a smaller form, is found in Southern India and Ceylon. Two very interesting species have been brought from Tibet—the Tibetan Water Shrew, with sucking discs on the under surfaces of its feet; and the Tailless Shrew (*Anurosorex squamipes*), with a body like a mole, ears entirely concealed, eyes almost imperceptible, and feet short and scaly.

Shrew Mole (*Scalops*), a genus of insectivorous mammals of the family Talpidæ, very closely allied to the Moles (see MOLE). The tail is short and naked; the muzzle is long and slender, the nostrils looking forwards and upwards on the oblique slope at the end of the snout; the eyes are very small and are hidden in the fur. The teeth are peculiar in form; their number is represented

by the formula i. $\frac{3}{2}$, c. $\frac{1}{2}$, p. $\frac{3}{2}$, m. $\frac{3}{2}$. The feet resemble those of the common mole, but the toes of the hind-feet are webbed. All the species are American. The Common Shrew Mole, or simply Mole (*S. aquaticus*), is found everywhere in the United States east of the Mississippi. The Prairie Mole or Silvery Shrew Mole (*S. argentatus*), about 7 inches long, is found on the western prairies as far eastwards as Ohio and Michigan. The Texan Shrew Mole (*S. latimanus*), larger in size and possessing broader fore-feet than any other species, is found in Texas and Mexico. Two other shrew moles have been placed in a separate genus: one, Brewer's Shrew Mole (*Scapanus breweri*), closely resembling the common mole externally, but agreeing in its dentition and habits with the star-nosed mole, inhabits the eastern United States; the other, the Oregon Shrew Mole (*Scapanus townsendii*), is found plentifully on the banks of rivers on the Pacific coast.

Shrewsbury, the county town of Shropshire, on the Severn, 36 miles SSW. of Crewe, 42 W. by N. of Birmingham, and 163 NW. of London. The river here makes a serpentine curve and is spanned by the English Bridge (rebuilt 1774), the Welsh Bridge (rebuilt 1795), the iron bow and girder Kingsland Bridge (1882), which lead to the suburbs of Abbey-Foregate, Coleham, Frankwell, Castle-Foregate, and Kingsland; and the Greyfriars iron foot-bridge (1879). With its steep, narrow streets, and its wealth of black and white half-timbered houses, Shrewsbury is picturesque as very few English towns. Of its castle, built by Roger de Montgomery, little Norman work remains. The present castle, built by Edward I., was in 1926 bought from Lord Barnard by the Shropshire Horticultural Society, given to the town, and restored as a council chamber. Holy Cross or Abbey Church belonged to a Benedictine abbey (1083). Of the other Anglican churches the chief is St Mary's, Norman to Perpendicular in style, with some fine stained glass and an octagonal spire (200 feet high). Noteworthy also are the Roman Catholic church (1856), by Pugin; the council-house (1501-60), where Charles I. stayed in 1642, and James II. in 1687; the old market-house (1595); the 'Raven' Hotel, where Farquhar in 1705 wrote the *Recruiting Officer*; the 'Quarry,' a pretty park of 25 acres, with its lime-tree avenue (1719); a Doric column (1816) to Lord Hill, 134 feet high; and a bronze statue (1860) by Marochetti of Clive. The county museum and a free library now occupy the old buildings (1630) of the grammar-school, which was transferred to a fine new site in 1882. Founded by Edward VI. in 1551, though not actually opened till 1562, and augmented by Queen Elizabeth in 1571, this school was recognised as one of the seven great public schools in the Public Schools Act of 1868, and owes its greatness largely to the exertions of two successive headmasters, Dr Samuel Butler (1798-1836), afterwards Bishop of Lichfield, and Dr Kennedy (1836-66). Among its alumni have been Sir Philip Sidney, Fulke Greville, Wycherley, Judge Jeffreys, Charles Darwin, Samuel Butler (of *Erewhon*, a grandson of the headmaster), Stanley Weyman, and such famous scholars as F. A. Paley, H. A. J. Munro, and R. Shilleto; a statue of Darwin, in front of it, was unveiled 1897. In 1926 the proposal was rejected to form a new bishopric out of parts of the existing bishoprics of Lichfield and Hereford. Glass-painting, malting, iron-founding, and the making of farm implements are industries; and 'Shrewsbury cakes' have long been held in esteem. Chartered by Richard I., the borough returned two members from Edward I.'s reign till 1885, one till 1918, when it was merged in the county. Pop. (1851) 19,681; (1891)

26,967; (1921) 31,013. The Cymric *Pengwern* ('alder hill'), after its capture in 778 from the king of Powys by Offa of Mercia, changed its name to *Scrobbesbyrig* ('town in the wood'), from which the modern name is derived. Thenceforward it has figured often in history, having been repeatedly besieged—e.g. by Llewellyn (1215), and the parliamentarians (1644). In the battle of Shrewsbury, fought at Battlefield, 3 miles NE., on 21st July 1403, Henry IV. (q.v.) routed Hotspur and his confederates. For the earls of Shrewsbury, see TALBOT, and SHEFFIELD.

See works by T. Phillips (1779), Owen and Blakeway, Pidgeon, W. Phillips, Fisher (1899), and the 'Victoria History' of Shropshire (1908).

Shrike (*Lanius*), a genus of passerine birds having the bill short and compressed, the upper mandible curved and with a prominent tooth, the base of the bill covered with hairs directed forwards, wings of moderate length, and very powerful feet. They are found in all parts of the world except in South America. They are called Butcher-birds from the habit, common to many species, of impaling their prey upon thorns. The food consists chiefly of insects, but often also of mice, frogs, lizards, and small birds. The Great Gray Shrike



Great Gray Shrike (*Lanius excubitor*).

(*L. excubitor*) visits the British Islands in autumn and winter, but has not been known to breed. It is one of the largest species, its length being 9 to 10 inches. The back is of a light gray colour, wing and tail feathers black tipped with white, bill and legs brownish black. The Lesser Gray Shrike (*L. minor*) has also been seen in England; but the commonest British species is the Red-backed Shrike (*L. collurio*), which breeds in wooded districts in England and Wales, and occasionally in the south-east of Scotland. The nest is made of twigs and roots, neatly lined with wool and hair. Only one brood is reared, and the birds usually migrate in August. The males of this, and of some other species, have considerable power of song. In Australia the shrikes are represented by the nearly allied Thickheads (*Pachycephala*), which abound in the forests throughout that continent and Oceania.

Shrimp (*Crangon*), a genus of crustaceans, of the order Decapoda, allied to lobsters, crayfish, and prawns. The form is elongated, tapering, and arched as if hunchbacked. The beak is very short, affording a ready distinction from prawns. The forceps are comparatively small. The whole structure is very delicate, almost translucent; and the colours are such that the shrimp may readily escape observation, whether resting on a sandy bottom or swimming through the water. For the change in colour on boiling, see PIGMENTS OF ANIMALS.

The quick darting movements, like short leaps betray them to any one who looks attentively into a pool left by the retiring tide on a sandy shore. When alarmed they bury themselves in the sand by a peculiar movement of their fanlike tail. The Common Shrimp (*C. vulgaris*) is very abundant



Common Shrimp (*Crangon vulgaris*).

on British and other European coasts wherever the shore is sandy. It is about 2 inches long, of a greenish-gray colour, dotted with brown. It is in great esteem as an article of food, and is generally taken by a net in the form of a wide-mouthed bag, stretched by means of a short cross-beam at the end of a pole, and pushed along by the shrimper wading to the knees. Sometimes a net of larger size is dragged along by two boats. The Skeleton-shrimp or Spectre-shrimp is a small crustacean of the family Caprellidae (e.g. *Caprella linearis*). The Brine-shrimp (q.v.) is the subject of a separate article. The so-called Fresh-water Shrimp is treated at GAMMARUS.

Shrine, a case or reliquary for containing the Relics (q.v.) of saints and martyrs.

Shropshire, or **SALOP**, a West Midland county of England, on the Welsh border, bounded by the counties of Cheshire, Stafford, Worcester, Hereford, Radnor, Montgomery, and Denbigh. It measures 50 miles by 41, and has an area of 861,800 acres or 1347 sq. m. The Severn, entering from Montgomeryshire, winds 55 miles across the interior, dividing Shropshire into two pretty equal portions, and being joined here by the Tern, whilst a lower tributary, the Teme, traces much of the southern boundary. Ellesmere (116 acres) is the largest of several lakes. The northern and eastern portion, to the left of the Severn, is level with the exception of the isolated Wrekin (1320 feet), and is occupied by the New Red Sandstone. The south-western portion, belonging to the Old Red and earlier formation, is rugged and mountainous, and in the Clee Hills attains 1805 feet. Coalbrookdale till exhausted was its chief coalfield. The mineral wealth also includes iron, lead, zinc, limestone, and freestone. The soil is variable, but generally fertile and well cultivated. Much attention is paid to live-stock. The county is divided into 14 hundreds. It contains the municipal boroughs of Shrewsbury (the county town), Bishop's Castle, Bridgnorth, Ludlow, Oswestry, and Wenlock. It returns four members for the Oswestry, Shrewsbury, Wrekin, and Ludlow divisions. Clive was a native; and historic scenes or antiquities, other than those noticed in the articles on the different towns, are Acton-Burnell, Boscobel, Wroxeter, Watling Street, and Offa's Dyke. Pop. (1801) 169,248; (1841) 225,820; (1871) 248,111; (1891) 236,339; (1901) 239,321; (1921) 242,959.

See works by Hulbert (1837), Lloyd (1844), Eyton (1853-60), Anderson (1864), Mrs Acton (1868), Walcott (1879), Miss G. Jackson (Dialect, 1879-81), Miss C. Burne (Folklore, 1883-85), A. J. C. Hare (1899), and Watts (1919), and the 'Victoria History.'

Shrovetide, 'shriving-time,' 'absolution-time,' the name given to the days immediately preceding

Ash-Wednesday, which, as indeed the whole period after Septuagesima Sunday appears to have been, were anciently days of preparation for the penitential time of Lent. In the modern discipline of the Roman Catholic Church a trace of this is still preserved, as in many countries the time of the confession, which precedes the paschal or Easter communion, commences from Shrovetide. These days were sometimes called Fasting-tide, Fast-mass, Fasten-e'en, or Fastern's-e'en, names still retained in some parts of Great Britain, as *Fastnacht* is the regular German name. The name of Shrovetide was retained in England after the Reformation, although the practice of shriving was abandoned. The duty of confession having been fulfilled, the faithful, upon the eve of entering upon the Lent, were indulged with permission to give themselves up to amusements and to festive celebrations, of which the counterpart is still seen in the continental carnival. In England the pastimes of football, cock-fighting and throwing at cocks, bull-baiting, &c. were long recognised usages of Shrovetide; and the festive banquets of the day are still represented by the pancakes and fritters from which Pancake Tuesday took its name, and by the 'collops' which gave its title to Collop Monday. Shrovetide cakes and ale, the last surviving relic of Shrove Tuesday celebrations, were discontinued by Brasenose College in 1887. The *Mardi Gras* of the French, with its merry-makings, is Shrove Tuesday. It is a popular festival at New Orleans.

Shrub. See RUM. For Shrubs, see TREES.

Shuckford, SAMUEL, Rector of All-Hallows, London (died 14th July 1754), is remembered for his *Sacred and Profane History* (4 vols. 1727), intended as a continuation of the work of Prideaux (q.v.).

Shumla, or SCHUMNA, a city of Bulgaria, by rail 56 miles W. by N. of Varna and 80 SE. of Rustchuk, is of exceptional strategic importance. Its strong detached forts and fortified camp were to have been demolished according to the Berlin treaty, though the clause stipulating this was not carried out. The treaty of Bukarest (1913) again provided that they should be demolished. Shumla is a straggling place, and has numerous mosques and churches, the splendid mausoleum of Hassan Pasha (18th century), an arsenal, barracks, and a military hospital. It manufactures slippers, clothing, copper wares, and silks. Pop. 24,000. The fortified works were attacked in vain by the Russians in 1774, in 1810, and in 1828, but were abandoned to them in 1878.

Shusha, a town of Azerbaijan, 65 miles SSW. of Elisavetpol, occupies a strong position on a mountain, which is accessible only on one side, and is, moreover, defended by a citadel. Pop. 40,000, who make celebrated carpets and coarse silk goods, and trade in horses that are held in great repute.

Shuster, a decayed city of Persia, stands on the Karun, at the point where that river emerges from the hills, 250 miles W. by S. of Isfahan. It is protected by a citadel. It has been identified by some with the ancient city of Susa, but the site of that city is Sus, 40 miles WNW. of Shuster. Pop. 18,000.

Shute, JOHN. See BARRINGTON.

Shwan-pan, the Chinese Abacus (q.v.).

Siah-posh ('black-clothed'), a name given by their Moslem neighbours to the pagan Kafirs of Kafiristan (q.v.).

Sialagogues are substances which increase the secretion of saliva. They may do so by stimulating the secretory nerves of the salivary glands reflexly through the sensory nerves of the mouth, stomach, eye, or nose. Thus, sweet or slightly irritating

substances in the mouth provoke a secretion of saliva, while the sight or smell of savoury eatables 'makes the teeth water.' These are known as topical sialagogues, and include such substances as mustard, ginger, pellitory-root, dilute acids, &c. Dilute acids and pellitory-root are the only ones which are much used in medicine to increase the flow of saliva and keep the mouth moist; a small piece of the latter is chewed from time to time. Sialagogues also act after absorption into the blood by a direct stimulating action on the secretory nerves. Jaborandi and mercurial compounds are well-known examples of this class. The former, or its alkaloid, pilocarpine, may cause the secretion of a pint or more of saliva within a short time after administration. This class is known as remote or direct sialagogues.

Sialkot, a town in the Punjab, near the left bank of the Chenab, 72 miles N. by E. of Lahore, is a rapidly growing, clean, and well-built town, with large manufactures of paper and a native cloth. There are an old fort, gallantly held by a few Europeans in 1857, but now converted into public offices, several shrines sacred to the Sikhs and the Mohammedans, the Punjab military prison, a public garden, and a Christian mission college and schools. Pop. (1881) 45,760; (1921) 70,619, including the cantonment, a mile to the north.—The district has an area of 1796 sq. m. and a pop. of (1921) 937,823.

Siam (native names, *Sayam*, *Muang-Thai*, 'the Land of the Free'), a kingdom of Asia, bounded on the west and partly on the north by Burma, partly on the north and on the east by French Indo-China, and on the south by Cambodia, the Gulf of Siam, and the British Malay States. Its extreme length extends some 1100 miles from about 5° N. to 20° N. lat., and its extreme breadth some 510 miles from about 96° E. to 106° E. long. The frontiers have been the subject of much negotiation, but the area of the present kingdom is 200,148 sq. m. In 1854 Pallegoix estimated the population at 6,000,000, but according to the census of 1919-20 (the first complete census having been made in 1909) the population amounted to 9,207,353, of whom Siamese and Laos each numbered over a third, with half a million Chinese, and numbers of Malays, Cambodians, Burmese, &c., and various hill-tribes. In the capital, Bangkok (630,000), there are large numbers of foreign Asiatics and about 2000 Europeans and Americans. Other towns of importance are Chiang-mai (30,000), Puket (30,000), and Ayuthia (12,000), the former capital.

The general aspect of the country is that of a plain sloping south and east from the enormous range of limestone resting on sandstone, which extends along the west and broadens out at the north. About three-quarters of the total area is forest, jungle, marsh, or generally uncultivated and uninhabited. The kingdom can be divided into four parts. Northern Siam is cut north and south by forested mountain-ranges, anything up to 5000 feet, with peaks of which Doi-Intanon (8450) is the highest, and is watered by the four rivers, the Meping, Mewang, Meyom, and Menam, which form two streams and then unite at Paknampoh. This united river, about 140 miles in length, and known as the Menam, flows through Central Siam, a vast fertile plain, and enters the sea at Bangkok. In this district are concentrated about nine-tenths of the population. Eastern Siam, surrounded on three sides by French Indo-China, is unproductive and inhospitable, while Southern Siam, in the Malay Peninsula, is much the most beautiful part of the kingdom. The rivers form the principal trade-routes, and in and around Bangkok there is

an intricate network of canals. The united Menam is navigable for steam-launches and other deep-draft vessels. The Pasak is a tributary of the Menam, while the Meklong and the Bangpakong rivers enter the Gulf of Siam direct. The Nam-Mun flows into the Mekhong (q.v.), which for part of its course forms the eastern frontier of Siam, but is never wholly in Siamese territory. Navigation on the Mekhong for vessels of any size is impeded by rapids, and, commercially speaking, this magnificent river is of little importance.

The Gulf of Siam, an arm of the China Sea, is bounded on the N. and W. by Siam, and on the E. by Cambodia and Cochin-China. At its entrance it is 250 miles wide, and it extends nearly 400 miles inland.

Central and Southern Siam, tempered by sea-breezes, are comparatively healthy for the tropics. In the former the maximum and minimum temperatures are about 100° and 55° F., while in the latter the extremes are not nearly so great. In Northern and Eastern Siam, however, intense heat during the day is followed by extreme coolness at night. The annual rainfall ranges from nearly 100 inches in the south to 60 inches in the north, the wet season varying in different parts of the country. The flora (almost entirely tropical) and the fauna resemble those of Burma (q.v.) in the north and of Malaya (see MALACCA) in the south. The famous white elephants are not now regarded with any special veneration.

Agriculture and fishing are the two main industries of Siam. Rice is easily the most important product, forming at once the staple food of the people and the principal article of export: about 6½ million acres are under cultivation, but the methods of ploughing, &c., are mostly still very primitive. Coconuts, pepper, tobacco, and cotton are grown, and betel-nut palms are found in most districts, but, generally speaking, the natural resources of the country are not nearly utilised to their fullest extent. Irrigation is practised everywhere, often in ways that are both primitive and inadequate. In 1924 the first big government irrigation scheme—the Prasak South Canal project in the province of Ayuthia—was completed at a cost of about 1½ million sterling, and other similar projects are under consideration. The number of live-stock, bullocks and buffaloes, &c., is very considerable.

Sea and inland fishing are both very productive, large quantities of 'pla tu,' a kind of pilchard, carp, eel, &c., being caught with nets, traps, rods, and other devices. There is not much hunting, but tame elephants are employed for travelling and for labour, especially in the teak forests in the north, which are among the most valuable in the world. The teak-cutting is mostly in British hands, and the logs are floated down the rivers to Bangkok. Rosewood, boxwood, ebony, and sapan are also found, but are not exploited to any extent. The chief mineral resource is tin, which is mined in Southern Siam, the annual output amounting to between 7000 and 8000 tons. There are a few gold and precious stone workings, and wolfram is also extracted. There are many important rice-mills, especially in the region of Bangkok, but the Siamese are not really a manufacturing people.

Most of the trade passes through Bangkok. The principal imports are cotton goods, food stuffs, metal manufactures, cotton yarn, and tobacco, while more than two-thirds of the exports are accounted for by rice, teak being also very important. It is calculated that in a good year as much as 1½ million tons of rice are available for export, some of it being the best in the world.

A British official occupies the post of financial adviser. The foreign banks in Bangkok have

not yet secured the confidence of the Siamese peasant.

There are about 1550 miles of railway, the main routes extending from Bangkok to Korat in the east, to Chiang-mai in the north, and to the Malayan frontier in the south, in direct communication with Singapore. Various extensions are under construction, but still about three-quarters of the produce of the country is carried by water to the markets. Good roads are found in the neighbourhood of the capital and in Southern Siam.

There is universal liability to military service from the age of twenty-one, but there are many exemptions, and only a final selection is made. The service is for two years with the colours, and for twenty-two years in the three reserves, with maximum services in the latter of a few weeks per annum. The peace and war footings number 30,000 and 100,000 of all ranks respectively. There is a small navy.

The prevailing religion is Buddhism, but there are a few Mohammedans and Confucianists. It is incumbent on every sincere Buddhist to become a lay-monk for a minimum period of three months, but there are supposed to be some 120,000 regular Buddhist priests in Siam, over 8000 monasteries (*wats*), and over 15,000 temples. Some of the Brahmin customs are observed in modified forms, and there is a considerable amount of 'spirit' worship. There are many monastic and local schools, government primary and secondary schools, as well as royal academies, technical colleges, private and foreign mission schools, &c. The university at Bangkok was opened in 1917. Owing to the absence of technical books in the vernacular, English was chosen as the official language for scientific study.

The monarchy is absolute and hereditary in the male line, though formerly the sovereign chose his successor. In 1892 ten chief departments of state were created; now the cabinet, nominated by the king, consists of twelve members, many of whom belong to the royal house, and the more important departments have European advisers. There is also a legislative council, a kind of privy council. The kingdom (outside Bangkok, which is controlled by a lord prefect) is divided into seventeen districts or *monkhons*, administered by lord-lieutenants with complete control, deriving their authority direct from the king. Titles are not hereditary, but are usually conferred together with some office of state. Extra-territorial jurisdiction for nationals of some countries is being gradually superseded as the codification of Siamese law slowly proceeds.

The north and east are occupied by Laos or Shans (q.v.), who are tattooed, and differ somewhat in speech from the Siamese; they are, however, descended from the same stock, and the two branches are even now in course of slow assimilation. The character of the Siamese is essentially rustic, peaceful, and indolent. They are very social, patriotic but vain, and fond of bright dresses and jewellery. Their intercourse with each other is conducted with a ceremonious attention to distinction of rank. They are a small, well-proportioned race, with olive-coloured skin, black hair, and are usually beardless. They shave the heads of their children, with the exception of a tuft on the crown, which is cut off with great ceremony at the age of puberty, whereupon the hair is then allowed to grow in the usual fashion. The national dress both for men and women consists of a bright-coloured *panung*—a cotton or silk cloth arranged somewhat in the form of Turkish trousers, and reaching to the knee. Princes and well-to-do people wear in addition a white jacket, often with gold or silver buttons, shoes, and white stockings,

while the women are distinguished by a gaudy scarf thrown across the bosom. The Lao women wear the *sin*, a kind of skirt, but European costume is being adopted in the towns and among the upper classes. The houses of the common people are built of wood or bamboo, thatched with the leaf of the attap palm, and are raised a few feet from the ground on piles. Both sides of the river at Bangkok (q.v.) are lined for several miles with houses floating on wooden pontoons or on bundles of bamboo. Furniture there is none, unless a mosquito-net, a mat or two, and cooking and betel utensils be reckoned furniture. Bangkok, however, is now rapidly becoming an orderly and well-laid-out masonry-built city. The food of the mass of the people consists simply of rice, curry stuff, fish, and fruit. Large quantities of tea are consumed in Chinese fashion without sugar or milk. A spirituous liquor is distilled from rice, but drunkenness is rare. Betel-nut chewing and tobacco-smoking are universal. Betel-nut discolours the teeth, and this process is often aided by the use of various materials to render them quite black and polished. The characteristic vice of the Siamese is gambling, which was carried on in the licensed government gambling-houses, now abolished. At the new-year holidays (in April), and on two or three other public holidays, the people are allowed as a privilege to gamble at home or in the streets.

Marriages are negotiated by elderly women, who find out if the birthdays of the intended bride and bridegroom are suitable—for the Siamese are superstitious in this respect—and arrange the amount of property or money the parents on each side are willing to give to set up the young couple in life. The marriage ceremonies, which are in reality purely domestic, last two or three days, and all friends are entertained liberally during this time. Priests are sometimes engaged to recite prayers, the bride and bridegroom are sprinkled with consecrated water, and on a favourable astrological day—generally the third—the marriage-bed is prepared by an old couple, friends of the family who have in their time been blessed with a large and prosperous family. Among the poorer classes there is little ceremony. The main feature of the contract is that the swain hands over to his mother-in-law a certain sum of money, which is termed 'ka nam nom,' or price of the mother's milk. Polygamy is fairly general amongst the wealthy and noble classes, but only the first wife wedded according to the solemn betrothal holds the rank of legitimate spouse. Systems of medicine are still very curious, and patients are accustomed to take medicines compounded of the most startling ingredients and in enormous quantities. It is a painful custom of obstetrics that after the birth of a child the mother lies thirty days roasting before a hot fire. The number of days is diminished with the number of children. The dead, after being kept for a period varying from two or three days for a poor man to nine or twelve months for a king, are cremated with much ceremony and at great expense.

Twentieth-century progress has been both rapid and thorough, especially under Rama VI. Slavery no longer exists; the old forced labour has been replaced by a poll-tax, not excessively heavy; corruption and waste in the public services are being resolutely attacked; while the position of women has been considerably improved. Western institutions, such as that of the Boy Scouts, and games, especially football, are very popular. The court has given the lead to all improvements, but many of the country districts are still very backward. A prominent feature of past Siamese history has been the important position taken by the foreigner. Mostly all the middlemen in business, the small capitalists, the artisans, and hand-workers

are Chinese, while British, Americans, French, Danes, Belgians, and Germans have assisted (and, in some cases, still are assisting) in the government and development of the country.

History.—The Siamese and the Laos are members of the Tai family, which originally belonged to Tibet. Expelled finally from China in the 13th century, they poured into the Indo-Chinese plain, driving the Annamese and Cambodians before them. Authentic Siamese history, however, does not begin till the year 1350, when Ayuthia (q.v.) was founded. Cambodia was conquered and made tributary in 1532. The period from 1659 to 1688 was rendered illustrious by the career of Constance Falcon (or Phaulkon), a Greek of Cephalonia, who attained the dignity of prime-minister. He was the king's favourite, and induced that monarch to send an embassy to Louis XIV. Ayuthia remained the capital till 1768, when after a siege of two years it was taken and burned by the Burmese. The invaders were finally driven from the country by a general named Phaya Tak, son of a Chinese by a Siamese mother, who made Bangkok the capital, and afterwards ascended the throne. The present dynasty was founded in 1782 by another successful general, Phaya Chakkri.

Portuguese traders in the 16th century were followed by the Dutch in the 17th, but the first treaty between Britain and Siam was only signed in 1826. After Sir John Bowring's successful mission in 1855 a consul was appointed, and other nations followed the British example. Numerous frontier disputes with France at the beginning of the 20th century were amicably settled, not altogether to the advantage of Siam. Extra-territorial jurisdiction was abandoned by Britain in 1909 and by the United States in 1922. Under the enlightened rule of Rama V. (1868-1910) and Rama VI. (1910-25), Siam has made enormous progress in the face of many difficulties, financial and other, while the declaration of war against Germany in 1917 greatly strengthened her position and prestige.

Art and Literature.—The Siamese practise bronze-casting, silver-work, and all kinds of lacquer-work. Owing to the influx of foreign productions at the end of the 19th century, the native arts rather declined, but there are signs of a revival. Owing to the damp climate and the luxuriance of the vegetation, few ancient and deserted buildings have survived, and the only modern buildings of any import are the temples and palaces, whose gilded minarets, multiple roofs, and quaint pagodas draw forth the admiration of the stranger on his arrival at Bangkok. As a nation the Siamese are musical, interested in poetry, and are extremely fond of the native plays, which are highly conventionalised and include much dancing. The Western drama is coming into favour. Siamese literature is comprised in some volumes of mythology, history, laws, astrology, &c., of no particular value. The sacred books are written in Pāli. The Siamese alphabet consists of forty-four characters and thirty vowel-signs. The language is monosyllabic and has five tones, which render its acquisition difficult to Europeans. The vocabulary is enlarged, either by joining two or more Siamese syllables or by borrowing from foreign languages. Etiquette is strictly observed in the various forms of address between superiors and inferiors, and the court language for the use of royalty is entirely different from that of the common people. The Lao language is more a dialect of the Siamese than a separate tongue.

There are general descriptions of the kingdom of Siam by La Loubère (1691), Kaempfer (Eng. trans. 1727; new ed. 1906), Pallegoix (1854), and Bowring (in Eng. 1857); books of travel by Mouhot (1864) and Coit (1867)

in English, by Bastian (1867) in German, and by Paire (1892-1902) in French; for history see Fournereau, *Le Siam ancien* (1895-1908), Gerini, *Siam's Intercourse with China* (1906), and the work by W. A. R. Wood (1926); for religion, Alabaster, *The Wheel of the Law* (1871); for general information, Warrington Smyth, *Five Years in Siam* (1898), books by Campbell (1902) and Carter (1904), P. A. Thompson, *Lotus Land* (1906; for Southern Siam), R. le May, *An Asian Arcady: the Land and Peoples of Northern Siam* (1926), and the work by W. A. Graham, which is indispensable (3d ed. 1924); see also Raynal, *European Trade with the East*, (1777), Crawford, *Journal of Embassy* (1828), Leon-owens, *English Governness at the Siamese Court* (1870), Gerini, *The Tonsure Ceremony* (1893), Clifford, *Further India* (1904), and Jottrand, *Au Siam* (1905); there is a Bibliography of Siam collected by Satow (1885), and grammars and dictionaries by Pallegoix (1850), M'Farland and Frankfurter (1900).

Siamese Twins, a name given to two children, Eng and Chang, born of Chinese parents in Siam, in 1811, having their bodies united by a band of flesh, stretching from the end of one breast-bone to the same place in the opposite twin. A union of the bodies of twins by various parts is not an unusual occurrence (see **MONSTROSITY**). The Siamese twins, purchased of their mother at Mek-long, were brought to America by Mr Hunter in 1829, and to England afterwards. After realising a competence by the exhibition of themselves in the various countries of Europe, the Siamese twins settled in one of the southern states of America, where they were married to two sisters, and had offspring. Ruined by the civil war in America, the Siamese twins again made the tour of Europe, and exhibited themselves in London again in 1869. They died 17th January 1874, the one surviving the other two hours and a half only, and then dying from the effect of the shock on a heart already weak.

Sibbald, SIR ROBERT, Scottish naturalist and antiquary, was born of Fifeshire ancestry at Edinburgh, 15th April 1641. Educated at Edinburgh, Leyden, and Paris, he settled in 1662 as a physician in Edinburgh, devoted much time to botany and zoology, and aided Sir Andrew Balfour in establishing a botanic garden. He was knighted in 1682 and appointed Geographer-royal for Scotland, in 1686 was for a short time a convert to Roman Catholicism, and died about 1722. He published many pamphlets on medical subjects, natural history, Scottish history, and antiquities.

His writings include *Scotia Illustrata, sive Prodrromus Historiæ Naturalis* (1684); *Collection of Several Treatises in Folio Concerning Scotland, as it was of Old, and also in Later Times* (1707); *A History of Fife and Kinross* (1710); and his *Autobiography* (1833).

Sibbes, RICHARD, Puritan divine, was born the son of an honest wheelwright at Tostock (not Sudbury), Suffolk, in 1577. He was put to Bury school, and afterwards, by the exertions of some friends who saw his promise, was sent to St John's College, Cambridge, as sub-sizar. He graduated B.A. in 1599, was elected Fellow two years after, and was Trinity Lecturer from 1610 till 1615, when he was deprived, as also of his fellowship. But he was at once appointed preacher of Gray's Inn, where he laboured till 1626, when, after declining Usher's offer of the provostship of Trinity College, Dublin, he was made Master of Catharine Hall, Cambridge. He was under the suspicion of Laud, but contrived to escape the penalties inflicted by his courts, and in 1633 was appointed by the king Vicar of Trinity Church. He died 5th July 1635. For his heavenly-mindedness he has been called, and not inappropriately, the English Leighton. Among his many books may be named the *Bruised Reed*, which converted Baxter at fifteen; the *Soul's Conflict*, which Izaak

Walton bequeathed to his son, as he did the former to his daughter; *Bowels Opened*; *The Returning Backslider*, &c. There is a complete edition in Nichol's Puritan Divines, with a Life by the Rev. A. B. Grosart (7 vols. 1862-64).

Sibelius, JAN, Finnish composer, born at Tavastehus in 1865, studied music at Helsingfors Conservatoire (where he became a professor in 1893), and also in Berlin and Vienna (1889-91). He visited England several times and America in 1914. His principal compositions comprise a series of orchestral works—*The Swan of Tuonela*, *Lemminkäinen*, *Pohjola's Daughter*, &c.—inspired by the Finnish national epic *Kalevala*, the suites *Karelia* and *Pélleus et Mélisande*, the tone-poems *Finlandia* and *The Bard*, some chamber music and seven symphonies, of which the last four (1912, 1915, 1923, and 1925) represent the high-water mark of his achievements. Sibelius frequently employs the idiom of the Finnish national music without directly using any folk-song material, but his vivid imagination and his profound grasp of technical resources combine to make his output of the greatest importance. His music is both wild and austere.

Siberia (*Sibir*), originally the name of a Tatar fort on the Irtysh, has now come to be applied to the huge stretch of country in northern Asia, under the rule of the Soviet Republics of Russia; it is bounded on the west by the Urals (though, politically, the 'Ural Region' includes some of the western slopes), on the north by the Arctic Ocean, on the east by the seas of Behring, Okhotsk, and Japan, and on the south by Manchuria, Mongolia, and the Kirghiz or Cossack Republic. The area of this region is calculated at 4,831,882 sq. miles, i.e. considerably larger than that of the whole of Europe.

Physical Features.—(See ASIA.) Large parts of this territory are still but very imperfectly mapped, especially in the wildernesses of the north and north-east—a few surveys along the chief rivers and lines of communication being the only sources of information. The great plateau of eastern Asia enters Siberia to the east of Lake Baikal, where it attains a height of from 3000 to 4000 feet and a width of nearly 1300 miles, and stretches therefrom, with a gradually decreasing height and width, towards the north-eastern extremity of Asia at the Behring Strait. It is fringed on its south-western border by the Great Altai and Sayan mountains, which separate Siberia from North-west Mongolia, the Barguzin and the South Muya ridges, and a series of yet unexplored and unnamed ridges stretching farther north in the same direction; while along its south-eastern border it has the Stanovoi Mountains, which rise as a high wall on the coast of the Sea of Okhotsk, and are continued farther south by the Great Khingan. The border-ridges of the lofty plateau are the highest in Siberia, and their peaks attain heights of from 7000 to nearly 11,000 feet, but very few of them penetrate into the region of perpetual snow. Mountains remaining snow-clad all the year round and giving origin to glaciers are met with only in the Altai (q.v.), at the Munku-Sardyk which rises to a height of 10,700 feet amongst the Sayan Mountains to the south-west of Lake Baikal, and in the highlands of the far north-east. In the remainder of Siberia, owing to the dryness of climate, and also perhaps to a warm current flowing in the upper strata of the atmosphere, the perpetual snow-line stands at a great height not attained by peaks 7000 to 9000 feet high. A broad belt of alpine tracts fringes the plateau along its north-western border, assuming a more and more gloomy aspect in proportion as they advance farther north. The whole of this belt is

thickly clothed with forests, the summits only of the higher peaks (4500 to 7000 feet) rising beyond the limits of tree-vegetation. The auriferous regions of the Altai, Upper Yenisei, Barguzin, and Olekma are situated in this alpine belt. A belt, nearly 500 miles wide, of high plains 1700 to 2500 feet above the sea-level spreads all along the base of the alpine belt, their outer limit being, roughly speaking, a line running from Tomsk towards the north-east. They are very fertile in the south, but of course become less and less suitable for agriculture as they advance into higher latitudes. The whole of West Siberia, between these high plains and the shores of the Arctic Ocean, is an immense lowland which has barely a few hundred feet of altitude and most of which must have emerged from the sea at a quite recent post-glacial epoch. The southern part of these lowlands—the prairies of Ishim, Upper Tobol, and Baraba—is extremely fertile. The soil is a thick layer of black earth, which also penetrates into the lower valleys of the Altai, and the traveller finds there to his astonishment a territory, nearly as large as Great Britain, entirely covered with a luxurious grass-vegetation, with masses of deciduous forest, which has been well called the granary of Siberia. About one-third of the population of Siberia is gathered on these prairies, which are more thoroughly Russian than many parts of European Russia itself.

Farther north, and especially in the space between the Ob and the Irtysh, the country assumes a quite different character; there begin the *urmans*, or immense marshes which cover nearly 100,000 sq. m., entirely clothed with thickets and meagre forests, and quite impracticable in the summer. Even the bear does not venture to cross the marshes when they are not frozen. Agricultural settlements may be found in this region on the banks only of the rivers, while some Ostiaks, Voguls, and Samoyedes find scanty means of existence in hunting and fishing. Farther north still begin the *tundras*, which extend along the Arctic seaboard as far as Kamchatka, and cover an aggregate area of some 450,000 sq. m.—more than twice the area of France. The climate of the tundras is really terrible; the average temperatures of December and January are 15 and 35 degrees below the zero of the Fahrenheit scale; the soil is frozen to a great depth, and only thaws on its surface during the short summer. The trees disappear, only a few species venturing to struggle against the cold by spreading as low bushes or by rising but a couple of inches above the ground. The want of drainage adds to the difficulties which vegetation has to cope with, and only a few flowering plants enliven occasional small patches of better protected and dryer soil. Of the plateau which fills vast tracts in East Siberia the upper terrace, 3000 to 4000 feet high, is quite unsuitable for agriculture, in consequence of its altitude, cold climate, and want of drainage; in fact, the whole of the Vitim plateau and its continuation towards Kamchatka is quite uninhabited. But its lower terrace, which is 2500 to 3000 feet above the sea and is separated from the upper by the Yablonovoi ridge, offers, especially in Trans-Baikal, great facilities for agriculture and cattle-breeding, and is peopled by both Buriats and Russians; while the smaller chains of mountains which intersect it are the seat of rich goldfields, and owing to their richness in copper, iron, and silver will certainly become some day an important centre for mining industry. The Great Khingan, which is continued farther north by the Stanovoi Khrebet and is pierced by the Amur about Kumara, is the south-eastern border-ridge of the great plateau, and it also is fringed on its outer side by an alpine

belt of several chains of mountains running parallel to the border of the plateau. Owing to this character, the Stanovoi and the Great Khingan are a most important geographical boundary; properly speaking they separate Siberia from a region which is Manchurian in its physical features. As soon as the traveller has crossed this ridge (which hardly rises as a range of hills above the level of the plateau) and has descended a couple of thousand feet down a very steep slope leading to the basin of the Amur, he sees a complete change of scenery. The oak, the walnut-tree which he has not seen since he left the Urals, the vine, and a variety of bushes and trees belonging to the Manchurian and the Japanese floras suddenly make their appearance. When he has emerged from the alpine belt he finds again the same prairies which he has crossed on the Siberian slope of the plateau, and the climate of these prairies remains as continental and the winters almost as cold as in Siberia proper; but the general character of the flora and fauna is totally changed. In fact it is European no more; the species differ from their European congeners, new genera appear, and even the European species offer notable differences from the types familiar in Europe.

Another belt of high plains, 1500 to 2000 feet high, follows. These prairies, watered by the Zeya and its tributaries, and covered with a very fertile soil and excellent oak forests, are the richest part of the Amur territory. The picturesque Little Khingan or Bureya Mountains separate the prairies of the Middle Amur from the lowlands of its lower course. The whole of the latter is only now emerging from the Lacustrine period; immense lakes enclosed within quite flat shores intermingle with swamps; and when the autumn rains, due to the monsoons of the China Sea, swell the waters of the Amur and the Sungari, making of the former a stream several miles wide and covering all its low islands, the whole region becomes an immense swamp. Various small tribes of Manchurian origin (Golds, Mangoons, &c.) lead a half-aquatic existence on the banks of the Lower Amur and its tributaries, while the Russian settlements are reduced to a number of villages built on the river for maintaining communication along its banks. It is on the border of this region that the capital of the Amur territory, Khabarovsk, stands at the junction of the Amur with the Usuri. The rocky and inhospitable mountains of Sikhota-alin, intersected by equally low and swampy valleys, fill the remaining space towards the sea-coast—the mountains rising over the sea as a stone wall, almost entirely devoid of indentations. From Khabarovsk the valley of the Usuri leads southwards to Lake Khangka and to the fertile tracts on the frontier of Korea, which surround the Gulf of Peter the Great. In that gulf Russia has at Vladivostok a splendid harbour, reminding one by its general aspect of the Golden Horn of Constantinople. The fact that the port is frozen over during great part of the year detracts from its value as a naval station, but, by the loss of Port Arthur in the open China Sea (in the Russo-Japanese war, 1905), the peculiar value of Vladivostok (q.v.) to Russia was greatly enhanced. See the separate articles SAKHALIN, KAMCHATKA.

Communications.—The rivers of Siberia are of an immense importance for the life of the country. They all take their origin on the plateau, and, after having pierced the surrounding mountains, enter the plains, where they describe great curves and receive numbers of large tributaries before entering the sea. All of them have moreover this feature in common, that each of them is formed by the junction of a pair of great rivers: such are the Ob and the Irtysh, the Yenisei and the Tunguska, the

Lena and the Vitim, the Shilka and the Argun which form the Amur. The three former enter the Arctic Ocean, and successful efforts have been made by explorers and traders, such as Wiggins, Webster, and Nansen (1913), to establish a regular communication between Europe and the mouths of the Siberian rivers, *viâ* the Kara Sea, which is free from ice for a few weeks every year. But for the interior communication the rivers are of still greater importance. It was by their means that the early Cossacks were able to overrun the country in so short a time. The Irtysh and the Ob are navigable as far as Semipalatinsk in the Kirghiz Steppes, and Barnaul in the Altai Mountains; the Yenisei as far as Minusinsk, within 300 miles of the Mongolian frontier; the Lena as far as Verkholensk, 200 miles N. of Irkutsk; and the Amur as far as Sryetensk in Trans-Baikal. Except for the railway connecting the Kama, a great tributary of the Volga, with the town Tiumen, more or less complete water communication can be maintained between Europe and Lake Baikal—there is a canal connecting the Ob and the Yenisei—but not across the plateau separating the lake from the Amur watershed. The rivers are free from ice only for a few months every year, while the lack of a direct outlet to the Caspian (and thence to the Mediterranean) is a decided disadvantage for Siberia. The Behring Strait was discovered in 1648 by the Cossack Dezhnev, but the scientific discovery of the passage between Asia and America belongs to Bering or Behring (1680-1741); Nordenskiöld was the first, in 1878-79, to accomplish the circumnavigation of Asia.

Overland communication is maintained by means of post-stations between all the chief towns—the great highway from Russia to the Pacific passing through Tiumen, Omsk, Tomsk, Krasnoyarsk, Irkutsk, Chita, Blagovestschensk, and Khabarovsk, the capitals of all the old southern provinces. Communication remains, however, difficult along the Shilka and the Amur, where long distances have to be traversed on horseback, especially when ice is drifting on the river before it is frozen, or when it is about to thaw. Two lines of railway enter Siberia from the west—the line from Perm to Tiumen, and the line from Ufa in the Bashkir Republic to Cheliabinsk, which joins at Samara the railway-net of European Russia. The trans-Siberian railway is a continuation of the latter, and was commenced in 1891. It establishes direct communication with the eastern seas, through Omsk (where it is joined by the line from Tiumen), Novo-Sibirsk (where there is a branch to Semipalatinsk in the Kirghiz Steppes; further east there is a small branch to Tomsk), Krasnoyarsk, Irkutsk, round Lake Baikal to Chita and Kaidalovo in Trans-Baikal, whence there are two lines to Vladivostok; one, by concession from China in 1896, through Manchuria, sending off a branch at Kharbin to Mukden and Port Arthur, and the other wholly in Siberia by Khabarovsk (finished in 1916). The complete line *viâ* Manchuria was opened for through traffic in 1904, the distance from Leningrad to Vladivostok by this route being 5672 miles, and was supposed to have cost some 87 millions sterling.

Climate.—It is a mistake to generalise about the climate of a huge territory such as Siberia from the sensational tales of the old penal settlements situated within or near the Arctic Circle (in Yenisei and Kamchatka), and though the winter is cold, the summer is warm. Beyond 60° N. the July average temperature varies from 60° to 40° F., and in moderate latitudes from 60° to 70° F., temperatures of 100° F. being occasionally recorded. The hot summer and a cloudless, bright sky favour vegetation, and melons are grown in the open air

on the steppes of Minusinsk and Irkutsk, and barley which has been sown in May about Yakutsk (62° 2' N. lat.) ripens by the end of August. The great wheat belt in central Siberia has the same latitudes as London and Paris. But the summer is short, as a rule, and cold weather sets in very rapidly. Night frosts are usual in September, and in November all rivers are frozen; even the Baikal becomes a highway for sledges in January. In November, even in South Siberia, the mercury of the thermometer is occasionally frozen, and in December and January it remains frozen for weeks. The spring begins in April or May, according to the latitude, and is very pleasant, though it still freezes hard at night; but in the second half of May, when all fruit-trees are in full blossom, there is a sudden return of cold which prevents apples and pears from being grown in Siberia. The average January temperature varies from 10° to -30° F., while in northern Yakutsk the climate gets rapidly worse. In the far north, indeed, the cold is really terrible, and Verkhoyansk, although its latitude is only 67° 34' N., is the cold pole of the eastern part of the northern hemisphere. Temperatures between -75° and -90° F. have actually been measured at Yakutsk and Verkhoyansk. Man certainly could not stand such low temperatures, were it not for the dryness of the atmosphere and the absence of wind during the great frosts, which render them more supportable than might be supposed. Not so with the snowstorms, which are frequent by the end of the winter, and are most dangerous to both man and cattle.

Population.—Since the revolution Siberia has formed part of Russia (q.v.) proper, itself the principal member of the Soviet Union; but different regions and republics, with varying scales of autonomy, have been created in Siberia. The following figures for areas and populations are those estimated for 1925:

Province.	Area in sq. miles.	Pop. (estimate 1925).
Altai	49,044	1,642,317
Far-Eastern Region (comprising north- ern Sakhalin, Amur, Kamchatka, Trans-Baikal, and the Maritime Government).....	1,147,132	1,568,924
Irkutsk.....	326,090	665,084
Mongolo-Buryat Republic.....	26,965	432,371
Novo-Sibiersk.....	55,568	1,340,866
Omsk.....	96,544	1,649,958
Oyrat Territory.....	36,506	83,500
Tomsk.....	158,625	1,125,173
Ural Region (including Perm in Europe, and Tobolsk in Asia).....	640,140	6,389,316
Yakutsk Republic.....	1,454,643	255,387
Yenisei.....	986,828	1,261,911
	4,978,085	16,414,757

The population is thus very unequally distributed. At the beginning of the 19th century the total population amounted to less than 1,000,000, but in 1897 it had attained to 5,727,090. The estimate of the Central Statistical Committee gave the figure as 10,377,900 in 1915. The increase of population since then is to a considerable extent accounted for by the inclusion in the Ural Region of the old government of Perm (mostly in the western slopes of the Urals), with some 4,000,000 inhabitants. The chief towns of Siberia are Omsk (143,000), Irkutsk (103,920), Vladivostok (99,000), Tomsk (89,887), Barnaul (81,504), Chita (79,000), Novo-Sibiersk (67,989), Blagovestschensk (63,000), Nikolsk-Ussuriski (62,000), Krasnoyarsk (59,000), and Khabarovsk (51,000), but on the whole the life is rural rather than urban. It has been estimated that about 92 per cent. of the population are Russians, 4½ per cent. Tatars, while the remainder belong to various stocks; some remnants of the indigenous population, nearly exterminated by the Mongols and later by the Russians, still linger in

the north of Yenisei and Tobolsk; various stems of Turkish origin, including the Yakuts, inhabit the slopes of the Altai and Sayan mountains; the Mongolian race is chiefly represented by the Buriats round Lake Baikal, and by the Tunguses in southern Yakutsk; there are some Manchurian, and in the far north-east the Hyperboreans, akin to the Eskimos. The condition of the aborigines is altogether precarious; their hunting and grazing grounds are constantly being invaded, and they themselves become an easy prey to traders, who plunge them into perpetual debt by means of loans of food, gunpowder, &c. The numbers of most of them are declining, which is to be regretted, because their children, when they have received education, often prove to be useful workers in various branches of science and art. The Tatars live a nomadic life, mostly in the provinces of Siberia west of Yenisei, and also in the steppes of Kirghiz, but have exchanged the pursuit of war for that of agriculture. The Russian colonisation has been made in five different ways—by Cossack and other military expeditions, by villages deported *en masse*, and by convicts and prisoners exiled by the tsarist government; and by traders and by peasants immigrating in large numbers of their own free-will. The convicts were sent to the north of Kamchatka, where there were mines, or to the north of Yenisei, but contributed little that was permanent to the civilising of the country; many died on the long pedestrian journey from Russia, or in the forests in attempts to escape from the settlements. The political exiles were given a certain amount of freedom, and, usually having a certain amount of education, were able to benefit the country to a considerable extent. During the last half of the 19th century over a million exiles were transported to Siberia. The Russian in Siberia is, on the whole, of an independent spirit, but almost devoid of poetical gifts, though successful, as a rule, in exact sciences. The chemist Mendeléeff, the historian Schapoff, and the zoologist Polyakoff were of Siberian extraction.

Agriculture, Industry.—Agriculture and cattle-breeding are the chief occupations. Wheat, and also corn, oats, barley, are grown fairly extensively in the south of the Ural Region, Tomsk, Irkutsk, and the Far-Eastern Region, while potatoes and beets are not so common. Sheep and cattle graze over the slopes of Eastern Siberia and North Manchuria, there is some horse-breeding, while the facilities afforded by the Siberian railway gave an extraordinary impetus to dairy-farming, especially in the west. Over the Kirghiz Steppes, cotton, tobacco, and fruit are grown, but irrigation is here badly required. Hunting continues to be profitable, notwithstanding the reckless extermination of wild animals and burning of forests which have been going on for three hundred years. Practically everywhere within the Arctic Circle furs can be obtained, the most important of which are ermine, sable, squirrel, and fox, and great annual fairs determine the price for the coming year. Fishing, especially salmon, herring, and sturgeon, is extensively carried on on Lake Baikal, the Amur, the Ob, and other rivers, and in the eastern seas. The timber wealth of Siberia is enormous, especially over the north and in the Far-Eastern Region, but of the 810,000,000 acres estimated to be covered with forest (cedar, fir, spruce, linden, birch, ash, oak, maple) about two-thirds are still practically unknown and unexplored. Industry is in its childhood, owing to the wants of the simplest technical knowledge. On the whole, the Russians in Siberia do not carry on the domestic industries so characteristic of middle Russia. Siberia is very rich in minerals. Coal is to be found more or less all over the country, but the best comes from the Urals, Irkutsk (north

of Lake Baikal), Amur, and Sakhalin. There are valuable gold mines in the Far-Eastern Region, and some silver, lead, and copper mines, which are also found in the Altai. Various minerals, including nearly the whole world's supply of platinum, come from the Urals. A considerable amount of water-power is available in central Siberia, but only a tithe of the natural wealth of the country has been exploited. Lack of capital, unfavourable climate, and uncertain political conditions have been serious drawbacks.

Religion.—A great variety of religions are met with in Siberia. The Russians belong chiefly to the Greek Orthodox faith, or rather to some of the nonconformist sects, the very making of Siberia being partly due to the emigration of dissenters persecuted by government in their mother-country, as well as to the runaway serfs, and at a later epoch, to the desire of avoiding military service. Most Turkish tribes profess the Mohammedan faith, the Buriats are Buddhists, and most of the indigenous tribes are Shamanists. Christianity is making but very slow and nominal progress.

Education stands at a very low level. A university was opened at Tomsk (1888), after much opposition on behalf of the government, but with only two faculties, medicine and physics. There is also a university at Irkutsk. In the chief towns there are gymnasia in which some education on classical lines is given, but primary and technical education is in great neglect. The technical societies of Irkutsk and Tomsk, the geographical societies at Omsk and at Irkutsk, and the natural science and anthropological museums of Irkutsk, Minusinsk, and Yeniseisk are worthy of mention.

History.—The earliest history of Siberia is still imperfectly known, and the numberless tumuli scattered over its surface only begin to be scientifically explored. See ART. Early inhabitants apparently of a stock different from the Ural-Altaians, are described by Radloff as Yeniseians. They were superseded in the 3d century A.D. by the Ugro-Samoyeds, whose bronze ornaments buried in the tumuli testify to a high pitch of artistic skill. They were subdued in the 11th century by Turkish invaders, who themselves were conquered, two centuries later, by the Mongols. The latter swept away the previous civilisation. The Russians, who vaguely knew Siberia from the 11th century through the Novgorodian merchants, began the conquest of the territory in 1530, when a band of Cossack robbers under Yermak subdued the Tatars on the Tobol River. New and new bands of Cossacks, traders, and hunters, supported by the Moscow government, and followed by dissenters flying from religious persecution and peasants escaping from serfdom, poured into Siberia during the next two centuries. The Cossacks took possession of the country, followed the courses of the Yenisei, Lena, and other rivers northward, and then reached the coasts of the Sea of Okhotsk within the first eighty years after Yermak's expedition. In 1643–50, under Poyarkov and Khabarov, they also took possession of the Amur, but were compelled by the Chinese to abandon their settlements and forts (1689). The estuary of the Amur was discovered in 1849, and a military post established at the mouth of the river in 1851. The left bank of the Amur and the right bank of the Ussuri were annexed in 1853–57, chiefly through the exertions of Muraviev-Amurski; a chain of villages was built along both rivers, and the 'accomplished fact' was recognised by China in 1857 and 1860. The deportation of political and criminal prisoners, begun by the tsars in the middle of the 17th century, was officially organised during the 19th; and with the adoption in 1872 of Vladivostok as a naval base, and with the construction of the

Trans-Siberian railway (finished in 1904), Russia definitely adopted an aggressive policy in the Far East. In 1898 Port Arthur was leased from the Chinese to secure an ice-free port in the China Sea. After the Boxer rising large stretches of Manchuria were occupied, but the Treaty of Portsmouth (1905) after the Russo-Japanese War (see JAPAN, *History*) put an end meanwhile to Russian hopes and aspirations. There is little doubt, however, that in the decade before the Great War, Russia was concentrating more troops in Siberia than mere peaceful occupation would seem to warrant. By the Kiakhta Convention concluded in 1915 between Russia and China, Outer Mongolia was declared an autonomous state under Chinese suzerainty. Many disturbances resulted from the Russian revolution. Mongolian chiefs, Bolshevik leaders, 'white' generals and adventurers generally, collected armed bands and assumed an independence of their own. The situation was complicated by the landing in 1918 of Japanese troops, ostensibly to keep order, and of Americans; the latter left the country in 1920, but the former seized all the Russian littoral south of Korea, including northern Sakhalin, and only evacuated Siberia after the Washington Conference (1922).

For general description see books on Siberia by H. de Windt (1891), Stadling (1901), Turner (1906), Price (1912), Wright and Digby (1913), Channing (1923). See also Radloff, *Aus Sibirien*, and other works; Kennan, *Siberia and the Exile System* (4th ed. 1897), and other works; J. Y. Simpson, *Side-Lights on Siberia* (1898); Wright, *Asiatic Russia* (1903); Koulomzine, *Le Trans-Sibérien* (1904); Deutsch, *Sixteen Years in Siberia* (trans. 1905); Czaplicka, *Aboriginal Siberia* (1915); Pasvol'sky, *Russia in the Far East* (1921); works in German by Wiedenfeld (1916), Danckworrt (1921), Schultz (1923); the Journals of Nordenskiöld (1881) and Nansen (1914); Ossendowski, *Man and Mystery in Asia* (1924).

Sibi, a pass, town, and district, in British Beluchistan, on the Afghan frontier. The town, which is 88 miles SE. of Quetta and has a station on the Sind and Pishin Valley Railway, is the residence of a British political agent. The inhabitants of the district, mostly Pathans and Beluchis, number about 119,000 (1921).

Sibyl, the name given in antiquity to certain inspired prophetesses, whether Apollo's mistresses or daughters, or merely his priestesses. The name is explained by Lactantius on authority of Varro as made up of the Doric *sios* = *theos* and *bylē* = *boulē*; Maas tries to connect it with the Eastern *Saba* or *Sabē*; Bang makes bold to connect it with the *Volva* and *Voluspá* of the Old Norse Sagas. Their number is differently given; some writers—Ælian and Pausanias, for example—mention only four, the Erythræan, the Samian, the Egyptian, and the Sardinian; Aristophanes and Plato use the word in the singular number only; but in general ten are reckoned, as by Varro—the Babylonian, the Libyan, the Delphian, the Cimmerian, the Erythræan, the Samian, the Cumæan, the Trojan or Hellespontine, the Phrygian, and the Tiburtine. Of these by far the most celebrated is the Cumæan, identified by Aristotle with the Erythræan, and personally known by the names of Herophile, Demo, Phemonoë, Deiphobe, Demophile, and Amalthæa. She figures prominently in the 6th book of Virgil's *Æneid*, as the conductor of the poet into the realm of the shades. Livy records the legend that she came from the east, appeared before King Tarquin, and offered him nine books for sale. The price demanded appeared so exorbitant that the king refused to purchase them. She then went away, destroyed three, and returning, asked as much for the remaining six as for the nine. This was again refused, whereupon she destroyed other three, and

once more offered to sell him the remainder, but still at the same price asked at first. Tarquin was struck by her pertinacity, and bought the books, which were found to contain oracular advices regarding the religion and policy of the Romans. They were preserved in a subterranean chamber of the temple of Jupiter on the Capitoline, and were originally entrusted to two officials (*duumviri sacrorum*), appointed by the senate, who alone had the right to inspect them. The number of keepers was afterwards increased to ten (*decemviri*), and finally by Sulla to fifteen (*quindecimviri*). In the year 83 B.C., the temple of Jupiter having been consumed by fire, the original Sibylline books or leaves were destroyed, whereupon a special embassy was despatched by the senate to all the cities of Greece, Italy, and Asia Minor, to collect such as were current in these regions. The new collection, of about a thousand lines, was deposited in the rebuilt temple of Jupiter, but was transferred in 12 B.C. by Augustus as *pontifex* to the temple of Apollo on the Palatine, where it remained till it was publicly burned by Stilicho, between 404 and 408. Many spurious Sibylline prophecies in private hands were taken by Augustus and burned. Quite distinct are the fourteen books of so-called *Sibylline Oracles* in Greek hexameters (over 4000 lines), a series of pretended prophecies written by Alexandrine Jews and Christians, in the interest of their faiths, and supposed to date from the 2d century B.C. down to the 3d century A.D., or, according to Ewald, even the 6th. The origin and signification of many passages have caused fierce discussion, but beyond doubt many are plainly Jewish and pre-Christian, others as plainly Christian. One passage in the eighth book (217-250) touched powerfully the imagination of that Christian world which found no difficulty in reading Messianic prophecy into the vague spirituality of the fourth eclogue of Virgil. This passage, alone in the whole series, is written acrostically, like all the Sibylline verses of Rome, the initials forming the Greek words for Jesus Christ, Son of God, Saviour, Cross. It is alluded to in the *De Civitate* of Augustine, and we find it again in the solemn Sequence of Thomas of Celano: 'Dies iræ, dies illa Solvet sæclum in favilla, Teste David cum Sibylla.' And it was the same sense of mysterious continuity between the ancient order and the new that gave so rich a motive to mediæval art in masterpieces by Giotto, Michelangelo, and Raphael.

Editions of these so-called *Sibyllina* are by Alexandre (Paris, 1841-56), a monument of erudition, the second volume with an exhaustive commentary; Friedlieb (Leip. 1852); Rzach (Vienna, 1891); and Geffcken (Leip. 1902). See books by Ewald (1858), Dechent (1878), Badt (1878), Maass (1879), and Diels (1891); the *Edin. Review* for July 1877; Harnack's *Geschichte der Altchristlichen Litteratur* (1893); Zielinski, *La Sibylle* (Paris, 1925); and for an English translation, Terry's *Sibylline Oracles* (N. Y. 1890).

Sicilian Vespers, the name given to the massacre of the French in Sicily on Easter Monday (March 30) 1282, the signal for the commencement of which was the first stroke of the vesper-bell. Charles of Anjou, brother of Louis IX. of France, had deprived the Hohenstaufen dynasty of Naples and Sicily; but his cruelty and tyranny, his oppressive taxation, and the brutality of his followers excited among the Sicilians the deadliest animosity. So on that evening the inhabitants of Palermo, enraged (according to the common story) at a gross outrage offered by a French soldier to a young Sicilian bride, suddenly rose against their oppressors, and put to the sword every man, woman, and child to the number of 8000. This example was followed by Messina and the other towns, and the massacre

became general throughout the island: the French were hunted like wild beasts, and dragged even from the churches. The 600th anniversary of the Sicilian Vespers was celebrated with much enthusiasm in 1882, Garibaldi (shortly before his death) having come to Palermo on purpose to be present, though he was too feeble to take part in the ceremonies. See Amari, *La Guerra del Vespro Siciliano* (Eng. trans. by Earl of Ellesmere, 1850).

Sicily, the largest, most fertile, and most populous island in the Mediterranean Sea, lies in 36° 38'—38° 18' N. lat. and 12° 19'—15° 42' E. long., and is separated from the mainland of Italy by the narrow Strait (*faro*) of Messina (2 miles wide). Its shape roughly resembles a triangle (whence the early Greek navigators gave it the name of *Trinacria*, the 'Three-cornered')—the eastern coast, from Capo di Faro in the north to Capo Passaro in the south, forming the base, and the northern and south-western coasts the sides, which gradually approach each other towards the north-west. Area, 9860 sq. m.; of the *compartimento* (including adjacent islands), 9936 sq. m. Pop. (1881) 2,927,901; (1901) 3,529,799; (1911) 3,672,258; (1921) 4,132,156. Capo Passero, at the south-eastern extremity, is only 56 miles from Malta; and Capo Boeo, near Marsala, at the western, only 80 miles from Cape Bon on the African coast. The Strait of Messina is nearly everywhere over 150 fathoms deep; but its narrowness and the conformity of the geological structure on both shores bear witness that the island was formerly a part of the mainland with which it has always been so closely connected politically. There was also a connection with Malta and Africa in the Quaternary period.

Sicily is for the most part a plateau from 500 to 1900 feet above the level of the sea, and traversed throughout its northern half by a chain of mountains. The north and east coasts are steep and rocky, the south and west generally flat; the best harbours and the shortest rivers are found in the north. The mountain-chain may be looked upon as a continuation of the Apennines (q.v.). Beginning at Capo di Faro on the Strait of Messina, it runs in a south-south-westerly direction as far as Taormina, where it turns off to the west, and stretches across the whole island. The first part of the chain, from Capo di Faro to Taormina, is called the Peloritian range, which in Monte Antennamare attains the height of 3700 feet. The second and much the longer part is called the Nebrodi range; near the middle of the north coast it receives the local name of Le Madonie, and rises in the Pizzo d'Antenna to 6467 feet (the highest point in the island except Etna). Immediately to the west of the Madonie there is a notable depression, whose waters are carried off by the rivers Grande and Salso to the north and south coasts respectively; beyond this point the mountains for some distance maintain the character of a chain, but gradually lose this and break up into irregular and often detached masses, ending in the precipitous walls of Monte San Giuliano (ancient *Eryx*, 2464 feet), which rises straight from the sea. About the centre of the chain a range branches off through the heart of the island to the south-east—at first wild and rugged, but afterwards smoothing down into tablelands, which in turn slope away tamely to the sea. There are innumerable other spurs to the south from the great northern chain, which rise in several peaks to over 5000 feet: Monte Cammarata reaches 5177 and Rocca Busambra 5299 feet. Tertiary limestones occupy most of the island; the Nebrodi rocks are mainly of Oligocene date. The lower mountain-slopes are in general covered with groves of oranges and olives, and most of the plateau with fields of wheat. The only extensive plain of special note is that of Catania (given up to vine-

yards), out of which Etna (q.v.) rises to a height of 10,850 feet, with a base 400 sq. m. in extent. Although rivers are numerous, none are navigable. The principal perennial streams are the Simeto, the Salso, the Platani, and the Belici. The largest lake is the Lago di Lentini, near the east coast, which has an area of less than $4\frac{1}{2}$ sq. m.

The climate of Sicily is warm and equable, especially on the north and east coasts. The mean temperature in the years 1871-86 ranged from 45° F. in winter to 79° in summer; during the same period the extremes recorded were 25° (Caltanissetta) and 118° (Palermo); but only for brief periods does the dry parching Scirocco (see SIROCCO) chiefly in the spring and early autumn, drive the thermometer up to over 100°. Snow seldom falls in the lowlands; on the Madonie, however, it lies till June, and on Etna till July; and the temperature in winter in the wretched mountain towns is often bitterly cold. The reckless destruction of the forests, for which the whole island anciently was famed, has wrought serious injury to both the climate and the soil. This process is still going on, and little is done in the way of reafforesting; yet magnificent relics of the primeval forests of oak and ilex are left on the Madonie and elsewhere, and in some districts beeches clothe the mountains to their very summits, and chestnuts, pines, and enormous holly-trees flourish; on the other hand, wide tracts have been reduced to absolute sterility by the destruction of the woodlands. Malaria is endemic in many parts—sometimes more so in the uplands than upon the coast. Nearly all the rain falls in the winter months, when the rivers are swollen to destructive torrents; in the long summer there are usually three months of drought, most of the streams dry up, and the hill-sides and plains are turned to brown, sunburnt deserts. As regards cultivation, two types prevail—the intensive, on the eastern and northern coasts, and the extensive in the rest of the island. In 1911, one-sixth of the whole surface was owned by 173 proprietors, and one-sixth more by 614. The vast majority of these are absentees, and reside in the larger cities of the island, or even in Rome or Naples. The middle class can hardly be said to exist, so much is it hampered by poverty. Nevertheless the soil is naturally so fertile that even these causes and the ignorance and primitive methods of the people have not yet destroyed its marvellous productive power. Vegetation is everywhere luxuriant. Dwarf-palms abound, in the south-west especially, and agaves, prickly pears, oranges, lemons, olives, almonds, pomegranates, mulberries, and grapes are all largely grown. Sicily's wheat still represents a seventh of that of all Italy; and of the kingdom's barley, though the figures are much smaller, it raises one-half. Formerly corn was grown and exported at a profit; but of late years this can no longer be done, and to-day the island's chief agricultural products are grapes, oranges and lemons, and sumach. It sends out two-thirds of Italy's wine; of 'green fruit' it yields nearly nine-tenths of all the Italian crop, and sends large quantities to the United States and to Britain; and sumach, for tanning, is exported. In many districts the soil is enfeebled by being perpetually cropped with wheat, and only the rich supply of sunshine saves it from exhaustion; artificial manures are unknown, and good systems of irrigation and of rotation of crops are even more needed than the introduction of agricultural machinery. At present ploughs of rough-hewn branches, the wooden share thinly shod with iron, are in use, and the corn is usually threshed on the smoothest spot in or near the field—trampled by oxen and horses, who drag heavy stones after them—and winnowed by being thrown into the air. Cattle

rearing, in the usual sense of that term, is not attempted. Oxen and cows are bred for purposes of labour, not for the market or the dairy, and are sent old from the cart or plough to the butcher. But indeed in the interior little meat is eaten at all. Sicilian mutton is as tough as the beef, and has besides a very rank, woolly flavour. Goats are much more common than sheep, and pigs are reared in great numbers in the mountainous tracts, and in the small towns overrun the streets and act as scavengers. There is no regular pasturage for flocks and herds, which live entirely in the open air, and usually gather a subsistence as they can; when straw and cactus-leaves fail they are in some parts fed on the rinds of oranges and lemons. Butter, mostly imported in tins, is known only in the large towns, and the cheeses of the island, chiefly made from goats' and ewes' milk, are hard and bitter.

After agriculture the production of sulphur is the most important occupation. This is the only mineral product obtained on a large scale, and forms the essential resource of Sicily; but it too is separated from the ore by a very primitive process. There are some 300 mines in the island, and 2,117,924 tons (nearly 90 per cent. of the total production of Italy) were raised in 1914; though the industry was adversely affected by the development of the sulphur industry in the United States at the beginning of the century. The rich deposits of rock-salt are scarcely worked at all, though bay-salt is largely made in the salt-pans on the east and west coasts (200,000 tons at Trapani). Fishing, especially for the sardine, anchovy, and tunny, occupies a large number of the people; the coral-fishery has greatly declined, 32 tons having been obtained in 1914, less than one-tenth of the total amount obtained in 1900. Amber is found and worked in Catania. Manufactures are in the main connected with agricultural products—wine (both the Marsala produced in the town of that name, and the stronger varieties from other districts, e.g. that of Etna, which are mainly used for mixing purposes), citric acid distilleries, the preserving of tomatoes and other vegetables, grain-mills and macaroni factories. Asphalt and pumice-stone are also exported in considerable quantities, the former from Ragusa and other localities in the province of Syracuse, the latter from the volcanic island of Lipari. There is a large shipbuilding yard at Palermo, but other industries are on a smaller scale. Trade as a whole has developed rapidly since 1860. It is, however, much hampered in the interior by the scarcity of good roads—the whole island in 1889 boasted only 3200 miles; though the institution of motor-omnibus services has produced considerable improvements; 611 miles of railway were built between 1863 and 1890, and there are now rather over 1000 miles, all single lines, and some narrow gauge.

As a consequence of the successive foreign settlements on the island the population is rather a conglomerate one; in the east the Greek element prevails, and the people are superior to those in the west, where Arab blood is strongest. In some places in the interior the dialect of the Lombards survives in their descendants, and near Palermo (Piana dei Greci, &c.) both Greek usages and Greek costumes are to be found. The general dialect of the island differs markedly from that of the mainland, as does also the appearance of the country. Most of the farms are small; but in any case the traveller cannot but be struck with the absence of farm buildings and houses. The labourers as a rule herd in the small towns, walking wherever possible to their work every morning, and otherwise, in spring and harvest, sleeping during the week in temporary conical huts of straw.

The crops are guarded, and the losses of tenants from predatory animals, &c., certified, by mounted guards in the pay and uniform of the chief proprietors. Conditions of life are more primitive, and the spread of civilisation has been far slower (especially in the interior) than in many parts of Italy; but there is a very great difference between the north and east coasts and the rest of the island, which is more backward. But everywhere, except in the larger towns, and in such well-known resorts as Taormina, where adequate provision is made, facilities for the foreign traveller are lacking. As a whole, the Sicilian is manly and independent, good-humoured and obliging, prudent and steady in his habits. Under proper direction he will work hard and cheerfully, and his patience and resignation to his lot are truly Oriental: 'come Dio vuole' is but the 'kismet' spirit localised; but he can be treacherous and vindictive. The Mafia (q.v.) has only died with the new régime, until the advent of which the vendetta was preferred to more legal methods of punishment, so that criminal statistics still compared unfavourably with those for the rest of Italy. Emigration, especially to the United States, had assumed considerable proportions (141,880 in 1913) but has now been greatly reduced by their new immigration law. In religion the people are devout, and superstitious to a degree. Many of the popular festivals are of interest. Education is free and compulsory, but the law is not very strictly enforced, and illiteracy abounds. In 1895 there were 3500 elementary schools in the island, 13 normal schools, 67 'licei,' &c., 46 technical schools, besides government technical institutes, industrial schools, schools of mercantile marine, a military college at Palermo, a government conservatoire at Palermo, schools of agriculture and universities at Catania, Messina, and Palermo. The island is divided into seven provinces (see ITALY), and its chief towns are Palermo (pop. in 1921, 293,612); Messina (176,405); and Catania (192,448).

See Franchetti and Sonnino, *La Sicilia nel 1876* (1877); German works by Hoffweiler (1870), Th. Fischer (1877), Von Adrian (1878), Von Lasaulx (1879), Gregorovius (7th ed. 1895), Schneegans (1889), and Gsell Fels (1889); Mrs F. Elliott, *Diary of an Idle Woman in Sicily* (1881); G. Chiesi, *La Sicilia Illustrata* (1892); René Bazin, *Sicile* (1892); W. A. Paton, *Picturesque Sicily* (1898); besides the *Annuario Statistico Italiano* and the Consular Reports.

History.—The earliest inhabitants of Sicily of whom we know anything were the Sicani, belonging to the neolithic period. The Siculi, who followed them, do not appear to have been a distinct race, and probably both were branches of the same North-African stock. Professor Orsi, director of the museum at Syracuse, and of the administration of antiquities of the island, has divided the remains associated with the Siculi (fortified villages and cemeteries) into three periods, (a) down to 1500 B.C. (the eneolithic period); (b) 1500–1000 B.C. (the period of Aegean importation); (c) 1000–500 B.C. (the period of increased Greek importation).

We hear of yet another early stock mainly in the north-western corner, the Elymoi, whose towns of Segesta and Eryx showed a considerable progress in civilisation. The Phoenicians from an early period began to make settlements—Motya, Solous, and Panormus—on the north and north-west coasts, for the purposes of commerce; but the real civilisers of Sicily were the colonies of immigrant Greeks, both Dorian and Ionian, who founded a number of flourishing cities on the east and south coasts, such as Naxos (735 B.C.), Syracuse (734), Leontini and Catana (?28), Megara Hyblaea (726), Gela (688), Himera (648), Zancle or Messana (date uncertain), Selinus (c. 628), Agrigentum (582).

These Greek settlers became known as Sikeliots, in distinction to the native Siculi, with whom, however, they gradually became assimilated. Their cities were long independent, and flourished first under oligarchical constitutions, then under the short-lived rule of a succession of more or less enlightened tyrants like Phalaris and Theron of Agrigentum, and Gelon, who in 485 transferred the seat of his power from Gela to Syracuse, thereafter the first city of the island. The inevitable struggle with Carthage soon began, and its first stage was closed for seventy years by the great victory of Himera (480), won over Hamilcar on the same day as Salamis, by the united power of Gelon and Theron. The long Peloponnesian war and the intrigues of the mother-cities in Greece drew Sicily into the current of Greek history, but the fatal Athenian expedition to Syracuse (415–413) under Nicias (q.v.) ended for ever the Athenian dream of a wider empire in the west. Next followed a Phœnician invasion under Hannibal, grandson of the Hamilcar who perished at Himera. His course of conquest was facilitated by internal jealousies, and he took in turn Selinus, Himera, and Agrigentum, leaving behind him nothing but smoking ruins. The strong fortress of Lilybaeum was founded by the Phœnicians in 396, on the mainland, opposite the island town of Motya, taken and destroyed by Dionysius of Syracuse in the preceding year, whose vigorous reign (405–367) put a check to Carthaginian conquest. He fought Carthage in four wars, and carried his conquests into Southern Italy. After the tyranny of Dionysius and his son followed Dion and Timoleon, next the splendid but fatal reign of Agathocles (317–289). The Sicilian war of Pyrrhus of Epirus (278–276) was but the prelude to the long struggle between Rome and Carthage, the first stage of which was the war for Sicily. First Carthaginian Sicily in 241, then the whole island in 210 passed into a Roman province, on the death of Hieron, for fifty years a steadfast ally of Rome. The chief events in Sicily's Roman history were the two insurrections of slaves (135–132 and 102–99), the infamous pro-prætorship of Verres (73–70), its occupation by Sextus Pompeius (42), the conquest by the Vandal Genseric (440 A.D.), his cession of the island to Theodoric, and its recovery to the eastern empire by Belisarius (535). So it remained till 827, the date of the beginning of the Saracen occupation. Syracuse itself was taken in 877; the last stronghold, Rametta, fell in 965. For nearly a hundred years the Moslem rule was not seriously disturbed, but at length George Maniaces was sent by the eastern empire to win back the island (1038). His army included many Normans, who saw with eager eyes the goodness of the land. Town after town was taken—Messana, Syracuse, all save Panormus. The recall of Maniaces brought back a return wave of Saracen conquest, but at length, after much hard fighting, the Normans conquered the whole island; Panormus (Palermo) fell in 1071; Syracuse in 1085; Rametta (Noto), the last stronghold to hold out, in 1090. Robert Guiscard, son of Tancred of Hauteville, now took the title of Duke of Apulia and Calabria; his brother Roger, that of Count of Sicily. The Norman dominions were united under his son Roger, the great Count of Sicily, who took the title at Palermo in 1130 of 'King of Sicily and Italy.' He was followed by William the Bad (1154–66) and William the Good (1166–89), on whose death childless the Sicilians chose Tancred, an illegitimate grandson of King Roger. But Tancred died in 1194, whereupon the crown fell to the German Emperor Henry VI., who had married Constance, daughter of King Roger I. Henry forced the Sicilians to acknowledge him as king, and died in 1197, leaving the kingdom to his

son Frederick, afterwards the famous Emperor Frederick II. On his death in 1250 the succession fell to his son Conrad, next to his grandson Conradin, under whom Frederick's natural son Manfred governed Sicily. The latter declared himself king at Palermo in 1258 on an unfounded report of Conradin's death. But the popes pursued him with rancorous enmity, and on the nominal and shameless fiction of over-lordship offered his crown for money to Richard of Cornwall, brother of Henry III. of England, and next to Henry's younger son Edmund. At length Pope Urban IV., a Frenchman, opened up the most unworthy chapter of Sicilian history by granting it (1264) to Charles, Count of Anjou. Manfred fell fighting heroically against the invader just north of Benevento in 1266, and Anjou entered Naples in triumph. But Peter, king of Aragon, who had married Constance, the daughter of Manfred, laid formal claim to Sicily in her right. The government of the French proved intolerable to the Sicilians, and the massacre of the Sicilian Vespers (q.v.) opened up a long struggle, which ended with the crowning of Peter's son Frederick in 1296, and his being acknowledged at the peace of 1302 king of *Trinacria* for life. But he soon felt strong enough to resume his proper title of King of Sicily, and at his death in 1337 left the crown to his son Peter.

The Angevin House continued to reign in Naples, although they still maintained their nominal claim to Sicily—hence after the union the name Kingdom of the Two Sicilies. They upheld the Guelphic party; the Aragonese in Sicily, set up against the pope, were Ghibellines. Frederick's successors reigned on in Sicily, but in 1409 Mary, queen of Sicily, married Martin, son of Martin of Aragon, and through this the island was again united to the crown of Aragon. Queen Joanna II. of Naples, successor of Ladislas, was childless by both her marriages, and had first adopted as her successor Alfonso V., king of Aragon and Sicily, then revoked this disposition to adopt Louis III. of Anjou. The two parties went to war and divided all Italy: the Duke of Milan and Sforza on the Angevin side, the pope and the Florentines on Alfonso's. On the death of Louis the queen adopted his brother René of Anjou in his place. She died in 1435, and seven years later Alfonso succeeded in taking Naples, and died in 1458 king of Aragon, Naples, and Sicily. He left Aragon and Sicily, which he had inherited, to his legitimate son John II.; Naples, which he had won, to his bastard son Ferdinand I., whose cruelty made the chief citizens invite John of Calabria, son of René, to contest the crown. He was unsuccessful, but Charles VIII. of France revived the claim as the representative of the Angevin House, entered Italy in 1494, and made his progress in triumph to Naples, whence King Alfonso II. fled. Next year Alfonso's son Ferdinand II. returned to Naples to win back his kingdom. He died in 1496, and was succeeded by his uncle Frederick, who was betrayed by his kinsman Ferdinand of Aragon making an alliance with Louis XII. of France, and compelled to retire, giving up his rights to the French king. Next year (1502) the French and Spaniards quarrelled over their ill-gotten spoil, and the war was ended by the Spaniards utterly defeating the French at Mola near Gaeta in 1504.

Ferdinand the Catholic had thus again united Naples and Sicily to the Spanish monarchy. Both himself and his successor, the Emperor Charles V., had promised not to exact any new taxes from the kingdom of Naples without consent of nobles and people; but the viceroy of Philip IV. laid on grievous burdens, which at last led to insurrections both in Naples and Palermo, crushed mercilessly by Don

John, bastard son of Philip IV. In 1700 Charles II. of Spain died childless, whereupon Louis XIV. claimed the throne for his grandson Philip, Duke of Anjou, and the Archduke Charles of Austria for himself. The long war of the Spanish succession was closed by the peace of Utrecht (1713), which gave to Charles, now the Emperor Charles VI., Milan, Naples, and Sardinia, while the Duke of Savoy received Sicily with the title of king. Philip again plunged into Italian intrigues, and captured Sardinia by a treacherous attack. But the Quadruple Alliance (England, France, the United Provinces, and Charles of Austria) enforced the treaty. Victor Amadeus of Savoy had been on the side of Spain in hopes of gaining Lombardy, and the Powers compelled him in 1720 to give up his new kingdom of Sicily to Charles VI. in exchange for Sardinia. Don Carlos, son of the queen of Spain, after a series of intrigues, made an attack on Sicily, and at length in a readjustment of the map of Italy at the treaty of Vienna (1738) was acknowledged king of the Two Sicilies. As Charles III. was called to be king of Spain in 1759 he left Naples and Sicily to his younger son, Ferdinand IV., whose queen, Caroline, a sister of Marie Antoinette, naturally hated the French Revolution, and joined the English alliance. Bonaparte took Naples in 1798. King Ferdinand was turned out, allowed to return, but again turned out in 1806, when Bonaparte made his brother Joseph king. When Joseph was made king of Spain in 1808, Joachim Murat succeeded to his crown, Ferdinand being allowed to remain king of Sicily under British protection. By the treaty of Paris Italy was restored to her old masters. Victor Emmanuel received Sardinia with Genoa; the kingdom of Naples was restored to King Ferdinand IV. of Sicily, and he formally took the title of Ferdinand I. as king of the Two Sicilies. Ferdinand II. (1830–59) ruled Naples and Sicily with dreadful tyranny, bombarded Messina and Palermo, and flung the best citizens to rot in loathsome dungeons, especially after the unsuccessful revolution of 1848. Francis II. succeeded him; he had been brought up by the Jesuits, and under his rule the country ripened fast for revolution. At length Garibaldi sailed from Genoa with his thousand heroes, landed at Marsala, 11th May 1860, took Palermo, and at Milazzo defeated the king, who in abject terror promised all manner of reforms to Cavour and Victor Emmanuel. They did nothing but wait the issue, while Garibaldi crossed to Spartivento, drove back the king's troops, defeated them at Volturmo, and entered Naples in triumph on the 7th September. The people of Sicily and Naples joined themselves by a popular vote of more than a hundred to one to the Sardinian kingdom.

The palmiest age of letters in Sicily was the reign of the first Hiero (478–467), besung by Pindar; the next, that of the elder Dionysius, himself a poet and the friend of Plato. The lyric, the comedy, and the mime were practised by Stesichorus of Himera, Epicharmus, and Sophron of Syracuse; Empedocles of Agrigentum was a famous philosopher, Archimedes of Syracuse the most celebrated of ancient mathematicians; but the rarest flower that grew out of Sicilian soil was the bucolic poem which once for all attained perfection in the idylls of Theocritus and Moschus of Syracuse, and in Bion, who, though a native of Smyrna, was a Syracusan in all his sympathies and in his grave.

The modern Sicilian dialect is of course closely allied to the Neapolitan, but offers grave difficulties both in vocabulary and grammar to the student acquainted only with Tuscan. It has furnished a rich literary material to the popular imagination for six hundred years down to our own day, and yielded a harvest of genuinely popular poetry not equalled elsewhere in the world. But not in their number alone are the Sicilian folk-songs pre-eminent, but in their intrinsic poetic excellence. The love-songs especially are tender, passionate, and

sincere, and many have a penetrating pathos that haunts the memory of a reader. They have been collected by S. Salomone-Marino, Dr Pitrè (q.v.), and L. Vigo, whose *Raccolta amplissima di canti popolari Sicil.* (1870-74) alone contains 6000 songs, with besides a good bibliography of books in the Sicilian dialect. Dr Pitrè's great *Biblioteca delle Tradizioni pop. Siciliane* (19 vols. 1870-90) is a vast encyclopædia of folk-songs and ballads, folk-tales, legends, proverbs, customs, games, jests, riddles, &c., with grammatical introductions and glossaries. Two other works that must be named are Laura Gonzenbach's *Sizilianische Märchen* (2 vols. Leip. 1877), and S. Salomone-Marino, *Storie popolari in Poesia Siciliana* (Bolog. 1877). For the Sicilian dialect, see the works by Wentrup (Halle, 1880) and C. Avolio (Moto, 1882); the Sicilian-Italian Dictionaries of G. Biundi (Pal. 1857) and V. Mortillario (new ed. Pal. 1879).

There are histories of Sicily in antiquity by Holm (4 vols. Leip. 1870-98) and W. Watkiss Lloyd (1872); the Moslem period, by Amari (3 vols. Florence, 1854-72); the Norman period, by Bazancourt (2 vols. Paris, 1846) and Graf v. Schaack (2 vols. Stuttg. 1889); the Bourbon period, by Amari (Paris, 1849); the Piedmontese period, by Querner (Bern, 1879). See also the works on the history of Naples by Giannone and his continuator, Colletta; Seibert, Reuchlin, Orloff, Rüstow, Romano-Manebrini, La Lumia, E. A. Freeman's unfinished *History of Sicily* (vols. i.-iv. 1891-94), and his short history ('Story of the Nations' series, 1892); G. M. Trevelyan, *Garibaldi and the Thousand* (1909), *Guida d'Italia del Touring Club Italiano, Sicilia* (1919).

Sickert, WALTER, English painter of the Impressionist school, born at Munich in 1860, studied under Whistler, and has interested himself greatly in etching and engraving. His work is represented both in British and Continental galleries, and is fairly well known in Paris. He has painted landscapes, portraits, and *genre* pictures all with success. In 1924 he was elected A.R.A.

Sickingen, FRANZ VON, born on 2d March 1481 at the castle of Ebernburg near Kreuznach, fought in 1508 against the Venetians in the service of the Emperor Maximilian, but in peace led the life of a free-lance. He could bring 20,000 followers into the field, and during 1513-19 we find him warring against Worms, the magistrates of Metz, the Landgrave Philip of Hesse, and Württemberg. He twice levied ransoms of 20,000 and 30,000 gulden, and Charles V.'s election to the imperial crown was largely due to his influence. Reuchlin was protected by him at the capture of Stuttgart, and he formed a close friendship with Ulrich von Hutten (q.v.), who from 1520 was his constant guest, and won over his rude but lofty spirit to the cause of the Reformation. His fortresses, Landstuhl and Ebernburg, became the 'asylums of righteousness'; Bucer, Aquila, and Ecolampadius found refuge within their walls. In 1521 he assisted the emperor in his French campaign; in 1522, with the nobles of the Upper Rhine, he opened a Protestant war against the archbishop of Trier. That war miscarried; and put to the ban of the empire, and besieged in his castle of Landstuhl, on 2d May 1523 he received a musket-shot, of which six days later he died. In 1889 a stately monument to him and Hutten was erected at Ebernburg.

See works cited at HUTTEN, and monographs on Sickingen by Ulmann (Leip. 1872), Bremer (Strasb. 1885), and Hüll (Ludwigh. 1887).

Sickle. See REAPING.

Sicyon, an important city of ancient Greece, stood on a triangular plateau, between the rivers Asopus and Helisson, about 2 miles S. of the Corinthian Gulf and 7 NW. of Corinth. It was celebrated in antiquity for the unusual beauty of its bronze work, which exercised an important influence on the development of Greek art in general, and was the seat of a school of painting that included Pamphilus and Apelles, both natives of Sicyon. It was also the birthplace of Aratus

(q.v.), the general of the Achæan League, and of Lysippus, the sculptor. There exist at the present day a few remains of the ancient city, as well as of the more modern buildings erected by the Roman conquerors of Greece. These have been in part excavated by the American School of Classical Studies at Athens since 1887. Foundations of a great Doric temple were discovered in 1921.

Siddhartha. See BUDDHISM.

Siddons, SARAH, the greatest tragic actress England has produced, was the daughter of Roger Kemble, a respectable manager of a small travelling theatrical company, whose circuit was in the midland and western parts of England. Sarah, who was the eldest child, was born at Brecon on 5th July 1755. From her earliest childhood she was a member of her father's company, and in a playbill dated 12th February 1767 her name appears as acting the character of the Princess Elizabeth in Havard's tragedy of *Charles the First*. When only seventeen she formed an attachment to Siddons, who was a member of her father's company, and, after considerable opposition from her parents, she was married to him in Coventry on 26th November 1773. Her husband and herself joined the Cheltenham Company, and while here she was recommended to Garrick by the Earl of Ailesbury. Garrick asked the Rev. Bate Dudley to report on her abilities, and is said to have also sent King, the actor, to see her. The result was an engagement at Drury Lane, where she made her first appearance on 29th December 1775 in the character of Portia. It has been said that the comparative failure which attended her first attempt to become a London actress was the result of pique on the part of Garrick; but there is no evidence whatever of this, and the fact seems to be simply that her powers were not matured sufficiently to enable her to produce an effect in the huge metropolitan theatre. At the end of the season she was not re-engaged, and for six years she played in the provinces, making her greatest successes in York and Bath; but her reputation grew so fast that in 1782 she was invited to return to Drury Lane. She accepted the offer, and made her reappearance on 10th October 1782 as Isabella, in Garrick's adaptation of Southerne's *Fatal Marriage*. Her success was immediate and permanent, and from this time to her retirement she was the unquestioned queen of the stage. In 1803 she followed the fortunes of her brother, John Philip Kemble, who had purchased a share in Covent Garden Theatre, and here she appeared on 27th September 1803 in her favourite character of Isabella. During the rest of her career she continued at Covent Garden, and at that theatre she took her formal farewell of the stage on 29th June 1812, when she played Lady Macbeth. She appeared occasionally after this time, but only for charitable objects or for special benefits. After her retirement from the stage Mrs Siddons gave occasional public readings from Shakespeare and Milton. She died on 8th June 1831, and was buried in Paddington Churchyard. As an actress Mrs Siddons stands unapproached, so far as can be judged from recorded criticism, in every line of tragedy—her pathos, her rage, her despair, her suffering, her grief, all being perfect in expression and convincing in naturalness. Endowed by nature with a gloriously expressive and beautiful face, a queenly figure, and a voice of richest power and flexibility, she worked assiduously to cultivate her mental and physical gifts until she reached a height of perfection which has probably never been surpassed by any player of any age or country. In comedy she was less successful. See Lives by Mrs Kennard (1886), and Mrs Parsons (1909).

Side-bones are enlargements situated on the coronet just above the quarters of a horse's hoof, resulting from the conversion into bone of the elastic lateral cartilages. They occur mostly on the forefeet in heavy draught horses with upright pasterns, causing some stiffness, but, except when they are of rapid growth, little lameness, though they are accounted amongst the defects that render a horse 'unsound.' They are treated at first by cold applied continually, until heat and tenderness are removed, when blistering or firing must be resorted to, and removal of pressure by shoeing with a 'bar shoe.'

Sidereal Clock, a clock so regulated as to indicate *sidereal time*; see DAY. The sidereal clock is a most important aid to the practical astronomer, and is one of the indispensable instruments of an observatory.

Siderite. See CHALYBITE.

Sideroxylon. See IRONWOOD.

Sidesaddle-flower is a name sometimes given to a plant of the genus *Sarracenia*. See INSECTIVOROUS PLANTS.

Sidgwick, ETHEL, novelist, was born at Rugby 20th December 1877, the niece of Archbishop Benson (q.v.). She studied music and literature at school in Oxford, and subsequently taught in England and France. Her novels, all showing a carefully cultivated literary style, are *A Promise* (1910), *Le Gentleman* (1911), *Herself* (1912), *Succession* (1913), *A Lady of Leisure* (1914), *Duke Jones* (1914), *The Accolade* (1915), *Hatchways* (1916), *Jamesie* (1917), *Madam*, *Restoration* (1923), *Laura* (1924). She has also written several plays for children.

Sidgwick, HENRY, writer on ethics, was born at Skipton, 31st May 1838, and educated at Rugby and Trinity College, Cambridge, being elected a Fellow in 1859. From 1875 he lectured as prælector of Moral and Political Philosophy, and in 1883 was elected Knightbridge Professor of Moral Philosophy. He first became widely known as an able writer on ethical subjects by his *Methods of Ethics* (1874), a critical examination of the principles underlying the various historic systems of moral philosophy, in which the points of resemblance between the opposing intuitional and utilitarian schools are particularly dwelt upon. The writer is on the whole fair to both sides, although his own sympathies lean to the utilitarian standpoint. The strongest feature of the book is its keen analytical power, which, however, drifts at times into the over-refinements of mere intellectual subtlety. Professor Sidgwick contributed numerous papers on ethical and economic subjects to *Mind*, the *Journal of Philology*, and other journals. He took a warm and active interest in the higher education of women, and was especially interested in the management of Newnham College at Cambridge. In 1886 he published as a separate book *Outlines of the History of Ethics*, the historical summary of the chief ethical systems and schools that he contributed to the ninth edition of the *Encyclopædia Britannica*; in 1883 *The Principles of Political Economy*, a work that maintains, with modifications, the essentials of J. S. Mill's method and results; in 1891 *The Elements of Politics*. Professor Sidgwick was president of the Psychological Research Society. He died 30th August 1900. *The Ethics of Green, Spencer, and Martineau* (1902), *Philosophy, its Scope and Relations* (1902), *European Polity* (1904), and his *Miscellaneous Essays* (1905) were afterwards published, and his life written by his widow and his brother.—His wife, whom he married in 1876, was ELEANOR MILDRED BALFOUR, born in 1845, a sister of A. J. Balfour (Lord

Balfour), and of F. M. and Gerald Balfour. She was treasurer and principal of Newnham College, honorary secretary of the Society for Psychical Research, and wrote on Mrs Piper.

Sidi-bel-Abbès, a town of Algeria, 48 miles by rail S. of Oran; pop. 38,000 (two-thirds Europeans).

Sidlaw Hills. See FORFARSHIRE.

Sidmouth, on the south coast of Devonshire, 14 miles ESE. of Exeter, lies in a narrow valley at the mouth of the little Sid between the red sandstone cliffs of High Peak (513 feet) on the west, and Salcombe Hill (497) on the east. Its esplanade is protected by a sea-wall (1838); its parish church (1259) was almost rebuilt in 1860. Sidmouth's prosperity as a port, which in Edward III.'s day sent two ships to the siege of Calais, passed away through the silting up of the harbour. The climate is mild, the rainfall the least in Devon, and the beach yields plenty of agates and chalcodones. Pop. (1921) 5669.

Sidmouth, HENRY ADDINGTON, VISCOUNT, prime-minister, was born in London, 30th May 1757, the son of Lord Chatham's physician, Dr Anthony Addington (1713-90). After twelve years at Cheam and Winchester schools, and four at Brasenose College, Oxford (1774-78), he studied law at Lincoln's Inn, married (1781), and was led by his friendship with Pitt to quit the bar for politics, in 1783 being elected M.P. for Devizes. He made an admirable Speaker from 1789 till 1801, when, upon Pitt's resignation on the Catholic relief question, he was invited by the king and urged by Pitt to form a ministry. That most third-rate administration, in which Addington was First Lord of the Treasury and Chancellor of the Exchequer, and whose one great event was the short-lived peace of Amiens (1802), came to an end in 1804. In the following January Addington was created Viscount Sidmouth; and thereafter he was thrice President of the Council, once Lord Privy-seal, and from 1812 to 1821 Home Secretary, as such being thoroughly unpopular for his coercive measures. He retired from the cabinet in 1824, and died 15th February 1844. He was a very sincere Tory. See his *Life and Correspondence* by his son-in-law, Dean Pellew (3 vols. 1847).

Sidney, or SYDNEY, ALGERNON, grand-nephew of the famous Sir Philip, was born probably at Penshurst, Kent, and in 1622, the second son of Robert, second Earl of Leicester (1595-1677). He received a careful education, and accompanied his father in 1632 on his embassy to Denmark, and in 1636 to France. In 1641-43 he commanded a troop of horse against the rebels in Ireland, of which country his father was (nominally) Lord-lieutenant. Then with his elder brother, Viscount Lisle, he returned to England, and, declaring for the parliament, was in March 1644 appointed to a troop in the Earl of Manchester's regiment. At Marston Moor he was severely wounded; in 1645 was appointed governor of Chichester, and returned by Cardiff to parliament; in 1646 attended his brother, now Lord-lieutenant, to Ireland as lieutenant-general of the horse and governor of Dublin; and in 1647, after receiving the thanks of the House of Commons for his services, was appointed governor of Dover. In 1649, though nominated one of the commissioners, he kept himself clear from any hand in the king's trial, which yet he justified on abstract grounds, speaking afterwards of the execution as 'the justest and bravest action that ever was done in England or anywhere else.' In principle a severe republican, he resented Cromwell's usurpation of power, and from the dissolution to the restoration of the Long Parliament (1653-59) lived in retirement at Penshurst. He then was nominated one

of the Council of State, and next was engaged for a twelvemonth on a political mission to Denmark and Sweden. After the Restoration he lived precariously on the Continent, flitting from place to place (Rome, Brussels, Augsburg, Montpellier, Paris, &c.); but in 1677 a pardon was procured for him from Charles II., and he returned to his native country. In 1679 he twice stood for parliament, but each time was jockeyed out of his seat in favour of the court candidate; and an attempt was made that same year to involve him in the sham Meal-tub Plot. The attempt miscarried; still, he deemed it prudent to retire for a while to France, where he bought a small property, and, to detach Louis XIV. from Charles, entered into negotiations with him through Barillon. That prior to this he had taken moneys from the French ambassador, either for himself or (more likely) for the republican cause, is admitted by Hallam and Macanlay, but disputed by A. C. Ewald, who contends that Barillon embezzled the thousand guineas that he set down to Sidney's account. Anyhow, to understand Sidney's relations with Louis, it must be borne in mind that he was hardly less hostile to William of Orange, as stadhouder, than to Charles himself, as king. Next year he was back in England, and, it is said on somewhat doubtful authority, assisted his friend, William Penn, to draw up the Pennsylvanian constitution, including the ballot, universal suffrage, the abolition of a property qualification, religious equality, prison reform, and the abolition of capital punishment except for murder and treason. In June 1683, when the Rye-house plot was announced, the chance was seized to get rid of men felt to be dangerous, and, along with Lords Russell, Essex, and Howard, Sidney was arrested and committed to the Tower. On 21st November he was tried for high-treason before the brutal Jeffreys, and, on no evidence but the traitor Lord Howard's and his own unpublished *Discourses concerning Government*, was found guilty and sentenced to die. He met his doom bravely on Tower Hill, 7th December, and was buried the next day at Penshurst. His attainder was reversed in 1689; his *Discourses* appeared first in 1698.

See Blencowe's *Sidney Papers* (1813), and the Lives of Sidney by S. W. Meadley (1813) and A. C. Ewald (2 vols. 1873), with other works cited at RUSSELL, SHAFTESBURY, and CHARLES II.

Sidney, SIR PHILIP, has still about him, in spite of all that the effacing hands of time and change could do, a halo such as surrounds no other of his contemporaries. His unselfish chivalrous nature it is, bold at once and tender, his purity of life in the corrupt atmosphere of the Elizabethan court, above all, his heroic death, which make him still in a certain sense alive among us. Yet his was in fact an unadventurous life, wasted, not by his own fault, despite of strenuous endeavour; whilst by a kind of pathetic irony the fame which preserves his gracious memory has perversely failed to do justice to that true and passionate verse which in his own day placed him at the head of our poetry next in succession to Chaucer. Sidney, born 30th November 1554, at Penshurst, Kent, and named after Philip II., was son to Sir Henry, a man of high birth and noble character, married to Mary Dudley, daughter to the Duke of Northumberland (executed for treason 1553), and sister to that base and hypocritical Lord Leicester, of all Queen Elizabeth's favourites the most ill-chosen and baleful. Philip was sent first for education to Shrewsbury School (1564), thence (c. 1568) to Christ Church, Oxford—possibly to Cambridge also. He studied hard, as his writings show, and made his two best friends, Greville, afterwards Lord Brooke, and Dyer; men likened with himself in a certain seriousness

and manliness of character, such as was naturally formed by the atmosphere of that age—troubled, yet full of hope and energy.

From 1572 to 1575 Sidney travelled in France, Germany, and Italy, completing his education after the fashion of those days, returning well versed in the best Italian literature, but unspoiled by foreign temptations. He was not a man to verify the proverb of that day, 'A devil incarnate is the Englishman Italianate.' Few men or none were then more powerful in England than his uncle Leicester, and Sidney at once began to make his career at court, then the only portal to public life. His character was now fully formed as the model of a finished English gentleman; in Spenser's fine phrase he was the 'President of noblesse and of chivalry.' Yet as a statesman Sidney practically failed. At first a favourite of the ever-fickle queen, he accompanied her progresses; he was sent ambassador (1577) to Rudolph II., and then to William, Prince of Orange. There is a vague story that he was thought of as candidate for the uneasy Polish throne; he certainly longed to join Prince Casimir, then in arms in the Netherlands. But he was not yet (1578) fated to visit Zutphen.

Sidney's court position now became trying. Elizabeth displayed her too frequent ingratitude toward his father for his exertions as Lord Deputy in Ireland, and Philip wrote in his defence with much ability and courage. And in similar style he addressed the queen against her desired match with the miserable Duke of Anjou. Elizabeth hence frowned upon him; whilst, meanwhile, Leicester's own marriage with Lady Essex had removed him from court. Sidney also retired (1580) to his admirable sister Mary, now Lady Pembroke, at Wilton, where most, probably, of his *Arcadia* was written.

Of Sidney's life in 1581–82 we know little. He returned to court, like Spenser,

To lose good days, that might be better spent;
To waste long nights in pensive discontent:

tortured also with the hopeless love, which we shall notice further on. In 1583 he was knighted; he received a paper-grant of 3,000,000 acres in 'certain parts of America not yet discovered'; and married Frances, daughter to Sir F. Walsingham. But although he may thus have thought to strengthen his position, Sidney was doomed to yet another disappointment. The arrangement which he had settled (1585) to accompany Drake on one of his buccaneer expeditions to America was defeated by Elizabeth's weakness or caprice and Drake's jealous treachery. Indeed, when seen not through the haze of tradition, the distorting mists of partisanship, but in natural light, the popular heroes of that day often drop their halo. But this subject belongs to that unwritten section of our annals, the true history of the Elizabethan age.

It was poor amends that Sidney was ordered to accompany Leicester, chosen for her general by the queen's infatuation, to carry her half-hearted and untrustworthy support to the Netherlanders in their agony and struggle against Spain. Upon the miseries of Sidney's position in his partial charge of that thrice disgraceful expedition we need not dwell. For nearly a year he was detained in idleness; then, after one small brilliant exploit, he received a wound upon 22d September 1586 in a chivalrous conflict, rash as the English charge at Balaclava, under the walls of Zutphen. He died on the 17th October, not so much of his wound, it would appear, as of the crude surgery of his day; and was mourned by England with a unanimity and a depth of feeling never surpassed—perhaps never equalled.

By 1579 Sidney, who perhaps through Gabriel

Harvey, had become acquainted with Edmund Spenser, a year or more his senior, is thought to have formed with him and some others a little literary society, which aimed at rejecting rhyme and writing English poetry in classical metres. Of that folly Sidney soon repented; but a few letters between Spenser and Harvey upon the subject, happily preserved, are noteworthy as the sole contemporary notice of Sidney's own work in literature, which we may place between 1578 and 1582. Widely celebrated as that work was during Sidney's lifetime, yet nothing of it was published till after his death. He 'purposed no monuments of books. . . . His end was not writing, even while he wrote,' said his friend Greville. Like his immediate predecessors Wyatt, Surrey, Sackville, he was statesman or courtier first, author only in leisure hours. His writings must have been partially made known by MS. circulation; yet we may suspect that Sidney's own brilliant character, his connections, which placed him in the very foremost rank of high life, his generous patronage of men of letters, with the report of those to whom his writings were communicated, united to give him his pre-eminent contemporary reputation. This was, however, amply supported when the *Arcadia* (written for his sister, Lady Pembroke, probably 1578-80, but never finished) appeared, imperfectly in 1590, completely in 1598. This book, for perhaps about a century, retained a vast popularity, though now almost unread, and indeed unreadable. It is a pastoral romance, founded primarily upon the *Arcadia* (1504) of the Neapolitan Sannazzaro, being, like that, an intricate love-story, intermixed with poems and written in melodious but elaborate prose, and not free from the artificial 'conceits,' the Euphuism, familiar in Europe to that age. But the Portuguese Montemayor's *Diana* (1542), the old Greek romance *Theagenes and Chariclea*, with, doubtless, other traditional legends, had also their share in Sidney's story; whilst its many incidents, disguises, and intricacies supplied material for later writers. But the main value of the book perhaps lay in this, that here Englishmen found their earliest model for sweet, continuous, rhythmical prose—for the prose of art. Before the *Arcadia* we have fine single passages; no such consistent whole. The verse portions are rarely happy; they must have been among Sidney's earliest attempts; but in truth his genius required that high heat of personal passion which inspires *Astrophel* to fuse his ore into gold; although that ore (to pursue the figure) is always weighty with Sidney's seriousness, his elevated thought, his chivalry of nature. As of exceptional merit may be noticed the dialogue between Nico and Dorus, and an Epithalamium of stately dignity, which may have been suggestive to Spenser. In *Arcadia* Sidney tried numerous metres, English, Italian, classical; the latter, inevitably, with small success.

To about 1580 may be assigned Sidney's *Apology for Poetry* (afterwards named *Defence of Poesy*), in reply to an abusive Puritan pamphlet, and to a general disesteem then felt in England for that art; published 1591. In this tract, written in clear, manly English, and still well worthy of readers, Sidney defines poetry, after Aristotle, as Ideal Imitation, and for her claims her ancient place as the highest mode of literature, teaching mankind the most important truths through the medium of that pleasure which is the formal end of all fine art. In mediæval fashion, many authorities are quoted, and Sidney displays his wide range of reading. Lastly, he criticises severely and justly the crowd of contemporary versifiers—not peculiar to that age!—to whose want of power, bad taste, and trivial style he partly ascribes the then existing low estimate of poetry. And here he names the best English

poets known to him: Chaucer, Sackville, Surrey, and Spenser's just (anonymously) published *Calender*. 'Besides these, I do not remember to have seen but few (to speak boldly) printed, that have poetical sinews in them.' English drama, it will be remembered, was then in its cradle.

Sidney, like Shelley, was so great a poet that he had just right to come forward in defence of poetry. But for himself it was love, not instruction, that moved him:

Come, let me write: And to what end? To ease
A burthen'd heart;

and again, to his Love,

Only in you my song begins and endeth.

For the origin of *Astrophel and Stella* (published 1591), however, we must go back to an episode in Sidney's life. In 1575, aged twenty, he met Penelope Devereux, daughter to Lord Essex, then a child of twelve. Some intimacy followed, and Essex, on his deathbed (1576), expressed a hope that the two might in due time marry. In Sidney's nature, however, was some want of youthfulness; his heart did not respond, and it was only in 1581, when Penelope was engaged and wedded (apparently without love on her part) to Lord Rich, that Sidney awoke too late to find *Quid sit Amor*—to find also that she might have loved him. It is hence a sad drama, a miniature tragedy in lyrics, that is revealed in this long series; as Nash, the editor, said, 'The argument, cruel chastity; the prologue hope, the epilogue despair.'

These 108 sonnets and 11 songs (to which a few separately published in 1598 may be added), after, or rather with, Shakespeare's sonnets, have long seemed to us to offer the most complete and powerful picture, in this form, of passionate love, in our language.

Considering the charm that Sidney's name still exerts, the close relation of his poetry to the romance of his life, and the high place in our literature merited by its great qualities, that as poet he should have met hitherto so imperfect a recognition is little to the credit of popular taste. That high place has been amply vindicated in the admirable essay by the most exquisite of poetical critics, Charles Lamb. But that Sidney's fame falls far below his deserts is due in part to that inequality of his workmanship which he shares with other supreme writers of sonnet-sequences; with Petrarch, Shakespeare, and Wordsworth. Nor did life allow him to acquire their finished art, 'His end was not writing, even while he wrote.' Fanciful conceits, obscurity from the depth and wealth of thought, are not unfrequent; at times the style is prosaic, bare, unmelodious. But over-fancifulness was the defect of that age: obscurity is common to his great rivals, when moving in the sonnet's narrow bounds.

Sidney's Poetry and *Apology* were carefully edited, the first by the Rev. A. B. Grosart (3 vols. 1877), the second by Arber (1868) and Shuckburgh (1891); Professor Feuillerat has edited the *Complete Works* (4 vols. 1912-26), including the original version of the *Arcadia*, discovered in 1907. Dr H. Oskar Sommer published in 1891 a photographic fac-simile of the original quarto edition of *Arcadia* of 1590. Fulke Greville's Life (1652) was re-edited by Sir Egerton Brydges (2 vols. 1816). See also the Life by M. W. Wallace (1915); the *Sidney Papers*, edited by Arthur Collins (1746); the Correspondence of Sir Philip Sidney with Hubert Languet, edited by Steuart A. Pears (1845); *The Sydneys of Penshurst*, by Philip Sidney (1901); and the article ZUTPHEN.

Sidon (Heb. *Šidon*), anciently a city of Phœnicia, situated on the east coast of the Mediterranean, half-way between Tyre and Beirut. It soon rose, both by its exceptional position and the enterprising character of its inhabitants, to a

leading position among the cities of Phœnicia (q.v.), so that the whole country is sometimes designated by the name of Sidon, 'the Great,' 'the Metropolis.' The extensive commerce of Sidon is well known from ancient authorities. It was always better known to the Greeks than its rival Tyre; and, when the latter declined during the Persian age, it reached its highest prosperity. An unsuccessful revolt against Artaxerxes Ochus ended in its temporary ruin (351 B.C.). Speedily rebuilt and repopled, it opened its gates to Alexander the Great (333 B.C.), and from that time forth it fell successively into the hands of Syrian, Greek, and Roman rulers. Through the middle ages little is heard of it, except that it was taken by the Crusaders. The present town of Saida has 12,000 inhabitants, of whom 8500 are Mohammedans. In the neighbourhood are numerous rock-cut burial-places of the ancient Phœnicians, in which have been found the sarcophagus of Eshmunazar, king of Sidon, and others. The town was stormed by the allies under Napier in 1840.

Sidonius Apollinaris, a 5th-century churchman and author, descended from a noble Gaulish family, held high civil offices at Rome and in 472 became bishop of Clermont. Born about 430, he died in 483. His letters (nine books) are modelled on Pliny and other classics; his poems (twenty-four books) comprise panegyrics on three emperors and two bombastic epithalamiums.

See the Abbé Chaix, *Saint Sidoine Apollinaire et son Siècle* (2 vols. Clermont, 1867-68); works by Chatelain (Paris, 1875) and Kaufmann (Göttingen, 1864); Hodgkin's *Italy and her Invaders* (vol. ii. book iii.; 1880). There are editions by Baret (Paris, 1879) and Lütjohann (Berlin, 1888); a translation of the Letters by O. M. Dalton (1915).

Siebenbürgen ('Seven Castles'), the German name of the former principality of Transylvania.

Siebengebirge, or 'Seven Mountains,' in Rheinland, on the right bank of the Rhine, about 20 miles above Cologne. The highest is the Ölberg (1522 feet); but the most famous is the Drachenfels (q.v.) The crags are crowned with ruins of baronial castles of the 12th century. Trachyte is quarried amongst these hills; from them the stone was obtained for the greater part of Cologne Cathedral.

Siebold, PHILIP FRANZ VON, physician and botanist, was born at Würzburg, 15th February 1796, became sanitary officer to the Dutch in Batavia, and, accompanying the Dutch embassy to Japan, did much to make Japan known to the western world. He spent 1826-30 in Japan, wrote on the country, its flora, and language, and died 18th October 1866.—His brother KARL THEODOR ERNST VON SIEBOLD, anatomist, was born 16th February 1804, and became famous as professor at Munich (1853), where he died, 7th April 1885. He wrote works on the Invertebrata (Eng. trans. 1857), on tapeworms, on parthenogenesis, on salamanders, and on the fresh-water fishes of central Europe. See Life by A. von Siebold (1896).

Siedlce, a town of Poland, 57 miles by rail E. by S. of Warsaw, in the voivodeship of Lublin; pop. 30,800.

Siege (Fr., 'a seat,' 'a sitting down'). When the assault of a fortified place would be too hazardous and costly and its reduction by blockade too slow, recourse is had to the *regular siege* or *systematic attack*. Until the advent of the high-explosive shell of great calibre in the 20th century, the art of besieging was stereotyped with all the rigidity the word stereotype implies. In the earlier days artillery was rarely powerful enough to destroy sufficiently a fortress, unless it were a small one,

for the assailant to be able to count upon capitulation from sheer demolition; so he had to contrive means for crossing the open ground with the least loss. Great engineers like Vauban, builders of fortresses, set their minds also to the attack of fortresses, and with such success that they could 'guarantee' to capture a given fortress in a given number of days. The plan was to approach below the surface of the ground, by trenches while still at a distance, by sapping when close up, and by mining when the enemy was proving obstinate. (A trench is begun by men standing on ground level, a sap by men pushing forward from the floor of an existing trench.) The first thing after the enemy had been driven into his works was to establish, on the front chosen for active attack, a long trench facing the place from which good small-arm fire could deal with sorties by the foe. This trench, the *first parallel*, being completed and the siege batteries installed, zigzag digging carried forward the attack until a second and a third parallel brought the besiegers close to the hostile works. Sapping and mining would then begin, and the ideal of the engineers was that, certain sections of trench or sap being completed daily and nightly, the attack should reach the fortress ditch by a certain date, close to where the guns had meanwhile been effecting breaches of the main revetments and ramparts. It was remarkable how often the time-table would work out to date, if the besieged failed to make any successful sorties. On the other hand, if the place were not completely invested, as at Sebastopol (1854-55) and at Delhi (1857), the attack was liable to interruption by threats on its flanks.

Interference from a hostile field army has also to be guarded against. This used to be done of old by a *line of contravallation* guarding the besiegers on the outside, *circumvallation* being the term applied to the siege-works proper. But, when armies became more mobile, it was found better to send out a *covering army* to meet the enemy's field troops at a distance. A place, properly invested and besieged, and not succoured from outside has hardly ever survived. The distinction between siege proper and a mere blockade or investment must be kept in mind. In 1870 Strasbourg, with an indifferent garrison of 20,000, was besieged actively by the Germans with 60,000 men, and won in less than two months. Metz, with 170,000 soldiers in it, was blockaded by about 200,000 Germans, and was starved out in about the same time. Paris, blockaded and partially bombarded, was also starved out. In 1912 the Turks lost Adrianople by siege, which was now taking the form of destruction by shells more than close threat of infantry. In the Great War, besieging, except on two occasions at Przemyśl in Galicia, took the form of complete pulverisation by high-explosive shells. The systematic advance of Vauban's day has given place to sheer demolition; the sapper has made way for the gunner.

The siege outfits of the Great War were incomparably more powerful than at any previous time. Guns and howitzers that equalled in power all but the very heaviest ships' artillery were brought into the field by tractors or on rails, and fired shells which, by power of explosion and accuracy of flight, rendered nugatory all existing permanent defences. It came about, in fact, that a fortress, left to anything like its normal garrison, as Liège and Namur and Maubeuge were, could not hope to survive more than a few days. The *siege parks* or main depôts for the besieger's artillery and engineers have increased in proportion to the size of armies; but the increasing facility of traction by road and rail has made it possible to keep these vast organisations out of reach of the fire of the besieged.

Most of the so-called sieges of the Great War were not sieges at all; they were merely prolonged pitched battles in which certain forts took a part. The 'siege' of Verdun by the Germans (1916) was a notable case in point. The *garrison* of the whole place was before the war intended to be less than 100,000 men. Long before the unsuccessful German attack was over, there was a field army of 400,000 French fighting among and in front of the original permanent works.

Mining used to be a marked feature of obstinate sieges. In the Great War, if the word siege be confined in application to the attack of permanent works, there was no scope for mining in sieges. But if we apply 'siege' to the systematic approach and capture of strong field works, most of the war in France and Belgium was a siege, and a large amount of mining was done, met by countermining on the part of the adversary. In older days the first mining in a siege was usually undertaken by the besieger for the purpose of blowing in the counterscarp of the fort's main ditch. See also FORTIFICATION AND MINES.

Among great sieges in the world's history may be mentioned those of Troy, Tyre (572, 332 B.C.), Syracuse (396 B.C.), Saguntum (219 B.C.), Jerusalem (70 A.D.), Acre (1191, &c.), Calais (1347), Orleans (1428), Constantinople (1453), Haarlem (1572-73), Leyden (1574), Breda (1625), Rochelle (1628), Magdeburg (1631), Breisach (1638), Taunton (1644-45), Londonderry (1689), Gibraltar (1731, 1779, 1782-83), Prague (1741-44), Quebec (1759-60), Seringapatam (1799), Genoa (1800), Saragossa (1808-9), Ciudad Rodrigo (1810, 1812), New Orleans (1814), Antwerp (1832), Rome (1849), Sebastopol (1854-55), Kars (1855), Lucknow (1857), Delhi (1857), Gaeta (1860-61), Vicksburg (1863), Charleston (1863-64), Richmond (1864-65), Metz (1870), Strasburg (1870), Belfort (1870-71), Paris (1870-71), Plevna (1877), Khartum (1884), Ladysmith and Mafeking (1899-1900), Port Arthur (1904), Adrianople (1912), Maubeuge (1914), Przemyśl (1915).

In what is called the 'state of siege' civil law is suspended or made subordinate to military law. A fortress, city, or district is thus put under martial law—i.e. under the authority of the military power—either on account of the presence of an enemy, as at a siege, or because of the failure of the civil power, as in the case of domestic insurrection, or of a conquered district in military occupation. The *minor state of siege*, a modification of the more severe rule, usually suffices for domestic troubles. No such provision is made by the laws of the British Empire or of the United States, though very similar powers are exercised when martial law is proclaimed. For this no rules are made—the possibility of civil war is not presupposed; but should the civil power become inoperative it is the duty of the supreme authority to maintain order by any means (usually of course an armed force) that are available, afterwards coming to parliament for an act of indemnity to justify conduct in itself contrary to law. Perhaps an approach to the continental *minor state of siege* may be found in the restricted power to try offenders in Ireland by military tribunals created by act of parliament in 1799, 1803, and 1833.

Siegen, a town of Prussia, in Westphalia, stands on the Sieg, 47 miles E. of Cologne, manufactures leather, paper, linen, soap, iron, copper, lead, zinc, &c., having many mines in the vicinity. Siegen was the birthplace of Rubens. Pop. 31,000.

Siegfried, or SIGFRID. See NIBELUNGENLIED.

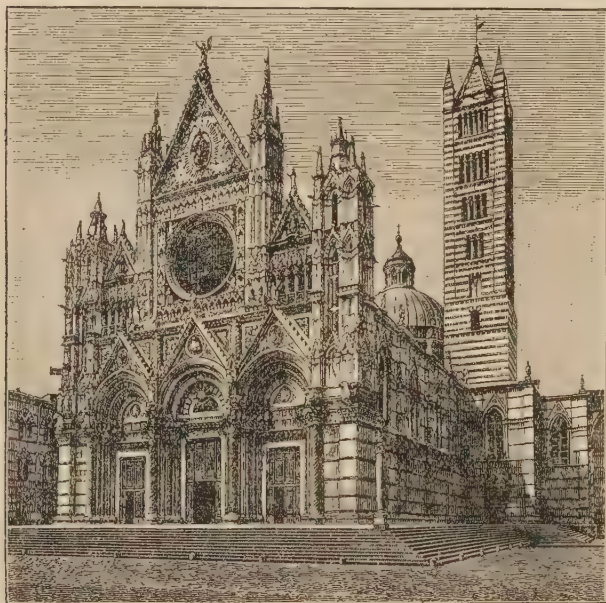
Siemens, WERNER VON, engineer and electrician, was born 13th December 1816 at Lenthe in Hanover. In 1834 he entered the Prussian artillery, and in 1844 was put in charge of the

artillery workshops at Berlin. He early showed scientific tastes, and in 1841 took out his first patent for galvanic silver and gold plating. He was of peculiar service in developing the telegraphic system in Prussia, and discovered in this connection the valuable insulating property of gutta-percha for underground and submarine cables. In 1849 he left the army, and shortly after the service of the state altogether, and devoted his energies to the construction of telegraphic and electrical apparatus of all kinds. The well-known firm of Siemens and Halske was established in 1847 in Berlin; and subsequently branches were formed elsewhere. Besides devising numerous useful forms of galvanometers and other electrical instruments of precision, Werner Siemens was one of the discoverers of the principle of the self-acting dynamo (see DYNAMO-ELECTRIC MACHINES). He also made valuable determinations of the electrical resistance of different substances, the resistance of a column of mercury, one metre long and one square millimetre in cross section at 0°C., being known as the Siemens Unit. His numerous scientific and technical papers, written for the various journals, were republished in collected form in 1881. In 1886 he gave 500,000 marks for the founding of an imperial institute of technology and physics; and in 1888 he was ennobled. He died at Berlin, 6th December 1892. See his *Personal Recollections* (translated, 1893) and his *Scientific Papers* (2 vols. 1892-95).

Siemens, SIR WILLIAM (KARL WILHELM), the younger brother of Werner Siemens, was born at Lenthe in Hanover, April 4, 1823. He was educated at the trade school at Magdeburg, and spent a year in study at Göttingen University, where he worked hard at science. In 1843 he visited England, and was successful in introducing a process for electro-gilding invented by his brother Werner and himself. In 1844 he again came to England and patented his differential governor. Thenceforward he made England his home, and became a naturalised British subject in 1859. In 1862 he was elected a Fellow of the Royal Society, and was presented with the Royal Albert Medal (1874) and with the Bessemer Medal (1875) in recognition of his researches and inventions in heat and metallurgy. He filled the president's chair in the three principal engineering and telegraphic societies of Great Britain, and in 1882 was president of the British Association. He was knighted in April 1883, and died on November 19 of the same year. As manager in England of the firm of Siemens Brothers, Sir William Siemens was actively engaged in the construction of overland and submarine telegraphs. The steamship *Faraday* was specially designed by him for cable-laying. In addition to his labours in connection with electric lighting, Sir William Siemens also successfully applied, in the construction of the Portrush Electric Tramway (opened 1883), electricity to the production of locomotion. In his regenerative furnace (1856) he utilised in an ingenious way the heat, which would otherwise have escaped with the products of combustion. The process was subsequently applied in many industrial processes, but notably by Siemens himself in the manufacture of steel (see IRON AND STEEL). Of his miscellaneous inventions and researches, the following are particularly worthy of mention: a water-meter; a thermometer or pyrometer, which measures by the change produced in the electric conductivity of metals; the bathometer, for measuring ocean depths by variations in the attraction exerted on a delicately suspended body; and the hastening of vegetable growth by use of the electric light.

See his *Life* (1889) by Pole and his *Scientific Works* (1889).

Siena, a Tuscan city 60 miles by rail S. of Florence; it is still surrounded by walls, and, owing to its situation on three hills and the number of buildings in the Gothic style which it still retains, is one of the most picturesque towns in Italy, with a predominantly mediæval aspect. The chief architectural glory of Siena is her cathedral, one of the finest examples of Gothic work in Italy. It was begun early in the 13th century; in 1339 it was intended to build a vastly larger church, of which the existing cathedral should have been only one transept. But after



Cathedral at Siena.

the plague of 1348 the idea was abandoned, and only ruined walls indicate the ambitious design. The magnificent west front with its three bays was not finished until 1380; it is partly pointed, partly round-arched, and is enriched with red, white, and black marbles, gilding, and many sculptures. A lofty square campanile stands on the south side. The art treasures of the interior embrace the wonderful octagonal pulpit by Niccolò Pisano (1268), similar to the one at Pisa; the marble mosaic floor of the cathedral, from designs by Buoninsegna and Beccafumi; the series of frescoes commemorative of the life of Pope Pius II., by Pinturicchio, in the Piccolomini Library, where also are preserved several choir-books splendidly illuminated by Sienese artists; the celebrated font, with bas-reliefs by Donatello, Della Quercia, and other sculptors, in the church of San Giovanni, situated beneath the cathedral. The churches of Sant' Agostino, the Servites, San Domenico, and some others contain pictures by Sodoma, Matteo di Giovanni, and other Sienese artists. The greatly venerated Church of St Catharine (q.v., a native of this city) stands on the site of her former dwelling-house; and not far away is the fountain of Fontebranda, celebrated by Dante. The municipal palace, in the picturesque market-place (Piazza del Campo), a magnificent edifice of brick in the Pointed Gothic style, begun in 1288 and finished in 1309, is adorned on the exterior by a lofty tower (1348), and contains numerous paintings by Sienese artists and the reliefs of the Fonte Gaia, the masterpiece of Jacopo della Quercia (1409-19)

which stood in the piazza, where it has been replaced by a modern copy. There are several noble palaces, as the Piccolomini, Tolomei, Monte de' Paschi, Loggia del Papa, some dating from the 13th century, and some now put to various public uses. The more noteworthy of the public institutions are the university, with faculties of medicine and law, founded in 1203; the state archives and the town library; and an Institute of Fine Arts (1816), sheltering in its gallery many fine pictures by masters of the Sienese school, the principal of whom are Buoninsegna, the brothers Lorenzetti, Simone di Martino, Matteo di Giovanni, Peruzzi, Sodoma (Bazzi), and Beccafumi. The city has also given birth to a host of other illustrious men, as Æneas Piccolomini (Pope Pius II.), Gigli (a scholar and a humorist), Bernardino Ochino, the two Socini (founders of Socinianism), and the architects Agnolo, Agostino, and Della Quercia. Every July (2d) and August (16th) celebrated horseraces (the Palio, so called from the banner given to the winning *contrada*, or ward of the city) are held in the market-place, being the survival of still more widely celebrated popular festivals of the middle ages. The inhabitants weave silk, manufacture cloth and hats, and carry on an active trade in wine and olive-oil. Siena is the seat of an archbishop. Pop. of commune (1921) 43,879.

Siena was made a Roman colony by Augustus under the name of *Sena Julia*. After the empire was broken up the city was under the rule of a *gastaldo* under the Lombards, and of a count in the Carolingian period, whose authority gave way to that of the bishop. Later on it formed itself into a free republic, governed by consuls, and grew so much in power and prosperity that it became the head of the Ghibelline towns in Central Italy. During this period (the 12th and 13th centuries) it had a dangerous rival in Florence, but inflicted a crushing defeat upon the Florentine militia at Montapertto in 1260. A century later, however, when hard pressed by Florence, the Sienese put themselves (1399) under the protection of the Duke of Milan. Nevertheless hostilities were frequently renewed with their powerful rival during the 15th century. Between 1487 and 1512 the virtual ruler of Siena was Pandolfo Petrucci, called the Magnificent, who aimed at founding a dynasty in his native city similar to that of the Medici in Florence; but his descendants were not the men to realise his ambitions, and in 1524 the people, to escape from the dominion of the Petrucci, put themselves under the suzerainty of the Emperor Charles V. Yet soon afterwards the city revolted and called in the French to its aid; but it and its ally were defeated and Siena itself besieged (1555) and taken. The emperor then gave it to Cosimo de' Medici (1557), who annexed it to Florence, and subsequently incorporated it in Tuscany (q.v.).

See W. Heywood, *Our Lady of the Palio* (1899) and other works; L. Douglas, *History of Siena* (1902); E. G. Gardner, *Story of Siena* (1902); W. Heywood and L. Olcott, *Guide to Siena* (1903).

Sienkiewicz, HENRYK (1846-1916), Polish novelist (see POLAND), was born at Wola Okrzeńska, near Żuków, in Russian Poland, and studied philosophy at Warsaw. He early devoted himself to literature, and lived for a time in America. Besides *Quo Vadis?* (1896), a study of Roman

society under the Emperor Nero, his chief works are the trilogy, *With Fire and Sword* (1884), *The Deluge* (1887), and *Pan Michael* (1889), dealing with the dramatic events in Polish 17th-century history, and *The Knights of the Cross* (1900), where, in a 15th-century setting, is set forth the conflict between Slav and Tenton. These historical novels of Sienkiewicz have been called 'a kind of national gospel,' in that they kept alive in the dark years after the eighteen-sixties the national pride in the past glories of Poland. His brilliant narrative and realistic presentations of history are coloured with a strong sense of humour, but are not free from crudity and melodrama. In 1905 he was awarded the Nobel Prize for Literature. For many years he worked hard in the cause of Polish independence. See Monica Gardner, *The Patriot Novelist of Poland* (1926).

Sienna. See SIENA; also BURN'T SIENNA.

Sierra, the name applied in Spain and in Spanish-speaking countries to a range of mountains. It is usually derived from the Latin *serra*, 'a saw,' but more probably comes from the Arabic *sehrāh*, 'a desert place,' whence also Sahara.

Sierra, GREGORIO MARTÍNEZ, Spanish novelist and playwright, was born at Madrid in 1881, and early devoted himself to journalism. His first works were volumes of short stories or novels, but since 1907 he has written, besides adaptations and translations, over forty plays, of which the best known are those translated as *The Cradle Song* (1911), *Mama* (1912), *Madame Pepita* (1912), *Dawn* (1915), *The Kingdom of God* (1915), *The Romantic Young Lady* (1918). While his earlier work is more idyllic and his later work more socialistic, his style is always clear and direct, and his dramatic effects are achieved with strict economy of material. With a healthy optimism, tinged with a certain ironic humour, he shows unbounded sympathy with humanity, and his studies of women are especially true. In 1916 he undertook the management of a repertory theatre in Madrid.

Sierra Leone, a British colony—since 1888 a separate and distinct colony—on the west coast of Africa, stretching 180 miles along the coast from French Guinea in the north to Liberia in the south, with an area of 4000 sq. m. (including the Banana, Sherbro, and other islands). In 1896 a hinterland of 27,000 sq. m. was proclaimed a protectorate, and was organised after the troubles about the hut-tax in 1898 (which for a time caused some anxiety). New arrangements were made in 1913 and in 1914. Pop. of protectorate (1921) 1,456,148. The name Sierra Leone is more strictly confined to a densely wooded peninsula, 26 miles long by 12 broad, jutting out to the NW., just south of the Sierra Leone (i.e. the river Rokelle) estuary, which rises to 3000 feet in Sugar Loaf Mountain. The climate is very hot and very moist. The rains last from April to December, and the annual rainfall ranges from 144 to 170 inches. The thermometer varies between 64·5° and 100·5° F. The low-lying districts are infested with a good deal of fever and malaria; but the higher parts are comparatively healthy. Sierra Leone is often called the 'White Man's Grave'; but the title would be just as appropriate to any of the adjacent coast-regions of that part of Africa. The resources of the colony are by no means fully developed. The population, 37,039 in 1871, 75,572 in 1911, was 85,163 in 1921 (1161 Europeans). They are nearly all negroes, about one-half the descendants of liberated slaves, the others belonging to almost all the tribes of that part of Africa. But all the negroes are alike

indolent, and the soil does not yield anything like what it is capable of yielding. Coffee, cocoa, tapioca, ginger, maize, cassava, and cotton are grown; but the bulk of the exports (palm-oil and kernels, ground-nuts, kola-nuts, benni-seed, ginger, hides, india-rubber, and gums) comes from the interior. Clothing, provisions, coal, wine and spirits, and tobacco are the principal imports. The capital is Freetown (q.v.), an important port and coaling station. The colony is provided with good roads, and has a narrow gauge railway system connecting Freetown with Pendembu and Kamabai. Furah Bay College (1828), near Freetown, was founded by the Church Missionary Society, with which the Wesleyan Missionary Society has been associated since 1918. It was affiliated in 1876 to Durham University. There are several good schools in the colony. Sierra Leone gives title to an Anglican bishop, and contains many Methodists, besides a large body of Mohammedans. The governor is assisted by a nominated executive council and a legislative council, of whom three members are elected by male voters, the rest being official or nominated, including three paramount chiefs of the protectorate.

This district was discovered and named (from the lion-like thunder on its mountain-tops, Sierra Leone, 'Lion Mountain') by the Portuguese navigator, P. de Cintra, in 1462. In 1787 a body of freed slaves were planted here as a colony; but the enterprise was not a success. Four years later a second attempt was made by the Sierra Leone Company (which included amongst its promoters men like Granville Sharp, W. Wilberforce, and Sir R. Carr Glynn). But this scheme, even though supported by the arrival of 1200 freed negro slaves from North America, was not an unqualified success, and in 1807 the company transferred their rights to the crown. Slavery survives in the protectorate.

See N. W. Thomas's *Anthropological Report* (1916), Goddard's *Handbook of Sierra Leone* (1925), Migood's *View of Sierra Leone* (1926), and F. W. B. Thompson's history (1926).

Sierra Madre ('Main Chain'), a general name for the mountains that in Mexico stretch northward from about Guadalajara to Arizona, forming the western wall of the plateau, and separating Chihuahua from the maritime states of Sinaloa and Sonora. Along the eastern foothills of the range, in north-west Chihuahua, the country is very fertile. The so-called Sierra Madre Plateau, on the United States frontier, is a northern continuation of the Chihuahua plateau.—The name has often been more widely extended, however, to include the central and eastern ranges of the Cordilleras.

Sierra Morena, a mountain-range, or rather a broad mountain-ridge in the south of Spain, forming the southern edge of the great central plain of the peninsula. It separates the basin of the Guadiana on the north from that of the Guadalquivir on the south, and ranges in height from 2000 to 5500 feet. Valuable mines of lead, silver, quicksilver, sulphur, and lignite, as at Tharsis and Río Tinto, occur in certain parts of the system. It is frequently mentioned in *Don Quixote*, and is the scene of many of the incidents therein described.

Sierra Nevada (i.e. 'Snowy Range'), (1) a mountain-range of southern Spain, stretches east through the province of Granada to the frontiers of Almería, is 60 miles in length, from 20 to 30 in breadth, and covers an area of 1060 sq. m. It forms a portion of the watershed between the streams that flow into the Mediterranean and those that flow into the Atlantic. The peak of Mulhacén (11,421 feet) is the highest point of the

Spanish Peninsula. The range receives its name from the perpetual snow which covers the highest summits (down to 11,000 feet). The system is connected with other mountain-masses in Spain, to north, east, and west, and its edges are much indented by deep valleys.—(2) A range of mountains in California, forming the eastern boundary of its Great Central Valley, and extending from north-west to south-east 450 miles, until in the neighbourhood of 35° N. this and the Coast Range meet and become continuous. Among the higher peaks of the Sierra Nevada are Mount Whitney (14,501 feet high), Mount Williamson (14,384), Mount Russell (14,190), Mount Shasta (14,162), Mount Langley (14,044). Granite and metamorphic slate are the principal rocks; in some parts volcanic rocks are abundant. The sides of the range are covered with great forests. Gold embedded in quartz is found in large quantities, and silver-mines have been opened on the east side. The Southern Pacific Railroad crosses the range at an altitude of 7042 feet.—(3) *Sierra Nevada de Mérida* is the principal chain of the Andes in Venezuela, rising to over 15,300 feet.—(4) *Sierra Nevada de Santa Marta* is a system in the extreme north of the republic of Colombia, flanking the sea, and stretching westward from near Venezuela to the low swamps and marshes of the Río Magdalena (about 120 miles). The central knot consists of two tables, with from eight to ten separate summits, all capped with snow, the highest point being 16,733 feet. The leading rocks are granite, syenite, and various slates, sandstones, quartz, and older eruptive rocks. The northern slopes are densely wooded with virgin tropical forests from 4000 feet downwards; the southern slopes are naked rocks above 6300 feet. The valley of the Río Cesar is especially fertile, and in the mountains the Arhuacos Indians have even coca plantations. Copper, silver, and gold are found, and coal in the Río Cesar valley.

Sieyès, EMMANUEL JOSEPH, COMTE, who, as the Abbé Sieyès, figures prominently in the French Revolution, was born, the fifth child of an honest bourgeois family, at Fréjus, 3d May 1748. He had his education from the Jesuits at Fréjus and the Doctrinaire Fathers at Draguignan, and first wished to be a military engineer, but was condemned to the clerical calling by the weakness of his health. He studied theology at Saint-Sulpice, where his originality and boldness of speculation caused no small misgiving to his masters, and completed his course at the seminary of Saint-Firmin. He became canon in the diocese of Tréguier (1775), next chancellor and vicar-general of the diocese of Chartres, and was sent by the latter to the Chambre Supérieure of the Clergy of France. Between the dissolution of the Assembly of Notables and the reunion of the Constituent Assembly he published three famous pamphlets which carried his name over the length and breadth of France: *Vues sur les Moyens d'Exécution* (1788), *Essai sur les Privilèges* (1788), and, the most famous of all, *Qu'est-ce que le Tiers-Etat?* (January 1789). His answer to the last question was 'Everything'; 'What has it been hitherto?' was his next question; its answer, 'Nothing.' 'What does it desire to be?'—'Something.' He was elected one of the deputies for Paris, and it was on his motion (June 10, 1789) that the tiers-état sent a final invitation to the noblesse and clergy to join them, with the intimation that if they refused they would constitute themselves into the States-general. Seven days later the National Assembly was formed, the name being due to the suggestion of Sieyès. After Mirabeau made his memorable answer to the king's messenger, the Marquis de Dreux-Brézé (June 23), Sieyès reassured the members with the characteristically quiet words, 'Gentlemen, you are to-day what you

were yesterday.' The deadly enemy of privilege, cold, inflexible, fearless in logic and trenchant in phrase, Sieyès gained great influence, and the division of France into departments for administrative purposes, declared in the last two months of 1789, was mainly his work. He took part in the memorable declaration of the Rights of Man (26th August 1789), and opposed the royal veto, during the great debate on which question Mirabeau invoked the counsel of Sieyès as that of a man 'whose silence and inaction I regard as a public calamity.' But he kept aloof from Mirabeau's alliance, opposing his policy alike in the last measure and in his refusal to the Assembly of the right of nominating the regent in the event of the king's death. He was elected to the National Convention, sat in the centre, voted for the king's death *sans phrase*, it is said (though he denied adding these words to the one word *mort*); but as the Revolution grew sank into 'philosophic silence,' his heart filled with disdain alike at its illogical excesses and the bombastic rhetoric of its leaders. Asked long afterwards what he had done during the Terror, he is said to have replied, 'J'ai vécu.' He opposed the new constitution of Year III. (1795), and declined a seat on the Directory named by the new Corps Législatif, which entered on its functions on the 27th October of that year, but had a share in the *coup d'état* of 3d September 1797 (17th Fructidor). In 1798 he went on mission to Berlin, was elected to the Directory in 1799, and now, like Barras a traitor to the Republic, he plunged into a web of dark intrigues with a view to find a soldier who would be content to be an instrument. Bonaparte returned from Egypt on October 25, 1799, and together they plotted the revolution of the 18th Brumaire (November 9, 1799), the result of which was the institution of the Consulate of Sieyès, Bonaparte, and Roger Ducos. Once more he drew upon his skill as a framer of constitutions, his final effort being a masterpiece of complexity beyond the calculating machine of Pascal, its aim to break the force of democracy by dividing it, to triumph over the passions of men by cunningly balancing them the one against the other. But he soon discovered in his new ally a master. Finding himself befooled by Bonaparte, he threw up his consulship in disgust, his last illusion shattered for ever. His fall was somewhat gilded over by the title of count, a sum of 600,000 francs, and the estate of Crosne. The presidency of the senate was offered him later, but declined. He wrapped himself in morose meditations during the Empire, filled with silent irony and scorn for that humanity which had so little realised his views. Exiled at the Restoration, he lived in Belgium for fifteen years, returned in 1830, and after a long illness in which his mind often wandered to the Terror and the sinister name of Robespierre, died at Paris, 20th June 1836.

See Sainte-Beuve's *Causeries du Lundi* (vol. v.), and books by Beauverger (1851), Mignet (1853), Bignon (1894), and Clapham (1912).

Sigfried. See NIBELUNGENLIED.

Sight. For the organ of sight, its anatomy, physiology, defects, and diseases, see EYE; also BLIND, COLOUR-BLINDNESS, COLOUR-VISION, OPTICS. For the theory of vision, see VISION.

Sigillaria (Lat. *sigillum*, 'a seal'), a genus of fossil plants ranging from the Upper Devonian to the Permian, and attaining its maximum development in the Upper Carboniferous. The *Sigillaria*, forming as they do the chief constituents of many coal-seams, particularly in the Middle and Upper Coal Measures, are regarded as one of the most important genera of Palæozoic plants. They show a characteristic arrangement of the leaf scars

which are usually in vertical series, the scars of adjacent series alternating. Two main divisions of the genus are recognised—the *Eusigillariae* which have ribbed stems, and the *Subsigillariae* in which ribbing is absent. The latter are characteristic of the Upper Coal Measures and Permian. Over one hundred species of the plant have been described.

The *Sigillariae* were among the largest trees in the forests of Palaeozoic times. Stems, in most cases nearly cylindrical, have been found with a length of nearly one hundred feet, some unbranched, others branching dichotomously. Quite frequently leaves are found attached, particularly to the upper part of the stem. The fructifications, which were for long unknown, are large cones, called *Sigillariostrobus*. The roots, known under the name of *Stigmara*, usually start from the stem in four main branches, which divide dichotomously several times, and then extend for long distances like great cylindrical cables. They are abundant in the 'underclays' of the Coal Measures. Dr D. H. Scott has suggested that the unbranched *Sigillariae* had a habit something like that of the Australian grass-tree, the tall stem ending in a sheaf of grass-like leaves.

The affinities of the *Sigillariae* were for long matters of dispute among botanists. Dr Brongniart, who in 1839 described the first *Sigillaria* known to have preservation of internal structure, regarded the presence of secondary growth as a character unknown in cryptogams, and concluded 'that the *Sigillariae* and *Stigmara* constituted a special family, entirely extinct, probably belonging to the great division of gymnospermous dicotyledons.' At that time the fructifications were unknown. Subsequent research led to the discovery of secondary growth in many cryptogams. Moreover, *Sigillariostrobus*, the cone of *Sigillaria*, has proved to be cryptogamic in character. *Sigillaria* is now accepted as belonging to the lycopodiaceous cryptogams, and as having very close affinities with the well-known genus *Lepidodendron*. See Scott's *Studies in Fossil Botany*, Part I., 1920.

Sigismund, German emperor (1411-37), the son of the Emperor Charles IV., was born on 28th June 1368. He was made king of Hungary when only nineteen, succeeding to that dignity through his wife. In 1396 at the head of a numerous army he attempted to relieve the Byzantine empire from the Turks, but was terribly defeated at Nicopolis (28th September). Some years later he conquered Bosnia and Herzegovina and reduced Serbia to his sway. In 1411 he was proclaimed king of the Romans on the death of Rupert; he was crowned emperor in 1414 and again in 1433. One of his earliest acts as emperor was to induce Pope John XXIII. to call together the Council of Constance (q.v.) for the purpose of putting an end to the Hussite and other schisms. But although he supported the party of reform, he made no effort to uphold the safe-conduct he had granted to Huss, and permitted him to be burned by his enemies. In return for this breach of faith his

succession to the throne of Bohemia, after his brother's death, was opposed by the Hussites; and they maintained their opposition so stoutly that it was 1436 before Sigismund, making concessions, could put the crown of Bohemia on his head. But in the year following he died at Znaim, on 9th December. This emperor possessed many of the qualities of a capable ruler, and made praiseworthy attempts to introduce various reforms in the administration of the empire, but his efforts seem to have been frustrated in great part by his own lack of decision and by his chronic want of money. Brandenburg, given him by his father, Charles IV., he bestowed in 1415 upon his right-hand man, Frederick of Hohenzollern (q.v.).

See a monograph by A. Main (1903). For the Polish Sigismunds, see POLAND.

Sigmaringen. See HOHENZOLLERN.

Signalling is a method of transmitting intelligence to a distance, great or small, by means of coloured flags, shapes, semaphore, waving one or two flags, flashes, sounds, &c. Incomparably the most powerful medium yet known for this purpose is the electric current (see TELEGRAPH, TELEPHONE). For railway signals, see RAILWAYS.

A	J	S
B	K	T
C	L	U
D	M	V
E	N	W
F	O	X
G	P	Y
H	Q	Z
I	R	CODE FLAG & ANSWERING PENNANT

BLUE RED YELLOW WHITE BLACK

Fig. 1.

The ancients seem to have elaborated a fair system of night-signals by torches for military purposes (see BEACON); but in naval affairs the ships sailed so close together that orders could be

communicated by word of mouth, while the turning of a shield from right to left sufficed as sailing directions to the several lines. In the time of James II. a ship's signal could only be expressed by flags, in confusing number, hung in different parts of the vessel. Thanks to Sir Home Popham, Marryat, and other inventors, the system has been invented of hanging a number of flags under one another, each combination having an arbitrary conventional meaning attached to it. In 1857 the British Board of Trade devised a new set of eighteen coloured flags, and published a code under the name of *The International Code of Signals*. In 1901 this code was cancelled, and eight new flags were added to the old eighteen, thus completing the alphabet. This change involved rewriting the code-book.

In the present code, flag-signals are made by hoisting two, three, or four flags together, one below the other. In the code-book each set of hoists is printed alphabetically. The meanings of the signals are also printed alphabetically under the principal word of the signal, e.g. all 'Ice' signals are printed under the code-word 'Ice.'

To make a signal on board ship A, ship A hoists her ensign with the code flag under it; then hoists the signal where it can be best seen (not necessarily at the mast-head). The ship B, signalled to, hoists her Answering Pennant at the 'dip' when A begins signalling, and hoists it 'close up' when the signal is clearly read. Then A hauls down the signal-flags. If B cannot understand A's signal, B keeps her Answering Pennant at the 'dip,' and hoists a 'not understood' signal.

Two-flag hoists are 'Urgent' or 'Important Signals.' For general conversations, the three-flag hoists, called the 'General Vocabulary,' are most in request. Geographical signals are four-flag hoists, of which the uppermost flag is A or B. Names of ships of the British royal navy are four-flag hoists, of which the uppermost flag is G. Merchant ships' names are four-flag hoists, of which the uppermost flag is H or succeeding letter.

Various foreign maritime nations have adopted this code, and have, of course, translated it. It is obvious that, in using and interpreting signals, the signalman must be in possession of the Signal Code-book, a bulky quarto of 570 pages.

For signalling by shapes, the shapes used are a cone point up, a cone point down, a ball, and a drum.

Each letter of the alphabet is made by a combination of three of these shapes. A and U are shown in fig. 2.

The same alphabet is used for semaphore signalling, the cone point up being replaced by arm up; cone point down by arm point down; arm level for ball (all these are on the side opposite a short level arm at the bottom of the post, known as the

'indicator'); arm level, on same side as indicator, is the drum. The letters A and U on this semaphore are shown in fig. 3.



Fig. 2.

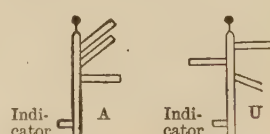


Fig. 3.

These signals, whether shapes or semaphore, are called 'Distant Signals,' but their use at sea appears to be very rare.

Another alphabet, given below, is framed for use in flag-waving with two flags, and for a corresponding semaphore.

ARM SEMAPHORE ALPHABET.

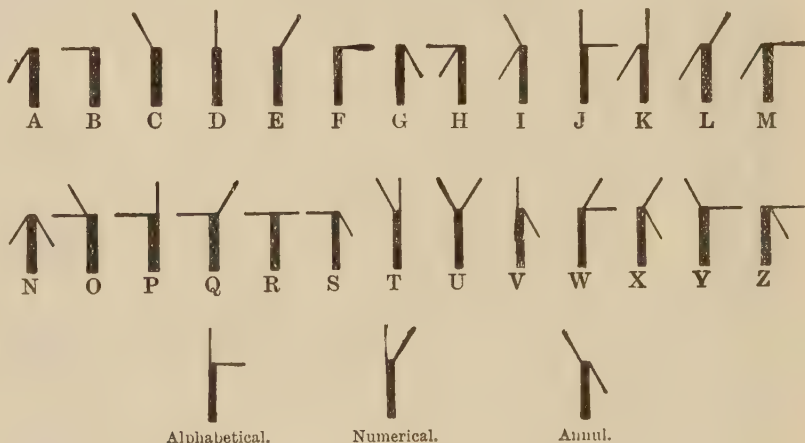


Fig. 4.

Note.—The letters A to I represent the numerals from 1 to 9 respectively; K represents zero.

Recent years have seen the general introduction at sea of light-flashing and sound-signals, especially in the form of wireless telegraphy. The Morse alphabet given below is invariably used:

MORSE ALPHABET.

A	— — — — —	N	— — — — —
B	— — — — —	O	— — — — —
C	— — — — —	P	— — — — —
D	— — — — —	Q	— — — — —
E	— — — — —	R	— — — — —
F	— — — — —	S	— — — — —
G	— — — — —	T	— — — — —
H	— — — — —	U	— — — — —
I	— — — — —	V	— — — — —
J	— — — — —	W	— — — — —
K	— — — — —	X	— — — — —
L	— — — — —	Y	— — — — —
M	— — — — —	Z	— — — — —

Fig. 5.

In signalling, the dot is represented by a short flash or short sound, and the dash by a long flash or long sound. Signals may be made by the ordinary International Code Signal Book. The same Morse alphabet is used in flag-waving with one flag. (See below, *Army-signalling*.)

The international signals used by vessels which are in distress to summon assistance are: in the daytime, a gun or other explosive signal fired at intervals of about a minute; the International Code signal of distress indicated by NC; the distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball; a continuous sounding with any fog-signal apparatus; and, at night, a gun or other explosive signal fired at intervals of about a minute; flames on the vessel (as from a burning tar-barrel, oil-barrel, &c.); rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals.

A steamer steaming shows green starboard light, red port light, and one mast-head white light or two, the second one aft of and higher than the forward one; and a white light astern, or a flare up astern when necessary; steam-tugs double or triple the masthead light; sailing-vessels carry a green starboard light and a red port light; steamers and sailing-ships unable to manœuvre show two red lights vertically at night, and two balls vertically in daytime; cable-laying ships show red, white, red lights vertically at night, and red ball, white diamond shape, and red ball, vertically, in daytime. Vessels fishing have special lights. See also FOG-SIGNALS.

Ships wanting a pilot hoist the Union Jack with a white border, or PT, or S, or a cone with two balls above it. At night the signal is a blue light, or a white light shown at short intervals during a minute.

The use of signals to indicate to the mariner the approach of wind storms has become common in maritime countries. The British signals are as follows: A 'cone point down' indicates the approach of a gale or strong winds from E., SE., SW., or W., veering (right-handed); and a 'cone point up' indicates the approach of a gale or strong winds from SE., E., or NE., backing (left-handed), or from NW., N., or NE., veering (right-handed). At night the cones are replaced by a triangle of lights.

See *International Code of Signals*, *The British Signal Manual*, *The Signal Letters of British Ships*, *Regulations for Preventing Collisions at Sea*, *Monthly Notices to Mariners*; weather signals published by the various government meteorological offices.

Army-signalling.—The system of visual signalling adopted in the British army is a combination of short or long flashes by lamps at night, and the alternate appearance or obscuration of any given object by day (revolving shutters or discs, semaphores, collapsible cones, flags, or even jets of steam), and if visible symbols are not available, short and long sounds on a fog-horn, bugle, or steam-whistle may be used. By any of these means the dot and dash of the Morse alphabet,

as used in telegraphy, can be expressed; a more regular method is to use flags or mirrors, the Heliograph (q.v.) if the sun is shining by day, and lamps at night. Powerful lamps are also used by day. Every unit of the army trains a number of its officers and men in signalling, which has been found to be of the greatest use on active service, especially in savage countries.

Fig. 6 shows the manner of working the flag in

and numbers laid down in the army and navy signal-book or secret codes are sometimes used instead of spelling the words by the Morse alphabet. This prevents unauthorised persons reading the signals. The semaphore systems already described are also made use of, and are indeed quicker than the Morse system of dots and dashes, in which some of the letters require four movements. While the maintenance of these systems of visual signalling is essential for military field operations, the great extension of modern battlefields, as well as the difficulties of communication produced by fog and by close country, where view is short, necessitates the supplementing of this means of communication by the use of field telephones and of wireless telegraphy. Thus the commander of a battery may often have to observe the effects of its fire, and order the necessary corrections, from a point where his guns are invisible to him.

The difficulties were overcome to some extent in the 19th century by the use of field telegraphy and telephony. Conditions were exceedingly unfavourable to visual signalling in Manchuria during the Russo-Japanese war and a beginning was made in wireless telegraphy. Progress, however, was slow until the years of the Great War. The need for highly organised intelligence and communication brought an elaborate system of field telephones, but the superiority of wireless communication steadily asserted itself, and wireless telegraphy and telephony became of first-rate importance. Other means of sending messages were, of course, utilised when necessary and possible, dogs and carrier-pigeons being frequently resorted to for conveying messages.

Signature. See BOOK, DEED.

Signature in Music is of two kinds. (1) The key-signature, placed on the staff after the Clef (q.v.), indicates in a group the number of sharps or flats of the Scale (q.v.) in which the composition is written. The order of the sharps or flats remains the same in which they have been introduced in the regular succession of scales. The sharpened seventh of the minor scale occurs in the music as an accidental (see ACCIDENTALS). (2) The time-signature, placed after the key-signature, indicates the rhythm of the composition, commonly by a fraction, the denominator referring to one of the divisions of a semibreve, and the numerator to the number of those divisions contained in one bar. In most classical music, however, for four crotchets in a bar, a semi-circle (in the shape of the letter C) is used—a relic from mediæval times, when the circle indicated perfect or triple time, and a semi-circle imperfect or duple time—while usually a semi-circle with a bar through it stands for two minims in the bar.

Signatures, THE DOCTRINE OF, an inveterate belief in early medicine that plants and minerals bore certain symbolical marks which indicated the diseases for which nature had intended them as special remedies. These figures, of course, were not the result of chance, but the evidence of Providence, being really the characters and figures of those stars by whom they are principally governed and endowed with particular virtues. And the doctrine brings us into the wider region of magic in its fundamental confusion between an object and its image, the word and its idea. Many names witness to a belief in this theory, as *mandrake*, *kidneywort*, *scorpion-grass*, and the *Euphrasia* or eyebright. In the case of the last, for example, the plant was supposed to be good for the eyes, because of a black pupil-like spot in its corolla; and by an analogous process of thought the yellow turmeric was thought good for jaundice, the bloodstone for stopping bleeding. Similarly white things were

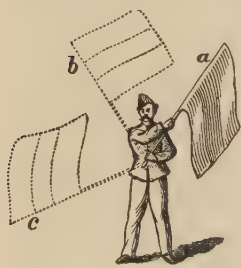


Fig. 6.

Morse flag-signalling: from *a* to *b* and back to *a* is a dot, from *a* to *c* and back to *a* is a dash. The code

regarded as refrigerant, red as hot. So in small-pox red bed-coverings were used, with the view of bringing the pustules to the surface of the body; red things were to be looked upon by the patient; burnt purple, pomegranate seeds, mulberries, and other red ingredients were dissolved in his drink. John of Gaddesden, physician to Edward II., directs his patients to be wrapped up in scarlet dresses, and claims by this means to have recovered the young prince quickly from an attack of small-pox. Wraxall, in his *Memoirs*, tells us that this was done so late as 1765 with the Emperor Francis I. when ill with smallpox. See PLANTS; and T. J. Pettigrew, *On Superstitions connected with Medicine and Surgery* (1844).

Signboards were known to both Greeks and Romans. There are allusions to them in classic writers; and specimens have been found at Pompeii and Herculaneum, sometimes painted, but oftener carved. A bush was the sign of many taverns so late as the reign of James I., and the antiquity of that sign may be inferred from the analogy of our proverb, 'Good wine needs no bush,' to the Latin 'Vino vendibili suspensâ hederâ non opus est.' During the illiterate middle ages every trade had its emblem, some of which have survived to our day, as the chemist's pestle and mortar, the pawnbroker's three balls, and the barber's pole, with in Scotland (as on the Continent) the brazen basin, which recalls Don Quixote. Besides these trade emblems, every individual trader might have his own special device: Southey's father, a Bristol linen-draper, for his chose a hare. During the 16th and 17th centuries huge painted signs came greatly into vogue. They were suspended either from projecting metal-work, from a post or an obelisk, or from a sort of miniature triumphal archway, and sometimes cost great sums—e.g. £1057 for the 'White Hart' at Scole in Norfolk, erected in 1655. These creaking and ponderous signboards proved a source of annoyance, sometimes of positive danger, as when in 1718 one in Bride's Lane, Fleet Street, dragged down a house front, and killed in its fall four persons. So in 1762-70, under act of parliament, the London signboards were either wholly removed or at least affixed to the fronts of the houses; and this example was gradually followed throughout the kingdom, though here and there signposts linger, or have been restored—even in London. A good many signboards have been painted by great artists, Holbein, Correggio, Paul Potter, Hogarth, Wilson, Morland, David Cox, 'Old' Crome, Sam Bough, and Sir J. E. Millais (some of which are still extant); and nearly every sign had its curious origin, hard though it may be to come at. Thus, there were the religious signs ('Salutation,' 'Lamb and Flag,' &c.), historical signs (as the 'Royal Oak' and 'Marquis of Granby'), heraldic (coats of arms, crests, and badges), humorous (as the 'Good Woman,' without a head), and a host of others. Not the least curious feature about old signs is the havoc played on their names by 'folk-etymologies.'

Signet, in England, one of the seals for the authentication of royal grants; for its use and for the signet office, now abolished, see SEAL. The signet in Scotland is a seal which seems to have been originally intended to authenticate royal warrants connected with the administration of justice. The principal class of solicitors in Scotland are called Writers to the Signet, from their having been originally clerks in the office of the king's secretary, it being their duty to prepare all warrants for charters or grants to be passed under either the Great Seal or Privy-seal, such warrants being called from an early period 'signatures,' because they bore the signet of the king.

Writers to the Signet and Solicitors before the Supreme Courts were long the only solicitors allowed to act as agents in the Supreme Courts. But by the Law Agents Act of 1873 any person duly admitted a law agent can practise in any court in Scotland. See SOLICITORS.

Sign-manual, ROYAL, the superscription of the sovereign, which must be adhibited to all writs which have to pass the Privy-seal or Great Seal. When attached to a grant or warrant it must be countersigned by one of the principal secretaries of state, or by the Lords of the Treasury. For certain deeds of minor importance a *cachet* or stamp of the royal signature is used.

Signorelli, LUCA, Italian painter, was born about 1441, at Cortona, being a distant relative of Vasari, the historian of Italian art. He studied under Piero della Francesca of the Umbrian school, but seems to have learned most from observation of the human form. During the first half of his life he had apparently no settled home; at all events he worked in various towns in Italy. At Loretto he painted a number of frescoes of sacred subjects, commissioned by Pope Sixtus IV.; in the Sistine Chapel the fresco called the Acts of Moses; and for Lorenzo de' Medici the picture known as the School of Pan. This last design he subsequently repeated on the wall of Pandolfo Petrucci's palace at Sienna; in a convent of that same city he painted, after 1497, eight frescoes illustrating the Life of St Benedict. But the greatest achievement associated with his name is a number of frescoes, depicting such subjects as the Fall of Antichrist, Punishment of the Wicked, the Last Days of Earth, done on the walls of a chapel of the cathedral in Orvieto. The boldness and grandeur of invention shown in these designs, and the powerful modelling of the nude forms, suggest comparisons with Michelangelo. Signorelli was one of the painters summoned to Rome by Pope Julius II. in 1508 to adorn the Vatican, and along with his colleagues was dismissed to make way for Raphael. In his native town he left many proofs of his artistic skill, and died there in 1525.

See Crowe and Cavalcaselle's *History of Painting in Italy* (1864-71), R. Vischer's *Signorelli* (Leip. 1879), and Miss Cruttwell's (1902).

Sigourney, MRS LYDIA HUNTLEY (Huntley being her maiden name), American authoress, was born at Norwich, Connecticut, 1st September 1791. For five years she taught a class of ladies in Hartford; in 1815 she published *Moral Pieces in Prose and Verse*; and in 1819 she married a Hartford merchant. In 1822 she published a descriptive poem on the *Traits of the Aborigines of America*; and in 1824 a *Sketch of Connecticut Forty Years Since*. These were followed by *Pocahontas and other Poems*, *Lays of the Heart*, *Tales in Prose and Verse*, &c., and *Letters to Young Ladies and to Mothers*, both of which passed through many editions, in England as well as America. In 1840 she visited Europe, and on her return wrote her *Pleasant Memories of Pleasant Lands*. She compiled amusing and instructive books for the young, and was a constant contributor to magazines and other periodicals of poems, whose subjects, style, and sentiment gave her the designation of 'the American Hemans.' She died at Hartford, 10th June 1865. See her autobiographical *Letters of Life* (New York, 1866).

Sigurd, or SIEGFRIED. See NIBELUNGENLIED.

Sihûn. See JAXARTES.

Sikhs, a religious sect of Northern India, which became a great military confederacy. The sect was founded by Baba Nānak (born in 1469), who rejected the institution of caste, idolatry, and

superstition, preached the existence of One spiritual God, and inculcated a higher moral life. He was followed in the headship of the sect—'Sikhs' means 'followers' or 'disciples'—by ten 'gurus' or chief-priests. The third of these excavated the sacred tank at Amritsar; and his son, Arjun Mal, built, towards the end of the 16th century, the holy temple, in the tank at Amritsar, which became the headquarters of the Sikh religion. The same guru first edited the *Adi Granth*, the sacred book of the Sikhs. As time went on the adherents of the sect, principally Jats by race, gradually becoming conscious of their numbers and their growing power, began to adopt something of a military organisation in addition to their religious discipline. This end—converting them into a powerful military community—was deliberately pursued by the guru Govind Rai (1675–1708); he adopted the appellation Singh (or Sing; better Sinh, 'lion') as a generic family-name for all members of the sect, strengthened the bonds of personal discipline, and revised the sacred book so as to bring it into harmony with the altered aims and position of the Sikhs. See INDIA.

On the downfall of the Mogul power, shortly after the middle of the 18th century, the Sikhs formed themselves into a number of tribal and territorial confederacies, some of which were virtually independent states. Their religious fanaticism was fanned by a body of devotees, who dedicated themselves to warlike pursuits; and the Sikhs greatly extended their possessions. It was, however, Ranjit Singh (q.v.), a young and warlike chieftain, who converted the Sikh confederacies into a powerful and formidable military power, by welding the separate confederacies into one organic whole and carrying his arms westwards, northwards, and southwards. On the east alone he made no conquests; he had in 1809 concluded a treaty of peace with the British, whose authority reached to the Sutlej, which was the eastern boundary of the Sikh dominions. This agreement Ranjit faithfully kept; but at his death he left an army of 124,000 men, animated by a warlike spirit and inspired by religious enthusiasm—a force that had been thoroughly organised and drilled by French officers on the European system. But there was none amongst his immediate descendants capable of taking up the sceptre he let fall, and wielding it with the same energy and skill. Amid the anarchy that followed his death, the soldiers of his armies clamoured to be led against the forces of the British; and accordingly in December 1845 they crossed the Sutlej and invaded British territory. Their advance guard was, however, routed by Sir Hugh Gough at Mudki (18th December), though not without heavy loss to the British, 'Fighting Bob' Sale being amongst the slain. The main body entrenched themselves at Ferozshah, 12 miles east of the river; but their camp was stormed, after two days' desperate fighting, by Sir Hugh Gough and Sir Henry Hardinge (governor-general) on December 21st and 22d. Another Sikh army that crossed the river was defeated and driven back by Sir Harry Smith, at Aliwal (28th January 1846); and on 10th February Gough and Hardinge totally crushed and dispersed the Sikh forces at Sobraon. The British at once captured Lahore, and on the 9th March following peace was signed between the combatant parties, the Sikhs ceding the districts between the rivers Sutlej and Ravi, and subsequently, in lieu of a money indemnity, Kashmir, the hill-country of Hazara, and some other portions of territory.

Two years later war broke out again, caused, as the first conflict was, by Sikh fanaticism: two British officers were massacred at Multan in April 1848. And although Lieutenant Herbert Edwardes

attempted to check the movement at its beginning, the war became general. Multan was taken; but the battle of Chillianwala (13th January 1849) was left undecided, in spite of very heavy losses on the British side. At Gujrat, however, on 21st February, Gough finally broke the power of the Sikhs. The Punjab was annexed to British India; and so successfully was its government organised by Dalhousie and the two Lawrences that during the Mutiny the Sikhs not only refrained from joining the rebel sepoys, but lent material assistance in quelling the outbreak. Dhuleep Singh (1837–93) who had succeeded Ranjit Singh as Maharaja of Lahore in 1843, and was deposed in 1849, became dependent on a pension from the Indian Government, lived long in England, professed Christianity, and married in succession two English ladies. He was much addicted to field sports and fell deeply in debt. In 1882 he made inadmissible claims, abjured Christianity, and started for India, but was not allowed to return, and finally lived on his pension in Paris, where he died. His son, educated at Cambridge, became an officer in the Guards and married a daughter of the Earl of Coventry.

The Sikhs constitute about 12 per cent. of the population of the Punjab; and there are connected with the Punjab seventeen protected Sikh states, of which Patiala is chief. In 1921 the Sikhs numbered, in the Punjab, 2,294,207; in the protected states, 813,000; in the rest of India, 155,000. It is an error to regard the Sikhs as a race—ethnographically they are like their neighbours, their language being Punjabi; and their religion it is alleged tends more and more to become a mere sect of Hinduism.

See J. D. Cunningham, *History of the Sikhs* (1849); Sir J. Malcolm, *Sketch of the Sikhs*, (1812); Gough and Innes, *The Sikhs and the Sikh War* (1897); Sir J. J. H. Gordon, *The Sikhs* (1904); Max A. Macauliffe's *The Sikh Religion, its Gurus, Sacred Writings, and Authors* (6 vols. 1909) contains a translation of the Granth Sahib, and was approved by the Sikh authorities, who strongly disapproved of Trumpp's *Adi Granth* (1867) and *Die Religion der Sikhs* (1881), as showing Christian missionary bias against their faith.

Si-kiang, a river of China, rises in Yunnan, and flows east till, just above Canton (q.v.), it turns south and pours its waters into the Chinese Sea. Canton and Hong-Kong stand on the eastern arm of its delta, and Macao on the promontory that divides it from this arm, the Canton River.

Sikkim, a protected state in the north-east of India, bordering on Tibet, Nepal, and Bhotan. Area, 2818 sq. m.; pop. (1921) 81,721, mostly Buddhist Rongs or Lepchas, akin to the Tibetans. The state lies on the southern slopes of the Himalayas, has mountains reaching to 24,000 feet and mountain-passes at 16,000 feet. The Chola pass, on the road from Tum-long into the Corumbi valley in Tibet, is 15,000 feet high. Swift torrents flow at the bottom of precipitous ravines; and valleys and lower slopes are clothed with forest. The maharaja, who resides at the village of Tumlong, is advised by a British political officer. His predecessor ceded Dárjiling to the British in 1835, having already acknowledged their 'protection' in 1816. The treaty of 1890 gave Britain exclusive control over its internal and foreign affairs. The district of Dárjiling (q.v.), which borders on Sikkim state, is often called British Sikkim.

See Strahan, *Exploration in Sikkim* (1899); Donaldson, *Lepcha Land* (1900); J. C. White, *Sikkim and Bhutan* (1909).

Sikrol, or SECRELE. See BENARES.

Silage is the term applied to fodder which has been preserved by the process of Ensilage. Ensil-

age is a French word, tracing through the Spanish, from the Lat. *sirus*, Gr. *siros*, 'a pit,' whence the Spanish verb *ensilar*, 'to store grain in a silo or pit.' It was originally employed to denote the preservation of green forage in an air and water tight silo—the contents being tightly pressed down so as to get rid of and permanently exclude the oxygen of the air, and thereby prevent putrefactive fermentation. The practice, since its introduction into the British Isles, has been considerably extended, so that the term silage is now applied to green fodder which has been preserved by pressure in stacks as well as to that preserved in silos by pressure. The making of silage was originally advocated as it was thought it would render the farmer independent of the weather in seasons when haymaking was attended with difficulty. The practice of ensilage is of great antiquity. From time immemorial grain has been stored in underground pits in eastern countries. In the time of Pliny it was, he tells us, pursued with success in Thrace, Cappadocia, Barbary, and Spain. Varro also speaks approvingly of the process, and asserts that by it wheat could be preserved fresh for fifty years and millet for a century. In early times it was probably employed chiefly to hide stores of grain from invaders. It is now used mainly in the preserving of green food for cattle and horses. The converting of green fodder, as distinguished from ripened grain, into silage is believed to have been first practised in Germany. In 1843, in the *Transactions of the Highland and Agricultural Society of Scotland*, Professor Johnston gave a detailed description of the German system of making 'sour hay.' The practice spread through the Austro-Hungarian empire, where graves or trenches, 4 feet by 6 or 8 feet in breadth and depth, were dug and crammed with green grass or green Indian corn, the whole being covered over with a foot of earth. The distinction of first succeeding in directing general attention to the subject was earned by a Frenchman, M. Goffart, whose book, *Manuel de la Culture et de l'Ensilage des Mais et autres Fourrages verts*, published in 1877, was not only widely read in his own country, but was translated into English and published in New York in 1879. The method had already been tried to a small extent in America, and the perusal of M. Goffart's work aroused the deepest interest and led to numerous and extensive experiments. The general results were satisfactory, and soon the system found its way into Great Britain. Although several trials were made earlier, the systematic and extensive adoption of ensilage in the United Kingdom dates from 1882. In that year the successful experience of Vicomte Arthur de Chezelles, who had been pursuing the system upon a large scale in France, was made known through the press to British farmers. A host of experimentalists were instantly at work, and so keenly was public attention aroused that in 1883 the Ensilage Commission, a private but highly influential body, was formed to collect evidence and consider and make known the merits of the practice. A mass of valuable information was collected and was embodied in the official blue-books issued by the government.

The commission reported strongly in favour of the system, concluding as follows: 'After summing up the mass of evidence which has reached us, we can without hesitation affirm that it has been abundantly and conclusively proved to our satisfaction that this system of preserving green fodder crops promises great advantage to the practical farmer, and, if carried out with a reasonable amount of care and efficiency, should not only provide him with the means of insuring himself to a great extent against unfavourable seasons, and

of materially improving the quantity and quality of his dairy produce, but should also enable him to increase appreciably the number of live-stock that can be profitably kept upon any given acreage, whether of pasture or arable land, and proportionately the amount of manure available to fertilise it.'

From 1883 the progress of the movement in Great Britain was rapid. The British agricultural returns first included statistics as to ensilage in 1884. In that year 610 silos were reported as existing in Great Britain. In the next three years the number increased to 2694. By 1887 it was proved by repeated experiments in England that silage might be made in stacks as well as in silos, and for a few years the stack system was in fairly general use. The practice of ensilage, however, gradually fell into disuse in Britain until about 1910, when the American Tower silo was introduced. This consists of a tall cylindrical building, made of wood, brick, steel, or most commonly of reinforced concrete; the height being from thirty-five to fifty feet and the diameter from twelve to twenty feet. The green material to be ensiled is cut by a power machine into short lengths and is conveyed into the silo usually by means of an air blast. It is firmly packed round the wall by treading, and is thereafter left to settle under its own weight. Fermentation ensues, the nature of the process depending mainly on the amount of moisture contained in the crop. If this is high a slow fermentation occurs, accompanied by a comparatively slight rise in temperature, and the resulting silage is green in colour and rather sour. With drier material a greater rise in temperature takes place, and the product is brown and sweet; in the latter case the loss by fermentation is greater. Intermediate conditions producing what is called 'green fruity' silage are generally aimed at.

In the United States and Canada the crop most commonly cultivated for silage is maize, with or without an admixture of leguminous plants. In tropical countries Great Millet (*Sorghum vulgare*) is used. In Britain the most generally satisfactory crop is a mixture of beans, oats, and vetches. Leguminous crops alone are liable to undergo putrefactive changes in the silo, and are less satisfactory.

The feeding value of well-made silage is nearly twice as great as that of swedes or mangels, and about two-fifths of that of good hay. The proportion of dry matter to water in the cured material is about thirty per cent. of the former to seventy of the latter. An average yield in Britain is about eight tons of mature silage per acre. Silage can be kept indefinitely so long as it is left undisturbed; the upper layer, where it is exposed to the atmosphere, of course becomes mouldy and must be discarded.

Well-made silage is relished by both sheep and cattle, and may be fed in moderate quantities to horses and pigs. The practice of ensilage is now common in clay soil districts, where the cultivation of roots is difficult and costly; also in the wetter parts of the country where the hay crop is very liable to damage.

Silbury Hill. See AVEBURY.

Silchester, a village in the extreme north of Hampshire, 7 miles N. of Basingstoke, famous for the remains of the ancient Romano-British town of *Caer Segint*, called by the Romans *Calleva*, and by the West Saxons *Silceastre*. The chief visible remains are the amphitheatre, 50 yards by 40, and the walls, 2760 yards in length; excavations have shown the whole plan of the town (100 acres), with the foundations of a basilica, the forum, a temple, baths, &c.; and coins, seals, rings, and much broken pottery have been found. New excavations were made in 1890-1909. See *Archæologia*.

Silene, a genus of Caryophyllaceæ, having the calyx, corolla, and stamens of *Lychnis* (q.v.), three styles and a three-celled capsule opening at the top in six teeth or valves. The species are numerous, mostly natives of the temperate parts of the northern hemisphere, annual and perennial plants; nine or ten of them natives of Britain, and others frequent in flower-gardens. One of the most common British species is the Bladder Campion (*S. Cucubalus*), a perennial, which grows in corn-fields and dry pastures, and has a branched stem fully a foot high, ovate-lanceolate bluish-green leaves, panicles of white flowers, and an inflated calyx, with a beautiful network of veins. The young shoots are sometimes used like asparagus, and have a peculiar but agreeable flavour, somewhat resembling that of peas. They are best when most blanched. The cultivation of this plant was long ago strongly recommended, but it has not obtained a place among garden plants. The seaside plant *S. maritima* is very similar, with fewer and larger flowers and procumbent barren stems. The Moss Campion (*S. acaulis*) is a pretty little plant, with beautiful purple flowers growing in patches so as to form a kind of turf, one of the finest ornaments of the higher mountains of Scotland, found also in Cumberland and Wales. Many species, some of them British, are popularly called Catchfly, from their viscidities, as *S. anglica*, a species found in sandy and gravelly fields in many parts of Britain. For the Red Campion, White Campion, and German Catchfly, see **LYCHNIS**.

Silenus, a primitive woodland deity of Asia Minor, whom men try to catch in a drunken sleep, in order to compel him to prophesy and sing. Later representations make him a son of Hermes or of Pan, and the chief of the Sileni or older Satyrs, and the inseparable companion and instructor of Dionysus, with whom he took part in the contest against the Gigantes, slaying Enceladus. He is described as a little pot-bellied old man, bald-headed and snub-nosed, his body very hairy, always drunk and bearing a skin of wine, and usually propped up by the other satyrs or astride of an ass, since his own legs could not be trusted.

Silesia (Ger. *Schlesien*; Pol. *Szląsk*; Czech *Slezsko*), a region of Europe forming, before the Great War, a Prussian province and an Austrian land, now forming two Prussian provinces (Upper and Lower Silesia), one Polish, and one Czechoslovak.

Early in the 10th century, Silesia, except the extreme western districts, was under the dominion of Poland, and towards the end of the 12th century was divided into two duchies (Breslau or Lower Silesia and Ratibor or Upper Silesia) ruled by Polish dynasties. In the following century great numbers of German immigrants settled in the country and gradually Germanised its semi-Slavic inhabitants. Duke Henry II. of Lower Silesia perished in the memorable battle of Liegnitz (1241), in conflict with the Mongol invaders. By the beginning of the 14th century Silesia was divided up amongst a score of petty rulers, nearly all of whom acknowledged King John of Bohemia as their feudal superior instead of the king of Poland in the years 1327-29. The Silesian dukes put no obstacles, as a rule, in the way of the Reformation; but the emperors, who as the heirs to the kingdom of Bohemia became the suzerains of Silesia, treated the people with cruel intolerance, and pursued that policy down to the first decade of the 18th century. The great duel between Austria and Prussia for the mastership of the Silesian territories grew out of a contract by which in 1537 the Duke of Liegnitz left his lands to the

Electors of Brandenburg in the eventuality of his house becoming extinct in the male line. On the conclusion of the first Silesian war (1742) the duchies were divided, Prussia getting by far the greater number and greater area; and the result of the second Silesian war and the desperate struggle of the Seven Years' War confirmed Frederick the Great in the possession of the lands he had so greatly coveted. Frederick, however, took the most active and judicious measures to improve his conquest, and reform its administration and put it on a sound basis. Silesia took a very zealous part in the final struggle against Napoleon in the early years of the 19th century. For the history of Austrian Silesia, see **CZECHOSLOVAKIA**, Vol. III. p. 649. It was a separate Austrian crown-land from 1849 till the break-up of the empire, when it became part of Czechoslovakia, except part of the Teschen district which, after some bloodshed, went to Poland by agreement, the plebiscite provided for by treaty being abandoned. A small piece of Prussian Silesia, to the east of Troppau, was added, and connected the two areas which a wedge of Moravia had till then entirely separated. The Treaty of Versailles transferred a small north-eastern corner (about Bralin) of Lower Silesia from Prussia to Poland, and provided for a plebiscite for the greater part of Upper Silesia. In spite of the filibustering activities of the Polish leader Korfanty this was held in 1921, and resulted in a vote of about three to two in favour of Germany. The territory was divided by a line passing through the mining and manufacturing district, giving the mines mostly to Poland, many of the towns and factories they fed to Germany, and satisfying nobody. Upper Silesia decided by an overwhelming vote in 1922 to remain a Prussian province rather than become a separate state of the German Reich. For the Silesian Schools of Literature, see **GERMANY** (Vol. V. p. 193), and **OPITZ**.

Silesia, AUSTRIAN. See **SILESIA, SILESIA (CZECHOSLOVAK)**, **AUSTRIA**, and **CZECHOSLOVAKIA**.

Silesia, CZECHOSLOVAK, a province of Czechoslovakia, answering roughly to the former Austrian Silesia (see **SILESIA**). Area, 1708 sq. m.; pop. (1921) 672,268. Subsidiary chains of the Carpathians and Sudetic Mountains diversify the southern and western frontiers; the province is watered by the systems of the Vistula (in the east) and the Oder (west). The climate, though somewhat raw, is healthy, and the soil produces good crops of rye, oats, barley, potatoes, beet-root, hay, &c. Mining and manufacturing industries both flourish. The mines yield coal, iron, and other minerals. The principal industries are the smelting of iron, making of machinery, the manufacture of various textiles (worsted, cloth, linen and linen thread, cottons, &c.), brewing, distilling, and the preparation of chemicals. The principal town is Troppau (Opava).

Silesia, LOWER (Niederschlesien), a south-eastern province of Prussia, traversed from SE. to NW. by the Oder, which forms in its middle course a deep valley, with a westward extension from near Liegnitz, crossed in its western corner by the Spree and the Black Elster. The south-western parts are broken and made uneven by the Sudetic Mountains and their outlying ranges. North and east of the Oder, and in the west of the province, are great tracts of marsh and sand, in which there is much forest. But between the Oder and the mountains the soil is exceptionally fertile, producing the usual cereals, besides flax, beet-root, chicory, hops, and fruit. Much has been done to encourage the breeding of sheep, horses, and cattle. The two Silesian provinces form one of the greatest industrial regions of Germany. Very important in

Lower Silesia are cotton and linen. Besides these, woollen, metal, glass, pottery, and many other industries flourish. There is a coalfield around Waldenburg. Area of province, 10,276 sq. m.; pop. (1925) 3,121,153. The capital is Breslau.

Silesia, POLISH, a palatinate in the south-west of Poland, reaching up into the Beskid Mountains, and including the source of the Vistula and part of the upper basin of the Oder. It is a very rich mineral district, producing coal, iron, zinc, and lead. It was formed after the Great War out of the south-eastern part of Prussian Upper Silesia and the easternmost part of Austrian Silesia (see SILESIA). In the Upper Silesian plebiscite area Poland got the towns of Kattowitz (Polish Katowice) and Königshütte (Krolewska Huta), both of which voted overwhelmingly for Germany, along with most of the mines; in Teschen-Silesia she got the town of Teschen (Cieszyn), but most of the coalfield went to Czechoslovakia. On account of the mixed population almost complete autonomy has been conceded to Silesia. Area, 1623 sq. m.; pop. (1921) 1,124,967; capital Kattowitz. The territory taken from Prussian Lower Silesia is included in the Polish voivodeship of Posen.

Silesia, PRUSSIAN. See SILESIA, SILESIA (LOWER), SILESIA (UPPER).

Silesia, UPPER (*Oberschlesien*), the south-easternmost province of Prussia and of the German Reich, forms part of the upper basin of the Oder. The Oder itself passes through the western part of the province, and is navigable all the way. Upper Silesia is pre-eminently a mining and manufacturing province, sadly hampered by the cession to Poland of most of its coalfield and nearly all its zinc and lead mines (see SILESIA). Its industries are those connected with iron and steel and other metals, and the manufacture of textiles, glass, pottery, paper, &c. Area, 3746 sq. m.; pop. (1925) 1,377,830; capital Oppeln.

Silex (Lat., 'flint'), a generic name given by some mineralogists to all those minerals of which silica is the principal ingredient. See SILICON, QUARTZ.

Silhet. See SYLHET.

Silhouette, a profile or shadow-outline filled in of a dark colour, the shadows and extreme depths

being sometimes indicated by the heightening effect of gum or some other shining material. This species of design was known among the ancients, and was by them carried to a high degree of perfection, as the monochrome on Etruscan vases amply testify; but the name silhouette is quite modern, dating from about the middle of the 18th century, though the art itself seems to have been practised in England prior to 1745. It



Silhouette of Robert Burns.

was taken from Étienne de Silhouette (1709-67), the French minister of finance for four months in 1759, who, to replenish the treasury, exhausted

by the costly wars with Britain and Prussia, and by excessive prodigalities, inaugurated numerous reforms and the strictest economy of expenditure. His earliest reforms were admirable; his later ones, however, were so capricious, short-sighted, and unsuccessful that he fell utterly for favour, and his name became a byword for injudicious parsimony; any mode or fashion that was plain and cheap was styled *à la Silhouette*; and profiles made by tracing the shadow projected by the light of a candle on a sheet of white paper, the rest of the figure being filled up in black, have continued to bear the name. Profiles cut out of black paper with scissors also receive the name of silhouettes. It should be added that Littré derives the use of the word otherwise: quoting from the *Journal Officiel* of 1869 a statement that one of M. de Silhouette's chief amusements after his fall was making such shadow-portraits, and that his château of Bry-sur-Marne had the walls of several of its rooms adorned with pictures of this sort. M. de Silhouette was at an earlier date secretary and chancellor to the Duke of Orleans, and was one of the three commissioners appointed in 1749 to delimit the frontiers of the French and British possessions in Acadia. He wrote a number of works, and published translations from Bolingbroke, Pope, and Warburton. See Mrs E. N. Jackson, *The History of Silhouettes* (1911); Desmond Coke, *The Art of the Silhouette* (1913).

Silica. See SILICON.

Silicon is one of the non-metallic elements: sym. Si; at. number 14; at. wt. 28.4 (O = 16); sp. gr. of crystalline form, 2.49. It may be obtained in three different forms—viz. the *amorphous*, the *graphitoid*, and the *crystalline*. It is amorphous silicon which is obtained by the processes in common use, the other forms being obtained from it.

Amorphous silicon presents the appearance of a dull brown powder, which adheres to the finger, is insoluble in water and in nitric and sulphuric acids, but readily soluble in hydrofluoric acid and in a hot solution of potash. It is a non-conductor of electricity, and when heated in air or oxygen its external surface burns brilliantly, and is converted into silica, which fuses from the extreme heat, and forms a coating over the unburned silicon. *Graphitoid* silicon is obtained by exposing the amorphous variety to an intense heat in a closed platinum crucible. This form of silicon will not take fire when heated in oxygen gas, and resists the solvent action of pure hydrofluoric acid, although it rapidly dissolves in a mixture of nitric and hydrofluoric acids; moreover, it is a conductor of electricity. Deville obtained *crystallised* silicon in regular double six-sided pyramids of a dark steel-gray colour.

Silicon, in a state of combination with oxygen, is the most abundant solid constituent of our globe; in less proportion, is an equally necessary ingredient of the vegetable kingdom; while in the animal kingdom it occurs in mere traces, except in a few special cases. It is never found in nature except in combination with oxygen; but, by a somewhat difficult process, it may be separated as a dark brown powder. It was first isolated by Berzelius in 1823. For our knowledge of the other modifications we are indebted to Wöhler and Deville.

Silicon forms an oxide, the well-known compound silica, represented by the formula SiO_2 . Silica exists both in the crystalline and in the amorphous form. The best examples of the crystalline form are rock-crystal, quartz, chalcedony, flint, sandstone, and quartzose sand. Silica in this form has a specific gravity of about 2.9, and is only

attacked with difficulty by potash or hydrofluoric acid. The amorphous form exists naturally in opal, and is obtained artificially as gelatinous silica, &c.; it differs from the former in its specific gravity, being about 2.2, and in its being rapidly dissolved by potash and by hydrofluoric acid. Pure silica (as it occurs in rock-crystal, for example) is perfectly transparent and colourless, and is sufficiently hard to scratch glass. The heat of the oxyhydrogen blowpipe is required for its fusion, when it melts into a transparent glass, capable of being drawn out into elastic threads. Perfectly pure silica in its amorphous form may be obtained by various chemical processes. If a solution of silicate of potash or soda be treated with hydrochloric acid, the silicic acid separates as a hydrate, and on evaporating this to dryness, and treating it with boiling water, silicic acid remains as an amorphous powder, which, after being washed, dried, and exposed to a red heat, may be regarded as chemically pure. The hydrated silicic acid mentioned in the above experiment is soluble in water, and (more freely) in acids and alkalis. The solubility of hydrated silicic acid in water accounts for the presence of silicic acid in mineral springs and in the geysers of Iceland, as well as for its gradual separation from these waters in the form of petrifications. That silicic acid is a true acid (although a feeble one) is obvious from its uniting with bases, especially those which are capable of undergoing fusion, and forming true salts, known as silicates. These silicates occur abundantly in nature, all the forms of clay, felspar, mica, hornblende, augite, serpentine, &c., being compounds of this description.

Most of the silicates are fusible, the basic silicates fusing more readily than those which are either neutral or contain an excess of acid. Excepting the silicates of the alkalis, no silicates are soluble in water. The anhydrous, neutral, and acid silicates of the earths resist the action of all acids except hydrofluoric.

Silica derives its name from the Latin *silex*, 'flint,' of which it is the essential constituent, and is largely employed in the manufacture of glass, china, and porcelain. For these purposes it is obtained in a finely comminuted state by heating flints or portions of colourless quartz to redness, and plunging them in cold water. The silica splits up into a friable mass, which may be easily ground to a fine powder. The use of silica in giving firmness and rigidity to various parts of the animal organs is exemplified in its free occurrence in the quill-part of the feathers of birds, in the shields of certain infusoria, and in the spicules occurring in sponges; while its similar use in the vegetable kingdom is seen in its more or less abundant presence in the stalks of the grasses, more particularly in the cereals and in the bamboo (where it is especially deposited about the joints, and is known as *Tabasheer*), in the Equisetaceæ, &c. Fused silica is now much used in chemical apparatus in place of the more expensive platinum.

Silicon may be made to combine with several other elements besides oxygen, but most of these compounds are of no practical value. With carbon it unites in the electric furnace to form carborundum. Silicon and hydrogen form a hydride of silicon, a colourless and spontaneously inflammable gas. Nitride of silicon is a bluish fibrous body, while sulphide of silicon is a white earthy powder. Silicon unites with the halides. Fluoride of silicon, SiF_4 , is a colourless pungent gas. It is obtained by heating powdered glass with hydrofluoric acid. When a stream of this gas is transmitted through water a reaction takes place, yielding silicofluoric acid, H_2SiF_6 . A saturated solution of this acid

forms a very sour fuming liquid, which does not directly attack glass, but if allowed to evaporate on it causes erosion from the fluoride of silicon becoming evaporised, and free hydrofluoric acid being left. A dilute solution is sometimes employed in the laboratory as a precipitant of potash, which it throws down in a transparent gelatinous form. With salts of baryta it gives a white crystalline precipitate. It combines with bases to form salts.

For soluble glass, a silicate of soda or potash, see GLASS, Vol. V. p. 244; and for silicate cotton, see SLAGS.

Siliqua. See FRUIT.

Silistra, or SILISTRIA, a town of Rumania (till 1913 Bulgaria), on the right bank of the Danube, here $1\frac{1}{2}$ mile wide, about 70 miles NW. of Varna. Owing to its strategic position it has for many centuries been a more or less formidable fortress, especially since the 14th century, under the dominion of the Turks. The Roman *Durostorum*, it was captured by the Russians under Sviatoslaff in 867, but was recovered in 971 by the Byzantine emperor, John Zimisces. It has been repeatedly besieged by the Russians. They destroyed the works after capturing it in 1810; but the fortifications were rebuilt more strongly than before, and offered a stout resistance to the Russian attacks in 1828-29. In 1849 it was made a stronghold of the first class, and was rendered almost impregnable by the addition (1853) of twelve detached forts on the south and east. On the outbreak of the Crimean war the Russians laid siege to it with an army of from 60,000 to 80,000 men, but were compelled to retreat after thirty-nine days. In 1877, again, it successfully defied the troops of the tsar. The Congress of Berlin in 1878 decreed that the fortifications should be dismantled; but this was not given effect to. It was besieged by the Rumanians in the second Balkan war (1913), and in the Great War was taken by Mackensen (1916). The people weave cloth, tan leather, and grow vegetables. Pop. 12,000.

Silius Italicus, a minor Latin poet, was born in 25 and died in 101 A.D. At an early age he became a prominent forensic orator, was consul the year of Nero's death (69), became a familiar friend of Vitellius, and was afterwards proconsul in Asia. He was a devoted student of Cicero and Virgil, and owned their estates at Tusculum and Naples. In old age, finding himself labouring under an incurable disease, he starved himself to death. His epic poem, *Punica*, in seventeen books and about 14,000 lines, has come down entire, and remains a monument of industry, of patient imitation, not of poetic creation. Scipio and Hannibal are its Achilles and Hector, its Æneas and Turnus; and every episode in his great originals is slavishly reproduced and degraded to a dead level of literary mediocrity.

The poem was discovered by Poggio about 1416, and the *editio princeps* appeared in 1471. Editions are by Ernesti (1791) and Lemaire (1823), and in Postgate's *Corpus Poet. Lat.* (Fasc. iv. 1904).

Silk appears to have been first systematically manufactured by the Chinese, although some claim that the Tussur silk of India was the earliest silk fibre used. The name is derived from the Chinese name of the silkworm *sze*, *see*, or *si*, in Korean *sir*, whence the Greek *σῆρ*, 'the silkworm'; *σῆρες*, 'the people furnishing silk,' 'the Chinese'; and *σερικόν*, 'silk.' The Latin *sericum* has been traced to the Mongol *sirkeh*; and the *serikoth* of Isaiah xix. 9 has been supposed to be silk. From *sericum* is derived the French *soie*; and etymologically connected with it are the German *Seide*, the Russian *sheolok*, the Old English *seolc*, the Icelandic *silke*, and the modern

English *silk*. We are informed by Hawae-nan-tze, in a Chinese work called the *Silkworm Classic*, that Se-ling-she, the principal queen of Hwang-te (2640 B.C.), was the first to rear silkworms, and the Emperor Hwang-te was induced to invent robes and garments from this circumstance. The Chinese historians carry back the cultivation of the mulberry and the breeding of silkworms to the mythic period. If they are to be believed, the art of silk-reeling was known in China in the time of Fouh-hi, a century before the date usually assigned to the biblical deluge, and Hwang-te's queen did not disdain to share in the labours attending the care of the insect, as well as in those of the loom, the invention of which seems to be attributed to her, and to have raised her to the position of a tutelary genius with special altars of her own. But whatever the precise date of the discovery, it appears there can be no question of the very high antiquity of the knowledge of the worm and its product in China. A series of imperial edicts and voluminous literature of practical treatises testify to the importance of the industry and the care that was taken to foster an art which was considered, according to M. de Rosny, 'best fitted to promote the morality of the people and extinguish pauperism in the empire.' The queen and wives of the nobles through successive generations personally attended to the rearing of the silkworms. That this silk was of the mulberry-fed kind is evident from a further extract from the *Silkworm Classic*, which says that afterwards 'When Yu regulated the waters (2200 B.C.) mention is made, in his work on the tribute, of the land adapted for the mulberry-tree having been supplied with silkworms, from which time the advantage thereof gradually increased.' It is not known whether silk was utilised in India at so early a period as this—probably not; but that India learned the art from China is generally believed, although at what period is not known.

About the middle of the 6th century A.D. the western world received a supply of silkworms' eggs. They were conveyed from China to Constantinople by two Persian monks who had gone to the East as missionaries, and had observed in China the various processes connected with the rearing of silkworms, the nature of the trees on which they fed, and the preparation of the silk. This occurred in the year 552, in the reign of Justinian, who gave every encouragement to the introduction of the valuable insect. The eggs were secretly conveyed from China within a hollow cane; at the proper season they were hatched, and the caterpillars were fed on the leaves of the wild mulberry-tree. The monks continued to superintend at Constantinople the rearing of the insects and the whole process of manufacturing the silk. From this small commencement the myriads of silkworms have sprung which throughout eastern and western Asia have met the demand for silk—a demand that has gone on increasing from that time to the present.

Natural and Life History.—The natural history of every kind of silk may be briefly stated. From a small egg laid by the moth, of whatever species, appears in due season a small larva, or caterpillar, or worm, as it is usually called. This worm, after having lived its day, feeding only on the leaves of certain plants specially suited to its own species, and increasing in size, spins, or rather secretes, a fine silk thread around itself for a covering and protection during the time it lies dormant in the next stage of its existence. As soon as it has secreted all the silk, it changes into a pupa or chrysalis, and remains inside its silken cell until the time for its appearance as an imago or perfect moth, having four scaly wings, with six legs, and

two antennæ, which are larger in the male than in the female. When its hibernation is ended it emits a fluid which softens the end of its cocoon cell, and, by means of its wing-spines and legs, parts the fibres aside until the opening is large enough for it to creep out. After a short time its wings expand and dry, and it enters into a perfect state. It lives only a few days in this phase of existence. ☹ It is in this stage only that the race is perpetuated, the female laying a number of eggs and dying soon afterwards (see the articles INSECTS, CATERPILLAR, CHRYSALIS, COCOON).

There are a number of species of silkworms whose food is the leaves of the mulberry-tree, the principal and most useful of which is the *Bombyx mori*. The following is a list of mulberry-feeders, the various kinds of *Bombyx* alone being domesticated, the others being wild:

Bombyx mori (Linnaeus).—The common silkworm, domesticated in China, Bokhara, Afghanistan, Kashmir, Persia, South Russia, Turkey, Egypt and Algeria, Italy, France, and Spain, in all which countries it produces but one crop annually, spinning the largest cocoon and the best silk of a golden yellow or white.

B. textor (Hutton).—The Boro Poloo of Bengal, domesticated in South China and Bengal; an annual only, producing a white (sometimes yellow) cocoon of a different texture and more flossy than *B. mori*.

B. sinensis (Hutton).—The Sina, Cheena, or small Chinese monthly worm of Bengal, introduced from China, and partially domesticated in Bengal; produces several broods in the year; cocoon white and yellow.

B. crasi (Hutton).—The Nistri or Madrassee of Bengal, introduced from China, and domesticated in Bengal; yielding seven or eight broods of golden yellow cocoons in the year of larger size than *B. sinensis*.

B. fortunatus (Hutton).—The Desi or Chota Poloo of Bengal; yields several broods annually, spinning the smallest cocoon of a golden yellow colour.

B. aracanensis (Hutton).—The Burmese silkworm, domesticated in Arakan, said to have been introduced from China; yields several broods annually; cocoons larger than the Bengal monthly species.

Theophila huttoni (Westwood).—The wild silkworm of the north-west Himalayas, feeding on the indigenous mulberry in the mountain forests.

T. sherwilli (Moore).—The wild silkworm of the south-east Himalayas.

T. bengalensis (Hutton).—The wild silkworm of Lower Bengal, discovered in the neighbourhood of Calcutta, feeding on *Artocarpus Lakoocha*. Found also at Ranchee, in Chota Nagpore.

T. religiosa (Heller).—The Joree of Assam and Deomooga of Cachar. Feeds also on the ber tree (*Ficus bengalensis*) and the peepul (*F. religiosa*).

T. mandarina (Moore).—The wild silkworm of Chekiang, North China; said to feed on wild mulberry-trees, and on *Quercus serrata*, spinning a white cocoon.

Ocinara lactea (Hutton).—Masuri, north-west Himalayas; also feeds on *Ficus Tsjakala*, spinning a small yellow cocoon, yielding several broods during the summer.

O. moorei (Hutton).—Masuri; also feeds on *F. Tsjakala*, as well as on the wild fig, spinning a small white cocoon. It is a multivoltine (see below).

O. diaphana (Moore).—Khasi Hills.

Trilocha varians (Walker).—North and South India.

In Italy and France *B. mori* is cultivated under active government encouragement and oversight, having during centuries of effort become a subject of high national importance. The United States of America and the British colonies are making efforts to introduce the cultivation of *B. mori*; the only hindrance being in the high price of labour for cocoon reeling. *B. mori* is univoltine or annual; but *B. fortunatus* and *B. crasi*, which are confined to Bengal, are multivoltine—i.e. they produce several broods annually. For wild silks not from mulberry feeders, see page 394.

Classification.—The silk-producing Lepidopterous insects are of many species, possessing very marked structural differences, whilst the variety and quiet

beauty of their colours, and in many species their large size, contribute greatly to the charm of studying this branch of natural history. They belong to the order Lepidoptera, sub-order Heterocera or Moths, group Bombycina, and to several of the twenty-seven or more families which compose this group, the most important being the Bombycidae and the Saturniidae. All the Saturniidae are silk-producers, but not all the Bombycidae. Recent researches have resulted in adding many new or previously unknown species to the list of silk-producers, and the known number is now upwards of 400, and the list is by no means complete.

The Bombycidae have a very short and rudimentary proboscis, live for a very brief time in their perfect state, and take little or no food; the body is thick and hairy; the antennae are pectinated. The caterpillars feed on the leaves and other tender parts of trees or other plants; the chrysalises are enclosed in a cocoon of silk, which gives to some of the species a great economical importance. The most important is the Common Silkworm (*Bombyx mori*), cultivated chiefly in China, Japan, Italy, and France. The perfect



Fig. 1.—Common Silkworm (*Bombyx mori*):

a, larva, full grown; b, larva, seripositing; c, cocoon;
d, chrysalis; e, female moth; f, male moth.

moth is about an inch in length, the female rather larger than the male; the wings meeting like the sides of a roof; the colour pale buff with a broad pale brown bar across the upper wings. The females generally die very soon after they have laid their eggs, and the males do not survive much longer. The eggs are numerous, about the size of a pin's head, not attached together, but fastened to the surface on which they are laid by a gummy substance, which, when dry, becomes silky. In Europe they are laid in spring, and are hatched in summer. The caterpillar is at first very small, not more than a quarter of an inch in length, but rapidly increases in size, till, when full grown, it is nearly 3 inches long. It is of a yellowish-gray colour. The head is large. On the upper part of the last joint of the body is a horn-like process. The skin is changed four times during the growth of the caterpillar. Before each change of the skin it becomes lethargic and ceases to eat, whereas at

other times it is very voracious. When the skin is ready to be cast off it bursts at the forepart, and the caterpillar then, by continually writhing its body, without moving from the spot, thrusts it backwards; but silkworms frequently die during the change of skin. A very rapid increase of size takes place whilst the new skin is still soft. The natural food of the silkworm is the leaves of the white mulberry, but it will also feed on the leaves of some other plants, as the black mulberry and the lettuce. When so fed, however, it produces silk of inferior quality. The silk-producing organs are two large glands (*sericteria*) containing a viscid substance; they extend along great part of the body, and terminate in two seripositors in the mouth. These glands become very large when the change to the chrysalis or pupa state is about to take place. When about to spin its cocoon the silkworm ceases to eat, and first produces the loose rough fibre which forms the outer part of the cocoon, and then the more closely disposed and valuable fibre of its interior. In this process the position of the hinder part of the body is little changed, but the head is moved from one point to another; and the cocoon when finished is much shorter than the body, which, however, being bent, is completely enclosed in it. The cocoon is about the size of a pigeon's egg. Each fibre of silk or *bave*, when examined by a microscope, is seen to be double or of two *brins*, being equally derived from the two silk-producing organs of the caterpillar. The *bave* or double thread often exceeds 1100 feet in length. The time of the silkworm's life in the caterpillar state is generally about eight weeks. About five days are occupied in the spinning of the cocoon, after which about two or three weeks elapse before the cocoon bursts and the perfect insect comes forth. The opening of the end of the cocoon by the moth for its escape is, however, injurious to the free and perfect reeling of the silk from the cocoon, and the silkworm rearer prevents this by throwing all the cocoons into hot water or more usually into an oven, called in France *étouffoir*, *séchoir*, heated by hot air or by steam, except those which he intends to keep for breeding. These he selects with care, so that he may have about an equal number of male and female insects, the females being known even in the chrysalis state by their larger size. The cocoons intended for the production of moths are placed on a cloth in a somewhat darkened room, of which the temperature is near, but does not exceed, 72° F.; and the moths, when produced, show no inclination to fly away, but remain on the cloth, lay their eggs, and die there. It is an interesting peculiarity of this valuable species of moth that neither in the caterpillar nor in the winged state does it show that restless disposition which belongs to many others, the caterpillars remaining contentedly in the trays or boxes in which they are placed, feeding on the leaves with which they are there supplied, and at last only seeking a proper place for making their cocoons for their covering and protection. Whilst assuming the chrysalis state small bundles of twigs are placed above the feeding-trays for the worms at their last caterpillar stage to resort to for cocoon building. Owing to this peculiarity or domesticity, it is capable of being reared and managed in a way which would otherwise be impossible.

Rearing of Silkworms.—It is of the first consequence in the production of silk that one of the species of mulberry should be cultivated, and that it should be so favourably situated as to climate that it is in readiness for feeding the worms. The species best adapted is the white mulberry, *Morus alba*. The extreme lateness of season at which the black mulberry produces its leaves prevents its

employment generally, besides which it will not bear the loss of its leaves so well. It is said that in some parts of China the silkworm is easily reared upon the trees in the open air. So little has it a tendency to wander far from the place of its birth, if food be at hand, that it only requires a warm, dry atmosphere to bring it to perfection; but usually, even in China, and in all other countries, it is thought desirable to raise the silkworm in properly arranged buildings, and to supply it with mulberry leaves gathered from day to day. In India, China, and other tropical countries the eggs hatch readily at the proper time by the natural heat; but in southern Europe artificial heat is almost always required; formerly the heat of fermenting dung was found serviceable, and the warmth of the human body was also used, the eggs being carried in little bags in the bosom of the cultivator; but now they are regularly hatched by stove-heat, beginning with a temperature of 64° F., which is gradually increased through ten days to 82°, at which it is maintained until the eggs are hatched. Experience has shown that the operation is facilitated by washing the eggs in the first place with clean water; and some cultivators also wash them in wine, the value of which is very questionable. Washing is found to remove a certain gumminess and other impurities from the eggs which would otherwise impede the hatching. When the silkworms have been regularly developed as above described, it is usual to place above the trays contrivances for the caterpillar to spin within. In feeding the worms care is taken so to distribute the food on the shelves or in the trays that the insects shall not crowd together; and for this reason the most careful cultivators chop the leaves small, and strew them very evenly about. Great care is taken not to let the worms of one hatch mix with those of another, unless of exactly the same age, otherwise the stronger insects would deprive the younger of their food. Many other niceties of attention are required, which altogether render the successful rearing of silkworms a matter of much anxiety and labour.

Diseases.—Silkworms are subject to various diseases. In all about fifteen have been defined, but the most important, which only need mention here, are *Muscardine*, *Pebrine*, *Flacherie*, *Guttine*, and *Grasserie*. *Muscardine* is the result of the growth on the silkworm of a microscopic fungus named *Botrytis bassiana*. The spores of this minute fungus are not larger than the two millièmes of a millimetre. They are carried by the air, and falling on the mulberry leaves or on the worms cause the disease. Worms affected with muscardine die before arriving at the moth. In the magnaneries where the disease is present or is suspected they are daily fumigated with sulphurous acid gas (fumes of sulphur), which kills the spores, but does not hurt the worm. *Pebrine* is the most important disease. Worms affected with it are without difficulty detected; amongst other well-known signs by the appearance of blackish spots on the skin. This disease is the consequence of a corpuscle or bacillus, which, once having entered the worm, multiplies rapidly. The interior of the body of a moth is often found to be quite full of corpuscles. *Pebrine* is found in all the life-stages of the insect. Prevention is the remedy laid down by Pasteur, and in all well-managed rearing-houses the microscope is employed to examine the eggs, when those found to be pebrinised are rejected. This method, combined with greater cleanliness, desiccation, and fumigations of chlorine, has been so successfully used since 1865 that pebrine has nearly disappeared in a number of localities in France and Italy where previously sericulture had become almost extinct, and it now only exists where these precautions

are not sufficiently observed. *Flacherie* is a deadly and contagious disease, and is the result of bacterial growth of a vibronic nature. The worms are attacked in their last stage, having arrived at their full size; they languish, die, and decompose rapidly, a whole chamber sometimes perishing in a day. Pasteur has fully studied this disease, and has pointed out preventive remedies. It is generally the result of other diseases and the want of proper precaution, especially as to the careful conservation of the eggs from the laying of them to the time they are hatched. *Guttine* is a disease of the same character, and is probably only a modification of flacherie. *Grasserie* is of less importance than the other diseases; but it is interesting and not very well understood. A few worms will frequently be found in the midst of healthy ones, which are evidently ailing, crawling slowly, with a glossy skin, becoming thinner and longer. In the yellow races the colour becomes bright, and in the white races an unhealthy milky-white appearance, and through the skin there exudes a dirty liquid which under the microscope is seen to contain a multitude of many-sided globules, probably albuminous. A cold, stagnant, or damp atmosphere, or a too crowded chamber, favours the commencement of this disease, which is neither hereditary nor contagious.

Preparation of Silk.—When the cocoons are completed, which is known by the absence of any sound within, they are carefully sorted, and a certain number are kept for breeding. The sexes are readily known by the difference of shape as well as of size. The French growers sort them into several varieties; those which are less compact, or in which the worm has died—a fact known by external indications—being separated from the good ones. When the sorting is finished, the cocoons are placed in an oven with a gentle heat, which kills the enclosed chrysalis—otherwise they would all become perforated by the insect eating through; they are then prepared for winding by first removing the flossy covering, which is often somewhat hard and compact. The cocoons are placed in basins of water, kept warm by charcoal fires, or in the larger establishments by steam. This softens the natural gum which coats the silk, and loosens the various coils of silk adhering together in the cocoon. The operator then takes a small battage brush made of twigs and stirs them about in the water. This catches the outside portions of the cocoon, from which the reelable thread is gradually unwound. From three to five of these ends are taken and united into one thread, which is passed through a polished metal or glass eye in the reeling-machine. In large filatures or silk establishments complex machinery is used for winding; but reeling apparatus of greater simplicity is used by the Chinese, East Indians, and others. In all cases, however, the principle is the same. The plan most generally adopted in Italy is shown by fig. 2.

Great care and skill are required in reeling silk from the cocoons, because, although the reeler starts with four or five or six cocoons, not only are their individual threads apt to break, but they are not all of the same length, so that one will run out before the others. These matters are carefully watched, and, as often as a thread breaks or a cocoon runs out, another thread is joined on and is made to adhere to the compound thread on the reel by its natural gumminess. Each cocoon generally yields about 300 yards of thread, so that it takes 1200, 1500, or 1800 yards to make 300 yards of the filament of raw silk, by which name the reeled silk is always known. The raw silk is made up into hanks of various sizes. That from China and Japan is tied in packages of six hanks

each, technically called books, and sometimes the ends of these books are covered with silken caps very curiously formed out of unreeled cocoons macerated and felted into a thin material, so managed as to form a filmy cap sufficiently large to cover a man's head. Formerly all raw silk required to be made into compound and twisted threads was termed thrown silk, but at the present time much is woven in the raw state and afterwards dyed in the piece. The raw silk is used for the warp, and spun silk and cotton for the weft, of the cheaper kinds of silks, such as foulards and some satins, made in large quantities in Lyons.

When the silk has to be thrown into organzine or tram, the raw silk is put into warm soap and

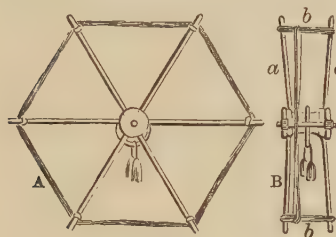


Fig. 2.

water to soften the gum, so as to make the hanks wind more easily. The hanks are placed on large skeleton reels called swifts (A, B, fig. 2), so adjusted that they will hold the hanks tightly. B, the

edge view, shows that the spokes, *a, a*, are in pairs. They are made of thin pieces of lance-wood, and each pair are rather nearer together at the axle than at the circumference, where they are connected together by a small band of cord, *b, b*. These bands are so tied that they will slip down easily to admit of the hanks being placed; then, by pushing the cords upwards, the hank can be stretched to its fullest extent.

This is necessary to compensate for the varying lengths of the hanks received from the different countries. When the swifts are set in motion the silk is carried from the hanks to bobbins, upon which it is wound for the convenience of further operations. The bobbins are then taken from the winding to the cleaning machine, when they are placed on fixed spindles, so that they will turn with the slightest pull; and the thread is passed through a small apparatus

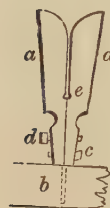


Fig. 3.

attached to the cleaner, and consists essentially of two polished smooth-edged blades of metal (*a, a*, fig. 3) attached to a part of the frame of the machine, *b*. They are held together by the screw, *c*, and are slightly opened or closed by the other screw, *d*, so that the thread can be put between them down to the small orifice, *e*, and then, by tightening the screw, preventing its return after passing through this small hole, which is the gauge of the thread, and which removes any irregularities or adherent dirt. The silk next passes over a glass or metal rod, and then through another small hole, much larger than that of the cleaner, and usually made of glass, on to the bobbin, upon which it is wound by the action of the machine. The next process is twisting the cleaned thread, by which it becomes better adapted for being combined with other threads. Doubling is the next process, and this consists in running off a number of bobbins of twisted silk on to one bobbin of a larger size, which is put into the throwing machine, when the ends of the doubled silk are passed through a smooth hole on to a large reel, which reel winds it into hanks, but twisting the threads into a fine cord as it goes from the bobbins to the reel. After this the hanks have to be again wound on reels and bobbins for the weaver, the

former for the warp and the latter for the weft. If it has been wound, cleaned, and thrown it is called thrown-singles; if wound, cleaned, doubled, and thrown, it is called tram, and is used for the richer silks and velvets, but only for the weft or shute; and if wound, cleaned, spun, doubled, and thrown, it is called organzine, and is used for the warps of fabrics.

'Waste' or Spun Silk.—Before winding the cocoons a flossy portion has to be removed, and then, in reeling, throwing, and other processes, a certain quantity of 'waste' is made, known as 'throwsters' waste. To these have to be added the fibres resulting from soft, damaged, misshapen, and pierced cocoons, all of which constitute a valuable species of by-product. 'Knubbs' is the term applied to cocoons drawn out into a long ribbon-like mass, and 'Punjam Books' to rough-looking hanks of filament which accrue in the winding of a large number of cocoons. Further, the difficulty experienced in the winding of Tussur cocoons causes a considerable portion of them to be employed in the preparation of spun silk.

As early as 1671 an invention was patented by Edmond Blond, a silk manufacturer, for the treatment of such waste by carding and roving; and other early attempts followed on this principle. But a practical method of working the substance into a yarn for commercial use was not designed till the middle of the 19th century. It appears to have been initiated in the West Riding of Yorkshire, where the machinery is still constructed for different parts of the world, and where this class of silk-spinning remains an important branch of textile industry. By the modern system, after degumming by either the 'boiling' process (English practice) or by the Schapping or steeping process (Continental practice), the 'waste' is (1) dressed, prepared into 'stricks' of straightened fibre; (2) combed; and (3) drawn and spun.

Centres of Manufacture.—The following silk centres represent the present and past localities of British silk manufacture: London (Spitalfields), Derby, Coventry, Sherborne (Dorsetshire), Sudbury, Glensford and Haverhill (Suffolk), Braintree, Yarmouth, Bungay, Leicester, Nottingham, Norwich, Macclesfield, Leek, Congleton, city and district of Manchester, Rochdale, Bradford, Halifax, city and district of Glasgow, city and district of Dublin, Tideswell (Derbyshire). Leek is justly celebrated for its manufactures of sewing and embroidery silks, and has become one of the principal centres of silk-dyeing in England. It is noted for the production of a special 'raven black,' nowhere else produced, and so called from its resemblance to the bluish-black plumage of a raven's wing. The value of this shade is said to be partly owing to the peculiar quality of the water used in dyeing. Silk is also dyed in London, Glasgow, Macclesfield, Coventry, Middleton, and other places, but to a much diminished extent.

Statistics.—About 100 lb. of cocoons are raised from 1 oz. of eggs, and 12 to 14 lb. of cocoons yield 1 lb. of raw silk; but the quantity is variable, and depends on silkworm study, selection of eggs, and in crossing the numerous varieties. As far as can be ascertained, the total quantity of raw silk annually produced in the world is upwards of 22 millions of pounds. China furnishes 38·53 per cent.; Italy, 29·65 per cent.; Japan, 12 per cent.; France, 7·52 per cent.; the Levant, 6·21 per cent.; India, 3·82 per cent.

Of silk manufacturing countries France is the principal. France itself produces about one-eighth of the raw silk consumed, the rest being imported from Italy and Asiatic countries. Of the world's manufactured silk France produces about two-fifths.

American Silk Industry.—The history of silk production in America dates from 1530, when the first mulberry-trees and silkworms were imported into Mexico. But by 1600 the industry had died out there; and a like fate overtook it in Virginia before the end of the next century, and practically everywhere by the beginning of the 19th century, although it had been vigorously encouraged by England, filatures established, and Georgia alone in one year had sent home nearly 2000 lb. of raw silk. About 1825 a powerful effort was made to revive the industry in the United States; silk societies were established, and manuals of silk-culture, such as J. H. Cobb's, printed and distributed by state legislatures and by congress. But success was prevented by a craze for speculation in Chinese mulberry-trees, which ended in widespread ruin in 1839. Since then silk-culture has never flourished in America. It was taken up with eagerness in California in 1854, but quickly dwindled and died; there is a state board of silk-culture in San Francisco, but it has not succeeded in arousing much interest in it. At Philadelphia a Woman's Silk-culture Association was founded in 1876, so far with the same result; nor has commercial success encouraged the attempts of the Agricultural Department, which established a filature at Washington in 1886 for reeling silk from American cocoons, and has distributed eggs of large Milanese silkworms. But if silk-culture has failed so far to engage American attention and capital, the reverse has been the case with the silk manufacture. This began in New England early in the 18th century, and steam-power for the manufacture of sewing-silk was introduced in 1810, improved machinery quickly following, until before the Civil War a great trade had grown up in twist, dress-trimmings, ribbons, and woven silk goods. Laces were manufactured at Brooklyn in 1871, and since 1876 silk handkerchiefs, tapestry, and velvets, besides dress-silks of all sorts, have been manufactured in steadily increasing quantities and excellent qualities. The most famous seat of the American silk manufacture is Paterson (q.v.).

Wild Silks.—This is a generic term generally signifying those silks used in commerce, and those not at present utilised, other than silk of the mulberry-feeding worms; but it relates almost entirely to the Saturniæ, whose fibres are more or less flat; it necessarily includes a few species which are subject to more or less of domestication, such as the Eria and Muga of Assam. Most of the principal wild silkworms are Asiatic. The best known are those of India. There are a few species in North America, one or two of which have received some attention. South America and the West Indies contain many others, and are almost unworked fields. The following list includes all the principal wild silks:

Atlas and Eria Group.—*Attacus atlas*, *A. silhetica*, *A. edwardsia*, *A. cynthia*, *A. ricini*, *A. canningi*, *A. lunula*, *A. obscurus*, *A. guerini*.

Actias Group.—*Actias selene*, *A. sinensis*, *A. leto*, *A. menas*, *A. ignescens*.

Tussur and Muga Group.—*Antheraea mylitta*, *A. pernyi*, *A. andamana*, *A. mezankooria*, *A. frithii*, *A. nebulosa*, *A. helferi*, *A. perrotteti*, *A. assama*, *A. roylei*.

Miscellaneous Group.—*Salassa lola*, *Rinaca zuleika*, *Rhodina newara*, *Caligula thibeta*, *C. simla*, *C. cachava*, *Neoris huttoni*, *N. shadulla*, *N. stoliczkan*, *Saturnia cidosa*, *S. grotei*, *S. lindia*, *S. anna*, *Lepa katinka*, *L. sikkima*, *L. sivalica*, *L. miranda*, *Cricula trifenestrata*, *C. drepanoides*, *Antheraea confuci*, *A. yama-mai*, *Saturnia pyretorum*, *Theophila mandarina*.

Of these a few species only need be noticed here. *Antheraea yama-mai* is a Japanese species, which feeds on the leaves of the oak. It is peculiar to

Japan, and has long been held in high estimation there, more so formerly than now. At one period its silk was solely reserved for the use of royalty, and the penalty of death is said to have been inflicted upon any person found using it or taking the eggs. At the present time it is woven along with the ordinary silk of commerce in patterns, giving the separate effects of each silk. The Eria silk is the product of the Eri or Arindi worm of Assam (*Attacus ricini*). It is largely cultivated in that part of India, and is handspun and woven by the natives in garments, rough, but so durable that mothers are said to leave them to their daughters. The cocoon is soft and not compact; it has hitherto been found impossible to unwind it in a continuous thread, and in consequence of this difficulty it is rudely spun by hand like flax. It would be largely employed in Europe for machine-spinning if it could be cultivated and exported in quantity. Its excellences for this process of manufacture are well known. The worm chiefly feeds on the *Ricinus communis*, or castor-oil plant. *Attacus cynthia* is a species closely allied to *Attacus ricini*. It comes originally from China, and feeds on the Ailanto (q.v.) tree. Its cocoons were first received in Europe in November 1856, and hatched out the following year, and towards the middle of May 1857 the first living specimen of *Attacus cynthia* was born in Europe. These cocoons were sent by Abbé Fantoni, a Piedmontese missionary, from the province of Shan-tung, to some friends at Turin. This species was first introduced into England in 1859, and reared by F. Moore of the East India Museum. The larvae, feeding on the castor-oil plant, and hatched from eggs sent by Guérin Méneville, were exhibited by Moore before the Entomological Society of London in October 1859. Afterwards Lady Dorothy Nevill cultivated that species extensively, and planted in her park in the



Fig. 4.—*Ailanthus* Silkworm (*Attacus cynthia*), reduced, showing Cocoon attached to a leaf.

south of England a number of Ailanto trees. Dr Wallace also wrote on this silkworm, and considerable efforts have been made in France and in England to domesticate it, but without success. The *Attacus atlas* is found over India. It is the largest known moth, being often 10 inches in expanse of wing. The cocoon is large, but the fibre is coarse; it has not hitherto been used in the reeled state, but it is utilised in the

Nepal Terai by the Mechi people, in the form of rudely made cloths. The warp and weft are hand-spun yarns of long staple. The *Antheraea assama* or Muga silk is confined to Assam, and is largely cultivated for native purposes. A little is exported to Dacca and Calcutta for embroidery purposes. Could the natives be induced to cultivate it on a commercial scale for exportation it would have a widely extended use, for it is a silk that could easily be utilised for many European purposes.

The last two silks are the principal wild ones; they may from their similarity be classed as one, and are known under the name of Tussur silk—a name said to be derived from *tasara*, a weaver's shuttle. The species known as *Antheraea pernyi* is a native of China; the worm feeds on the leaves

of the oak. It is very largely cultivated for export to Europe. That known as *Antheraea mylitta* is the principal species, and is exclusively Indian, being found over all parts of the country, particularly in Bengal. The Tussur silkworm when fully grown is very large and beautiful. It is about $5\frac{1}{2}$ inches long. Its cocoon is large and compact; the silk is of a deep fawn colour, which has to be resolved before any delicate shades of colour can be dyed upon it. The rapidly extended utilisation of this silk is very wonderful. About 1871 its European use was almost confined to the wearing of native-made cloths in the undyed state, and the consumption was extremely small; but in consequence of improvement in the bleaching and dyeing of this silk, at first effected by the original writer of this article (Sir Thomas Wardle), as well as his suggested utilisation, its importation has now become of serious import. The fibre is well adapted for pile fabrics, and very large quantities are used in Yorkshire for the manufacture of seal cloths, a fabric resembling sealskin. France has taken up the utilisation of this silk for trimming and upholstery purposes. The fibre of Tussur silk is flat and thick.

A fabric closely resembling silk is now manufactured from wood reduced to a glutinous, transparent pulp. See SILK (ARTIFICIAL).

See also the articles DYEING, LYONS, MOIRE, SATIN, VELVET, WEAVING, &c.; Lardner's Cyclopædia; the monograph by Cobb in 'British Manufacturing Industries' (1876); American works by Brockett (1879), Wyckoff (1879), Crozier (1880), and Riley (1886); and the following works by T. Wardle: *The Wild Silks of India* (a South Kensington Handbook), *The English Silk Industry* (in Report of Royal Commissioners on Technical Education, 1884), *Silk* (1888), *Kashmir* (1905)—besides Arbousset, *On Silk and the Silkworm* (trans. by Miss Wardle, pref. by T. Wardle, 1905); *Silk Throwing and Waste-silk Spinning*, by H. Rayner; *Silk Dyeing, Printing, and Finishing*, by G. H. Hurst; *Rubans et Soieries—Cours Théorique et Pratique*, by J. Seillon; *Coupe des Velours*, by E. Gand.

Silk, ARTIFICIAL, is the name usually employed to designate a number of artificial textile fibres which have been brought into commercial use during the 20th century; but any claim they may have to this title is mainly due to their high silky lustre, and also, perhaps, to the fact that they are formed by the solidification of fine streams of liquid in a somewhat similar manner to real silk. The first suggestion for the manufacture of a fibre to imitate real silk appears to have been due to the French scientist Réaumur in 1734, but nothing seems to have been done for over a century. In 1855 Andemars of Lausanne patented a very primitive process for making fibres from Collodion (q.v.), and during the ensuing thirty years considerable progress was made in the preparation of artificial fibres, but mainly with the object of preparing carbon filaments for the incandescent electric lamps then in use and not as textile fibres.

The real founder of the artificial-silk industry was a Frenchman, Comte H. de Chardonnet (1839-1924), who took out a patent in 1884 and, after overcoming great difficulties, was able to place the manufacture on a commercial basis about 1891. Many substances have been tried as a basis for artificial silk, but all the successful methods start either from cotton or from some other Cellulose (q.v.) material such as wood-pulp. Speaking generally, the methods of manufacture are similar in all cases. A viscous solution of cellulose, or of some cellulose derivative in a suitable solvent, is forced under pressure through fine jets or openings (spinnerets) either into the air, if the solvent be readily volatile, or else into some suitable liquid which will precipitate the cellulose substance from its

solution. In either case, the threads of viscous liquid issuing from the spinnerets are rapidly coagulated into fine solid filaments, a number of which are twisted together to form a continuous thread. The product has then to undergo a number of chemical and other treatments according to the particular process being employed.

The artificial silks at present on the market may be divided into four main groups: (1) Nitro silks; (2) Cuprammonium silks; (3) Viscose silks; (4) Acetyl silks.

(1) *Nitro silks*, sometimes called Chardonnet silks (from their inventor) or Collodion silks, are made by treating cotton with a mixture of nitric and sulphuric acids and dissolving the cellulose nitrate formed in a mixture of alcohol and ether to form a viscous solution of collodion. When this is squirted into the air the solvent evaporates and a silky cellulose nitrate fibre is obtained. This is very inflammable and is treated with chemicals, which convert it into almost pure cellulose no more inflammable than cotton. This was the first process used on the large scale, but is complicated, and, although it is still used, has been largely replaced by cheaper methods. (2) *Cuprammonium silks* are also known as 'Glanzstoff.' This method is largely due to Pauly (1892). Cotton or wood-pulp is converted into a slimy solution by treatment with copper hydroxide and ammonia, and is 'spun' by squirting into an acid or alkaline bath, which precipitates an almost pure cellulose fibre. This method is still used to a fairly large extent.

(3) *Viscose silks*.—The substance viscose itself was first made by Cross, Bevan, and Beadle, 1896. Cotton or wood-pulp is treated with caustic-soda solution and then with carbon disulphide, the solution of viscose obtained is squirted into an acid bath, and after further treatment yields an almost pure cellulose fibre. (4) *Acetyl silks*.—The best-known variety of these is 'Celanese.' Cotton is converted into cellulose acetate by chemical treatment and the product dissolved in acetone. It can be spun in the air as the acetone evaporates, leaving a thread of cellulose acetate, which is the final product, thus differing from the previously mentioned varieties, which are all practically pure cellulose fibres. This variety has quite different dyeing properties to the other textile fibres, which renders it specially valuable for use in combination with the other fibres, which can be then dyed to give two-colour effects.

When cotton is used as a basis the short fibres separated in the cotton ginning and known as 'linters' are employed for cheapness. Artificial-silk yarns as they come into the market consist of a number of single filaments twisted together. These single filaments have been 'spun' as fine as the thread spun by the silkworm itself ($1\frac{1}{2}$ denier), but are usually much coarser. A 150-denier yarn might consist of 18 filaments, each about 8 deniers. The greater the number of filaments in a yarn of a given size, the softer is the feel of the material and the greater its 'covering power.' Coarse filaments are very stiff. Besides yarns varying from 40 to 4000 deniers, some very coarse single filament material is produced for use in hat making, &c.

Staple Fibre or *Fibro* is made by cutting the continuous filaments into short lengths, and is chiefly used for blending with wool or cotton and spinning into mixed yarns. The main defect of artificial silk is its low strength, which is only about a quarter to a half that of real silk when dry, and still less when wet, and also its low resistance to friction. It is deficient in elasticity, and owing to the stiffness and smoothness of the fibres it gives rise to difficulties in weaving and knitting. On the other hand it far surpasses real

silk in the brilliancy of its lustre, and is a fairly durable material if reasonable care be taken in its treatment. Owing to its great lustre it rapidly replaced real silk for braids and trimmings, but from the first its main use has been for knitted goods of all kinds—jumpers, dresses, hosiery, &c.; increasing amounts are employed in weaving such materials as curtains, furnishing materials, damasks, crepe de chine, satins, linings, &c. It is often woven along with wool or cotton, which not only gives a stronger material but also one with more warmth-giving properties; artificial silk alone, owing to its structure, being rather a cold material. It is also much used for the ornamentation of cotton materials for which real silk would often be too expensive.

It is impossible to obtain reliable figures as to the annual production of artificial silk but, in 1926, it was estimated at from 100,000 to 120,000 tons, of which probably 80 per cent. was manufactured by the viscose method. The price in that year was about 6s. to 7s. per pound for a good quality yarn, or about one quarter that of real silk. The largest producers at that date were the U.S.A., followed by Italy, the United Kingdom, Germany, and France, in the order given. Attempts are being made to substitute the name 'Rayon' for artificial silk, but their success appears very doubtful.

Silk, VEGETABLE. See SILK-COTTON.

Silk-cotton. Under this name various silky fibres are from time to time brought from tropical countries to Europe; they are all of the same general character, and are chiefly produced by the trees composing the genus *Bombax* and other genera included in the family *Bombacaceæ* (q.v.). These trees are natives of the tropical parts of Asia, Africa, Australia, and America. The fibre fills their large woody capsules, enveloping the seeds contained in them, and is produced in great abundance, but is too short, too smooth, and too soft to be spun into yarn by machinery. Silk-cotton is, however, used for stuffing pillows, mattresses, sofas, &c. to a limited extent in England, but more largely in Holland, where a long-stapled variety is obtained from Java. One of the best-known silk-cotton trees is *Bombax malabaricum*, a very large soft-wooded tree growing in India, Burma, Java, and North Australia. Its fibre is called *sinhal*. Another of these trees is *Eriodendron anfractuosum*, which is found in tropical countries of both hemispheres, and which yields the fibre known as *kapok*, used for stuffing life-jackets, quilts, mattresses, &c. Kapok oil is used in the manufacture of soap and margarine. *Cochlospermum gossypium*, a small Indian tree, also yields a silk-cotton. A beautiful fibre of this kind is obtained in the West Indies from *Ochroma lagopus*. *Vegetable silk*, which, like silk-cotton, is only suitable for stuffing, is the covering of the seeds of *Chorisia speciosa*, a Brazilian tree.

Silk-cotton-grass, or SILK-GRASS, a name given to various species of the West Indian bromeliaceous genus *Karatas* or *Nidularium*, which yield fibres.

Silk-tail, the Chatterer or Bohemian Wax-wing. See WAX-WING.

Silk-weed. See ASCLEPIAS, FIBROUS SUBSTANCES.

Silkworm Gut, a material used by anglers for dressing the hook-end of the fishing-line. It consists of the drawn-out glands of the silkworm at the time it is about to spin its cocoon and when these glands are fully distended. The worms are immersed for twelve or fourteen hours in strong vinegar, and then taken separately, and pulled

asunder. The skilled operator knows by the strength of the silk-gut if the soaking in vinegar has been sufficient, and if so he lays hold of the ends of the two silk-glands and draws them out gently to the proper length—and so the gut is formed. He then stretches a number of these lengths separately across a board, fixing them at each side or end by slits or pins, after which they are exposed to the sun to dry. Silkworm gut is a very strong material. It is prepared in Italy and Spain.

Sill, or INTRUSIVE SHEET. See IGNEOUS ROCKS.

Sillery, a village in the French department of Marne, near Reims, famous for its Champagne (q.v.).

Silliman, BENJAMIN, American physicist, was born at North Stratford (now Trumbull), Connecticut, August 8, 1779. His father was a colonial judge, and a brigadier-general in the war of independence. He graduated at Yale in 1796, was appointed a tutor in 1799, and was admitted to the bar in 1802, but soon after received from the college the appointment of professor of Chemistry, and proceeded first to study this subject, attending lectures on chemistry for three years at Philadelphia, and in 1805–6 at Edinburgh (on geology also) and London. His chair he filled till 1853, and for two years longer lectured on geology. In the course of many experiments in 1822 he first established the fact of the transfer of particles of carbon from the positive to the negative pole of the voltaic battery. From 1808 he delivered popular lectures on chemistry and geology in many parts of the country, and interested in these subjects many who afterwards became among the foremost of American scientists. In 1840 Professor Silliman was elected the first president of the American Association of Geologists and Naturalists—since grown into the American Association for the Advancement of Science. In 1818 he founded the *American Journal of Science*, better known as *Silliman's Journal*, of which he was for twenty years the sole and for eight more the principal editor. In 1830 he published a textbook on chemistry; he edited several editions of Bakewell's *Geology* and of Henry's *Chemistry*; and in 1853 he published a *Narrative of a Visit to Europe in 1851* (his *Journals of Travels in England, Holland, and Scotland* had appeared as early as 1810). He died 24th November 1864, at New Haven, where a bronze statue was erected in 1884 in the college grounds. See the Life by G. P. Fisher (1866).—His son, Benjamin (1816–85), assisted his father from 1837, in 1847 founded the Yale (since 1860 the 'Sheffield') School of Science, and was its professor of Chemistry till 1869, except in 1849–54, when he held a chair at Louisville. He was professor of Chemistry at Yale from 1854—in the college till 1870, in the medical department till his death. His researches were chiefly in applied chemistry and in mineralogy. From 1845 to 1885 he was co-editor of the *Journal of Science*, and he published very popular manuals of chemistry and of physics, and a volume on *American Contributions to Chemistry* (1875).

Silloth, a seaport and watering-place of Cumberland, on the Solway Firth, 20 miles W. of Carlisle. Prior to the opening of the railway in 1856 it was a mere hamlet, but it is now of growing importance, with good docks opened in 1857–85. Silloth, which commands a fine view, is much resorted to for sea-bathing, the climate being mild and salubrious, and considered highly favourable for those affected with pulmonary complaints. The mean annual temperature is 49° 1', the same as that of Worthing, and only 1° below that of Torquay. It forms a ward of Holme Cultram urban district.

Silo. See SILAGE.

Siloam. See JERUSALEM, INSCRIPTIONS, HEBREW LANGUAGE.

Silphium, a gum-resin got from an unidentified umbelliferous plant, perhaps a *Thapsia*, imported by the ancient Greeks from Cyrenaica (q.v.). The juice was used in food and medicine. The name has been given to a genus of *Compositæ* found in the eastern United States. *S. laciniatum*, in exposed places, is a compass-plant, avoiding the mid-day sun by turning its leaf-edges north and south.

Silures, an ancient people inhabiting the south-east of South Wales and the adjoining English area—Glamorgan, Brecknock, Monmouth, Radnor, Hereford. They were a dark and curly-haired race, and were probably of a non-Aryan stock—Iberian or Euskarian—though ultimately Celticised in language and manners. Less civilised than their British neighbours, they were more war-like, and offered fierce resistance to Ostorius Scapula and other Roman invaders. See WALES, BASQUES, CELTS.

Silurian System, a name given by Murchison in 1835 from the Silures (q.v.) in South Wales, where this system is well developed. The sedimentary strata consist principally of grits, slates, dark shales, flagstones, sandstones, and conglomerates, and interbedded with these occur occasional calcareous bands, and more or less lenticular beds of limestone. The following table gives the succession of the Silurian system of Britain:

UPPER SILURIAN....	{ Ludlow Group. Wenlock Group. Llandovery Group.
LOWER SILURIAN OF ORDOVICIAN.....	{ Bala and Caradoc Group. Llandeilo Group. Arenig Group.

The strata attain a thickness of more than 20,000 feet, and have a wide distribution. In Wales the basement beds rest conformably on the upper members of the Cambrian system, while a well-marked unconformity separates the Lower from the Upper Silurian. Silurian rocks are exposed at the surface in many of our upland areas: thus, they form a large part of the high grounds of Wales, Westmorland, and Cumberland, and the major portion of the Southern Uplands of Scotland; they may occur in a metamorphosed state in the Highlands. In the hilly parts of Ireland they are also well developed at the surface; nor can there be much doubt that the same strata, buried under younger systems, extend throughout the larger part of the British Islands. The deposition of the Lower Silurian was marked by the appearance of considerable volcanoes in Wales, Westmorland, Ayrshire, and the south-east of Ireland.

On the continent of Europe Silurian strata have an extensive development. They occupy large tracts in Scandinavia and the basin of the Baltic, and probably continue eastwards under the great plains of northern Russia, for they crop up along the flanks of the Ural Mountains. In middle and southern Europe they rise again and again to the surface in mountain-regions, from which it may be inferred that they underlie vast areas in the surrounding low grounds. In North America Silurian rocks extend westwards from the mouth of the St Lawrence by the great lakes into the far north-west, and south-west by the Alleghanies into Alabama. As more or less isolated areas rise to the surface in the interior of the continent, it is probable that Silurian strata, concealed under younger formations, extend throughout the interior continental basin; and they reappear in the Rocky Mountains. The system has been recognised as entering into the formation of the Cordilleras of South America. Silurian strata have

also been detected in the Himalayas and other parts of Asia, in Australia, and New Zealand.

The Silurian rocks which occur in mountainous areas are usually much indurated and dip at high angles, being frequently much contorted and dislocated. In regions of intense folding, as in Norway, they have even been subjected to such disturbance that they have over wide areas acquired a more or less schistose or foliated character. In other low-lying regions, however, as in Russia, the strata are not indurated, and occur in horizontal or gently inclined positions.

Life of the Period.—Plant-remains consist almost exclusively of seaweeds, only a few traces of land-plants having been met with. These indicate a cryptogamic flora—ferns and lycopodiaceous trees. The lower forms of animal life were represented chiefly by sponges (*Amphispongia*, *Astylospongia*, &c.). Amongst the *Cœlenterata* were numerous forms of graptolites and corals. The former are eminently characteristic of the Silurian, and abound in certain thin bands of black shale. Those with two rows of cells are mostly confined to the Lower Silurian, while the single-rowed graptolites are upon the whole most common in the Upper Silurian. Corals abounded—certain limestones appearing to be almost wholly made up of their remains. Some common or characteristic rugose forms were *Omphyma*, *Zaphrentis*, *Cyathophyllum*, &c. Prominent tabulate forms were *Halysites*, *Favosites*, &c. The living *Alecyonarian* corals (*Heliopora*) were represented by *Heliolites*. Crinoids or sea-lilies were very numerous—their jointed stems and arms entering largely into the composition of many of the limestones. Cystideans, which attained their maximum development in Silurian times, star-fishes, and brittle-stars appear to have been less abundant. Annelid-tracks are common on the surfaces of beds, and the filled-up burrows of sea-worms frequently occur. Now and again jaws of annelids are likewise met with, and occasionally their tubular cases (*Serpulites*, *Spirorbis*) are seen attached to shells, corals, &c. Among the most characteristic Silurian fossils were the Trilobites, which made their first appearance in Cambrian seas and reached their greatest development in the Silurian age. They lived on in much diminished numbers through the Devonian and Carboniferous periods, and became finally extinct in Permian times. Some of the more widely distributed Silurian forms are *Ogygia*, *Trinucleus*, *Asaphus*, *Illænus*, *Phacops*, *Calymene*, &c. Other remarkable Arthropods were the Eurypterids (an extinct order allied to the existing king-crabs). One of these (*Pterygotus*) was seven or eight feet in length. Ostracods (*Beyrichia*) and Phyllopods (*Ceratiocaris*) likewise occur in Silurian rocks. Here also we meet with the first scorpion (*Palæophoneus*) and the earliest insect (*Palæoblattina*, a form of cockroach). Various lace-corals (*Fenestella*) and other Polyzoa occur, but by far the most abundant forms amongst Molluscs were the Brachiopods. Characteristic types are *Discina*, *Orthis*, *Leptæna*, *Pentamerus*, *Rhynchonella*, *Strophomena*. Lamellibranchs were much less numerous—*Modiolopsis*, *Ctenodonta*, and *Ortho-* *nota* are examples. Amongst Gasteropods the more common genera are *Euomphalus*, *Bellerophon*, *Holopella*, *Murchisonia*, and *Pleurotomaria*. The Cephalopods are well represented by straight and coiled chambered cells: amongst the former is *Orthoceras*, many species of which are known; the latter show such types as *Cyrtoceras*, *Lituities*, *Phragmoceras*, *Litoceras*, &c. Vertebrates make their earliest known appearance in the Upper Silurian. They are represented chiefly by Ostracoderms, the most remarkable being the small shark-like fishes (*Birkenia*, *Lanarkia*, &c.) discovered by the Geological Survey in the Pentland Hills and Lanarkshire.

Physical Conditions.—The Silurian strata appear to have been deposited chiefly in shallow seas, which here and there, however, may have been moderately deep. No certain indications of true oceanic conditions have yet been met with. During the formation of the Lower Silurian strata the entire area of the British Islands, with the exception, perhaps, of some of the Archæan tracts of the north-west, appears to have been under water. At this time active volcanoes, forming groups of islets, were scattered over the area of what is now North and South Wales, the south-east of Ireland, and southern Ayrshire. Considerable earth-movements affected the British area at the close of the Lower Silurian period—the bed of the sea being here and there elevated, so that islands of considerable size came into existence at the beginning of the Upper Silurian period. Eventually, however, a movement of depression supervened, and the islands referred to were submerged and gradually buried under the sedimentary accumulations of the Upper Silurian sea. Judging from the geographical distribution of the Silurian strata, we are led to conclude that enormous areas of what are now our continents were during the accumulation of those rocks overflowed by shallow seas. The main land-masses of the period seem to have been grouped chiefly in boreal regions and were composed essentially of Archæan rocks. In Europe and North America alike the old land-surface lay towards the north, but the great continental ridges may have risen here and there to the surface in other places so as to form groups of islands, as in Bavaria and Bohemia in Europe, and in the region of the Colorado and Park ranges in America.

The temperature of the seas was such as to allow of the migration of closely allied and apparently identical species of molluscs, crustaceans, &c. over vast regions. In arctic lands fossils occur which are met with likewise in the Silurian rocks of Wales; more than this, many Silurian species were truly cosmopolitan, ranging from the extreme north across the equator to Australia. To have allowed of such world-wide distribution the temperature of the seas must have been singularly uniform. But while not a few Silurian species were cosmopolitan, many others appear to have had a more restricted range. Thus it may be inferred that, however uniform the climatic conditions may have been, the uniformity nevertheless was only comparative, and that even in Silurian times the oceanic areas had their distinct life-provinces. By systematic studies of the lithological characters and fossil content of similar and contrasted provinces it may be possible eventually to picture in some measure the geographical conditions which obtained in times as remote even as the Silurian period. See also the articles MURCHISON (SIR RODERICK) and GEOLOGY in this work.

Siluridæ, or CAT-FISHES, a large family of fresh-water fishes, included in the order Physostomi. The skin is naked, or equipped with some bony scutes, never with scales; the dorsal fin is short and is occasionally absent—when present it is inserted above or in front of the ventrals; there is generally an adipose fin; the maxilla is very small; the barbels are well developed. The family is represented in most parts of the world. In Europe, however, there is only one Siluroid, the Sheat-fish or Shadden (*Silurus glanis*), which occurs in some eastern and central regions—e.g. in the Danube and the Elbe. In size it sometimes approaches the sturgeon, and is a sluggish but very voracious animal, and has been the subject of many strange stories. In North America most of the common cat-fishes belong to the genus *Amiurus*; in tropical America the genus *Pimelodus* has many representatives (see CAT-FISH). In many species of

Arius—a marine genus—common in the East Indies and on both coasts of Central America, the males hatch the eggs in their mouths. Species of *Doras*,



Silurus glanis.

common in South America, are remarkable for their habit of travelling from one pond to another. In northern Africa the most remarkable Siluroid is the Electric Cat-fish, *Malapterurus electricus*.

Silver (sym. Ag; atomic weight, 107·88; atomic number, 47; specific gravity, 10·42 to 10·57), a precious metal of a peculiar and beautiful white colour, by which it can be distinguished from all other metals or alloys, except one or two rare metals, such as lithium and indium. Silver is harder than gold, but softer than copper. It takes a very high polish, and for this reason was sometimes used for making small mirrors by the ancient Romans. It ranks next to gold in malleability and ductility, the thinnest silver-leaf produced by hammering being only $\frac{1}{100000}$ of an inch thick; and a wire of the metal can be drawn so fine that a length of 130 yards weighs only one grain. Silver conducts heat and electricity better than any other metal, for which reason it is adopted as the standard represented by 100. The emissivity or capacity for radiating heat of burnished silver is less than that of any other substance, being one-fiftieth of that of lamp-black. Silver does not suffer even from long exposure to the atmosphere, except that it readily tarnishes when sulphuretted hydrogen or animal exhalations containing sulphur are present. Both nitric and sulphuric acid dissolve silver; and aqueous hydrochloric acid, as well as a solution of common salt, converts the surface of the metal into the chloride of silver. The metal is useful for laboratory utensils as it is not attacked, as are glass and platinum, by fused caustic alkali. Silver melts, in the absence of air, at 1760° F. (960° C.), and, when molten, has the remarkable property of absorbing oxygen. The so-called 'spitting' of silver is the almost explosive expulsion of oxygen which occurs when a mass of silver is quickly cooled from the liquid to the solid state. The metal volatilises at about 2000° C., the vapour being bright blue. When silver is deposited by a reducing agent upon a glass surface from ammoniacal solution it may be obtained as an excessively thin film, which again is blue to transmitted light.

Silver is rare among Neolithic relics, but it was known in Egypt at an early period. It was a great favourite among the nations of antiquity, ancient Greek and Roman statuettes, vases, coins, &c., of silver being among the treasures of the chief museums. Diodorus Siculus (1st century B.C.) records that silver was first found in Spain by shepherds who set fire to a Pyrenean forest and so melted silver from veins. The story may have a substratum of truth, and throws light upon a probable manner of discovery of other metals besides silver which are easily reduced from certain of their ores. In 1630 an Indian on the Cerro de Pasco, Peru, lit a camp fire on the mountain side and found next morning that he had melted silver from the rock below the ashes; he thus discovered a vein which later became famous for copper as well as silver.

Oxides of Silver.—There are two oxides; the better-known argentic oxide, Ag_2O , is made by adding pure potash or soda to a solution of silver nitrate. Argentic oxide when moistened absorbs carbonic acid from the air. It decomposes and loses its oxygen at 572°F . (300°C .), and ignition takes place when it is rubbed in a mortar with sulphide of arsenic or of antimony and other easily oxidisable substances. The other oxide of silver is the *Peroxide*, Ag_2O_2 .

Sulphide of Silver, Ag_2S .—The strong affinity silver has for sulphur is seen from the readiness with which it blackens in an atmosphere containing sulphuretted hydrogen. A silver coin can be easily darkened by rubbing it with sulphur or by placing it in contact with vulcanised india-rubber, which contains sulphur. Sulphide of silver can be prepared by melting together silver clippings and sulphur in a covered crucible. It is also formed when sulphuretted hydrogen or a soluble alkaline sulphide is added to an aqueous solution of a salt of silver, the silver sulphide precipitating as a black powder. The tarnish on silver articles which from their nature cannot be easily rubbed with leather and rouge or brushed can be readily removed by an aqueous solution of cyanide of potassium; but as this salt is poisonous the article should be afterwards carefully washed. Silversmiths perfectly restore the original white colour to darkened silver objects by heating them in contact with carbonate of soda and nitre. Statuettes and other art objects in silver are frequently 'oxidised,' as it is called. This is really darkening their surface more or less by a film of sulphide produced by immersing them in a hot solution of sulphide of potassium. The prominent parts are then brightened by brushing or otherwise. The native compounds of silver and sulphur (ores) are noticed below.

Chloride of Silver, AgCl .—This salt is prepared by adding to an aqueous solution of the nitrate of silver either hydrochloric acid or chloride of sodium (common salt), when a thick, white, curdy precipitate of the chloride is thrown down. The precipitate requires to be washed and dried in the dark, and it is then an anhydrous white powder. When fused and allowed to cool it becomes waxy and hornlike, in which state it is translucent or even transparent in thin plates. In this massive condition it is still sometimes called by the old name of *horn silver* or *luna cornea*, whether native or artificially prepared. Chloride of silver is very insoluble in water, so that an extremely small proportion of silver may be detected in water by the formation of chloride. It dissolves in ammonia-water and cyanide of potassium or sodium. When a solution of chloride of silver in ammonia-water is boiled a fulminating compound is deposited; but this can be avoided by evaporating the solution at a gentle heat, by which treatment scales of the chloride separate. As commonly prepared, chloride of silver blackens by exposure to daylight. Native chloride of silver is an important ore of the metal, and is referred to below.

Cyanide of Silver, AgCN , is obtained by precipitation as a white powder when hydrocyanic acid or cyanide of potassium is added to an aqueous solution of nitrate of silver. It is insoluble in water, but aqueous solutions of ferrocyanide of potassium, hyposulphite of soda, and ammonia and some of its salts dissolve it. It forms double salts with various metallic cyanides, one of these, the *argento-cyanide of potassium*, being of great service in Electro-metallurgy (q.v.). Mr A. Wright, surgeon, Birmingham, first applied this salt to electroplating, his invention having been bought and patented by the Messrs Elkington in 1840.

Nitrate of Silver, AgNO_3 , is the most important

salt of the metal. It crystallises in colourless tabular plates belonging to the prismatic system, has a specific gravity of 4.355, and fuses at a low temperature, forming after solidification the *lunar caustic* used as an escharotic by surgeons. If during fusion the temperature is allowed to rise above 383°F . (198°C .) the salt is decomposed. Nitrate of silver dissolves in rather less ('783) than its own weight of water at 51.8°F . (11°C .), and is more soluble at higher temperatures. It is prepared by dissolving silver in moderately strong nitric acid with the aid of heat, and has a very bitter taste. Unless in contact with organic matter, nitrate of silver is not blackened or discoloured by the action of light. An ink for marking linen or cotton is prepared by dissolving 2 parts by weight of nitrate of silver and 1 part of gum-arabic in 7 parts of water, a little Indian ink being added. For the use of nitrate of silver in taking photographic pictures, see PHOTOGRAPHY. Black stains upon the hands or upon linen caused by nitrate of silver may be removed by a strong solution of iodide of potassium, or more efficiently by cyanide of potassium, which, however, is poisonous. When phosphorus is kept immersed in an aqueous solution of nitrate of silver the metal is reduced. This supplies a means of coating delicate objects with a film of silver. The article is dipped for a moment in bisulphide of carbon containing $\frac{1}{2}$ of its weight of phosphorus in solution. As the bisulphide evaporates, phosphorus is left in a state of fine division over the surface of the object, which is then dipped into an aqueous solution of nitrate of silver, from which silver is reduced by the phosphorus. Such objects as insects, feathers, and lace can be thus coated with silver, but adroitness is necessary, as finely-divided phosphorus takes fire spontaneously.

Sulphate of Silver, Ag_2SO_4 .—This salt is formed either by adding sulphate of soda to an aqueous solution of nitrate of silver, when it is thrown down as a precipitate, or by boiling granulated silver with sulphuric acid. The process for 'parting' an alloy of silver and gold by sulphuric acid is referred to below.

Silver can be removed from old plated articles by boiling them in a menstruum of 3 lb. of sulphuric acid, 1 lb. of water, and $1\frac{1}{2}$ oz. of nitrate of potash. The silver in the solution is then precipitated as the chloride, and from this the metal is recovered.

ORES OF SILVER.—The greater part of the world's supply of silver is obtained as a by-product from *argentiferous galena* and *copper ore*. All galena contains silver, though in very variable proportion. When that proportion exceeds about 3 ounces per ton it is generally worth extracting. Commonly, the finer-grained varieties of galena are the more argentiferous. Silver and copper are frequently associated, and many important lodes have yielded silver in their oxidised 'gossans' (see ORE-DEPOSITS) and copper at greater depths. The deposits of Cerro de Pasco (Peru), Butte (Montana), and Ducktown (Tennessee) are instances in point.

Native Silver is not uncommon in the gossans of silver-bearing veins; it occurs as sheets, scales, laminae, and wires, and (rarely) in the crystalline form (cubical system). The Kongsberg mines, Norway (opened 1623), have long been famous for their native silver, which is sometimes found in masses of considerable size; the largest weighed 1537 lb. A piece of silver weighing 1842 lb. was extracted at the Smuggler mine, Aspen, Colorado, in 1894; while in 1860 a mass of 8 tons is said to have been mined at Hien de la Encina, Spain. Important finds of native silver have been made in the Cobalt region, Ontario; a vein 5 feet wide of nearly pure silver was exposed there at the Nipissing

mine in 1906, and later 3000 lb. of solid silver was taken out of the shallow workings. Native gold usually contains some silver, and when the proportion of the latter exceeds 20 per cent. the native alloy is called *electrum*. Some specimens of electrum from Transylvania contain as much as 38 per cent. silver. Native silver occurs with native copper in Michigan. A native silver amalgam containing 13½ per cent. mercury is worked near Coquimbo, Chile; it is called *arguerite*. Similar amalgams have been found at Almadén, Spain, Almont, France, &c. Compounds of silver and tellurium, and of gold, silver, and tellurium, are of value in some districts.

Much silver is obtained in Mexico and Chile from *Argentite* or *silver glance* (Ag_2S). It occurs in the Comstock mine, Nevada, and sparingly in Europe and Cornwall. Crystallising in the cubic system, it contains 87 per cent. silver when pure. *Stephanite* or *brittle silver ore* ($5\text{Ag}_2\text{S} \cdot \text{Sb}_2\text{S}_3$) is a common associate of argentite and a valuable ore in Mexico and Peru; it crystallises in the rhombic system, and contains 71 per cent. of the metal. There are two *red silver ores*, i.e. *pyrrargyrite* ($3\text{Ag}_2\text{S} \cdot \text{Sb}_2\text{S}_3$), which is dark red, and *proustite* ($3\text{Ag}_2\text{S} \cdot \text{As}_2\text{S}_3$), which is light red in colour; they are frequently found together. *Polybasite* is an iron-black mineral containing silver, copper, antimony, and arsenic; while *freieslebenite* is steel-gray, and contains lead and antimony as well as silver; both are valuable when they occur in quantity. *Horn Silver* or *kerargyrite* (AgCl) is an important ore in South America; it is also found at Comstock (Nevada), Broken Hill (New South Wales), in California, Harz Mountains, and (rarely) in Cornwall. It usually occurs as a massive, wax-like, non-crystalline form which cuts like wax. Other silver minerals are only occasionally of economic importance.

PRODUCTION AND VALUE OF SILVER.—Mexico has, since the beginning of the century, recovered its old-time predominance as the premier silver-producing country of the world. It is closely followed by the United States; then by Canada and Australia. The supremacy of the American continent in silver-production is noteworthy: in 1922, of the world's total output of 192 million ounces, America contributed over 165 million. According to official figures, Mexico has produced 6000 million pesos of silver since 1521; the equivalent currency value is about 600 million pounds sterling. The principal silver-mining districts in Mexico are in the states of Guanajuato, Zacatecas, San Luis Potosí, and Hidalgo. Silver-bearing lead and copper ore is widely distributed in the United States, Utah, Missouri, Idaho, Montana, Nevada, and Colorado being prominent in this connection. The Comstock lode, Nevada, is one of the richest and most remarkable in the world, and has yielded about 80 million pounds worth of precious metals, of which silver accounts for three-fifths. The mines are deep and very hot. In some places the men can only work in 15-minute spells in a blast of cold air with a spray of cold water. The principal silver district of Canada is the Cobalt region, Ontario, the output of which reached its zenith in 1911, with 31½ million ounces. The veins were discovered during the making of the Timiskaming and North Ontario railway; they are numerous, and though usually only a few inches wide, their walls are mineralised, and each therefore presents a considerable width of workable ground. The greater part of Cobalt's silver has been obtained at depths less than 300 feet. The silver yielded by Australia is a by-product of lead and copper mining. The Broken Hill lead-zinc mines, New South Wales, contribute fully 80 per cent. of that continent's silver, the remainder coming from Mount Lyell, Mount Morgan, and

numerous smaller lead mines. The Broken Hill mines support about 4500 men, and have produced 33 million tons of ore worth 112 million pounds, the silver output totalling 370 million ounces. Silver is a commodity whose price is particularly sensitive to the ebb and flow of world business conditions; and the great consuming centres of the Far East, where more than 700 million people use currency based almost entirely upon the metal, are the principal sources of demand. The price of bar silver is usually stated in pence per standard ounce, 925 fine. It varied but slightly from an average of 60d. during the period 1845 to 1874; then there was a decline due to increased production, the minimum price of 23·3d. having been reached in 1902. At the outbreak of the Great War the price was almost 26d. per ounce; the war period saw an increase up to the maximum of 85d., which occurred in February 1920; then a rapid fall ensued. The average price in 1922 was 34·4d. per ounce. The nominal or coinage value in Britain is 66d. per troy ounce.

METALLURGICAL PROCESSES.—The metallurgical processes in use for the extraction of the metal from its ores are very varied. The scarcity or abundance of fuel is an important question in determining what process can be most economically employed. The three important methods of separating silver from its ores are (1) by forming an amalgam of silver with mercury, from which the latter is afterwards separated by distillation; (2) by converting the silver in sulphuretted ore or regulus into a soluble salt, and from its solution precipitating the silver by metallic copper or iron; (3) by forming a rich alloy with lead, as through the smelting of silver ores with galena or other lead ore, from which the silver is afterwards separated by cupellation.

Amalgamation Processes.—The Mexican or Patio amalgamation process, invented by Bartholomé de Medina in 1557, has been practised with but little alteration down to the present time. Silver is one of the metals with which mercury unites at common temperatures, though the amalgamation proceeds more quickly as the temperature increases. The ore, first broken into small pieces by stamps or edge stone mills, is most frequently ground in Mexico in a circular trough (*arrastre*), in some cases 9 feet in diameter and 1 foot deep, with a flat bottom formed of hard stones. In the centre revolves a vertical shaft on which are fixed four arms, each dragging a heavy stone by which the ore is reduced with water to a fine mud.

In the Patio process, which is suitable for sulphuretted silver ores, the materials used besides the ground ore are *magistral* (sulphide of copper roasted, so as to produce as much sulphate as possible), common salt, and mercury. The ore, at first a fine mud, is partially dried and worked into flat circular heaps, which, though sometimes smaller, generally contain from thirty to sixty tons. Salt-earth is then added in such quantity as will yield chloride of sodium amounting to fully 6 per cent. of the ore, a limited quantity of water being used. After a mixture of this salt with the ore is made the heap is made circular and trodden by horses for two hours, the mixture being turned over by men in the middle of the operation. The next step is to add about 2 per cent. of *magistral*, which is spread over the ore and incorporated with it, also by the feet of horses. If the ore under treatment contains about 60 ounces of silver per ton, then mercury to the extent of 24 lb. per ton is spread over the heap in small globules by pressing it through linen bags. Only about two-thirds of this mercury is, however, added in the first instance, and the mass again trodden for two hours by horses. The ore in the heap, now called

a *torta*, is next turned over by men, and horses once more trot over it for a rather longer time. After this the mass is left to rest for a day, when horses again travel over it. The second portion of mercury is added. Further treading by horses and turning over by men follow at intervals of days, the completion of the amalgamation process taking about a fortnight in summer and considerably longer in winter. The dry amalgam produced by the above operations now receives an addition of mercury to render it liquid enough to admit of its being separated from the slime by washing.

For what is called the *Cazo* or *Caldron* process—i.e. the hot amalgamation method as practised to some extent in Mexico, but more generally in South America—the suitable ores are those containing native silver or those consisting of silver in union with chlorine, bromine, or iodine. It is unsuited for sulphuretted ores. After having been ground, dressed, and washed the ore is put into a cauldron with a thick copper bottom, along with water to form a thin mud. A fire is then lighted beneath it, and just before the liquid stuff begins to boil common salt to the amount of about one-sixth part of the weight of the ore is added, and enough mercury put in, but not all at once, to form a soft amalgam. The liquid is constantly stirred by revolving arms on an upright shaft with copper blocks attached to them. In about six hours the operation is completed, and the amalgam is then separated from impurities. Care is necessary in this process not to use excess of mercury, which should not be more than four times that of the silver by weight. A greater quantity produces adhesion of the silver amalgam to the copper, and sometimes a copper amalgam is formed if the blocks rotate too slowly.

The amalgam, after being subjected to filtration through canvas, is distilled in an iron bell-shaped vessel or cylindrical retort, by which the mercury is expelled as vapour and the fumes condensed in a trough containing water. The silver remains in the retort, and is afterwards cast into bars.

The *pan amalgamation* process was introduced soon after the silver ores of Nevada and adjoining states began to be worked. The pans are tubs 5 or 6 feet in diameter, and generally made of iron. Each has a vertical shaft passing up through the centre, upon which is fitted a revolving muller with iron shoes, which come almost close to dies fixed to the bottom, and between which the pulp passes. This shaft is kept in motion by spur gearing, and there is usually a double bottom to the pan for heating by steam. Fig. 1 shows a familiar type in section. These vessels are charged half-full of crushed ore and water, and they are designed with the intention of uniting as far as possible a grinding with a stirring surface. Common salt, sulphate of copper, and sometimes other chemicals are added to the charge. A pulp is produced just thick enough to allow the muller to rotate, and the temperature of the charge is raised by steam to from 160° to 200° F. The necessary quantity of mercury is added, and the pulp containing the amalgam is ready to be removed after the charge has been in the pan five hours. The amalgam is then cleaned and strained, and the mercury separated from the silver by distillation in a cast-iron retort.

Ziervogel's process is a wet process best adapted to the treatment of argentiferous copper mattes (mixed sulphides) obtained from the smelting of copper pyrites. The matte is ground and roasted to convert the iron sulphide into sulphate. On raising the temperature the latter is decomposed and copper sulphate formed. The mass is removed

from the furnace and finely ground. It is then charged into a reverberatory furnace where, by a careful regulation of temperature, copper sulphate is decomposed and silver sulphate produced; the latter is dissolved out by hot water in vats, and

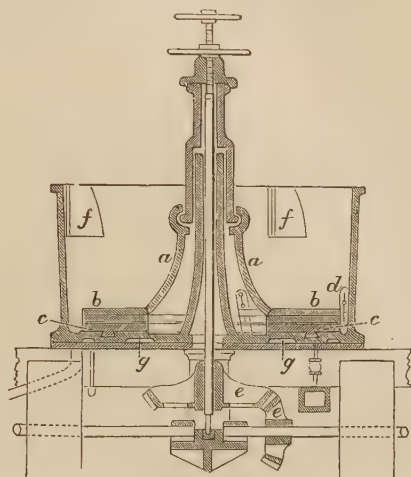


Fig. 1.—Amalgamating Pan :

a, muller; b, shoes fixed to muller; c, dies fixed to bottom of pan; d, scraper; e, driving wheels; f, wings to prevent pulp rising too high; g, steam space.

the silver precipitated from the solution by means of metallic copper. The process is but little used to-day. Other once-famous wet processes, such as those of Augustin and Patera, have now been superseded by the cyanide process.

Cyanide Process.—The cyanide process of extracting silver from its ores, introduced near the close of the 19th century, is by far the most important wet process at the present time. The pioneer work was done at El Oro in 1895, where it was demonstrated that low-grade silver ores could be economically treated by cyaniding. The process is now in operation in all important silver-mining regions. The extraction of silver by weak solutions of potassium or sodium cyanide is the same in principle as that of gold (see GOLD, Vol. V. p. 288).

Smelting of Silver.—Combined lead and silver smelting, and the desilverisation of argentiferous lead, are described under LEAD. There are no silver ores properly so called produced in the United Kingdom, but foreign ores are smelted along with lead ores or rich lead slags.

Liquation Process.—Silver can be separated from argentiferous copper by this process, which consists in heating a fused mixture of the copper with a large excess of lead to a temperature above the melting-point of the latter, but below that of the copper. In this state of matters the lead liquates or sweats out of the mass, carrying with it the greater part of the silver which the copper contained. This silver can then be extracted from the lead by cupellation.

Cupellation.—This process consists in melting lead rich in silver on the hearth of a small furnace, and blowing air over its surface, the oxygen of which, under the influence of the heat, rapidly converts the lead into litharge or plumbic oxide. Fused litharge has the property of dissolving the oxides of some other metals, such as copper, zinc, tin, antimony, &c. Silver, however, is not oxidised by this treatment. The result of the operation is that the whole of the lead put in the furnace,

together with small quantities of other oxidisable metals (present as impurities), is removed as oxides, and the silver is left on the bed of the furnace. In the English cupellation-furnace the bed or hearth is movable, and is formed of an oval iron frame or test rammed full of powdered marl, cement, or bone-ash. The German cupellation-furnace (shown in fig. 2) is of larger capacity than

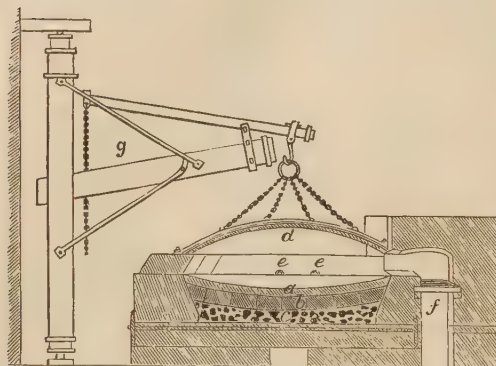


Fig. 2.—Silver Cupellation-furnace :

a, hearth of marl or clay; b, bricks; c, bed of slag; d, movable cover; e, e, tuyeres connected with bellows; f, fireplace; g, crane for lifting cover.

the English, and has a movable domed cover constructed of iron. The diameter of this furnace is about 10 feet, and the hearth is covered with marl. These furnaces differ only in details and in the way in which they are charged. In the United States what is termed a Steitz water-back cupel—a hollow casting through which water flows—is used in the first stage of cupellation.

There are three processes for separating silver from gold practised on a large scale. One of these is a very old method. It is called 'parting' by nitric acid. The alloy, which may consist of one part by weight of gold to two of silver or of one of the former to three of the latter, is melted and granulated—i.e. formed into small beads. It is then boiled (in platinum or earthenware vessels) with nitric acid, of 1·4 sp. gr. and an equal bulk of water, for several hours, till the silver is almost all converted into nitrate, the gold forming the residue after the dissolved silver is removed. To this solution of nitrate of silver common salt is added to precipitate the silver as chloride, from which the metal is reduced by the action of granulated zinc and weak sulphuric acid. The silver is then washed, pressed, dried, and melted, producing bars almost pure from the alloys generally treated.

Another method of 'parting' is by boiling the alloy in concentrated sulphuric acid. Auriferous silver, either granulated or in bars, is placed in cast-iron pots along with sulphuric acid, which is cautiously raised to the boiling-point. The silver, if it does not much exceed 200 lb. in weight, is dissolved in about eight hours, but sooner if granulated. The gold falls down as a sediment, and the sulphate of silver is drawn off by a platinum siphon or otherwise. The solution of sulphate of silver is then diluted with water, and the metal precipitated by scrap-iron. Impurities in the alloy sometimes render the sulphuric acid method of parting troublesome.

Separation of silver from argentiferous gold is now effected by chlorine, a method patented by F. B. Miller in 1867, and soon afterwards used at the Sydney mint and at other places. Gold, to the amount of 600 or 700 ounces, is melted in a clay crucible, and a little melted borax thrown in.

Chlorine gas is then admitted through a suitable pipe, the end of which almost reaches the bottom of the crucible, so that the gas is forced to bubble up through the molten gold. At first volatile chlorides of some of the baser metals, which may be present in very small quantity in the alloy, escape through holes in the cover of the crucible, but the chloride of silver does not. Chlorine is supplied till it is found that no more is absorbed, which shows that practically all the silver has been changed into chloride. When this is the case the crucible is allowed to cool sufficiently to allow the gold to solidify, and the red-hot liquid chloride of silver is then formed into slabs in moulds. This chloride generally contains 2 per cent. of gold, but it is eliminated by adding metallic silver, with which the gold forms an alloy. From the slabs of chloride of silver the metal is reduced by using them as one of the elements of an electrolytic cell.

Silver is largely used for coinage, plate, jewellery, and watch-cases, and for electroplating. Silver compounds are used in photography, in glass-staining, and in several chemical preparations, including marking-ink and hair-dyes. Like gold, silver is too soft to be used alone for vessels, jewellery, or coin, for which reason it is usually alloyed with copper. Further references to silver will be found in the articles on Alloy, Assay, Bimetallism, Chasing, Filigree, Embossing, Hall-marks, Mining, Mint, Mirror, Numismatics, Electro-metallurgy, Metal-work, Photography, and Repoussé.

See H. F. Collins, *The Metallurgy of Silver* (1900); Julian and Smart, *Cyaniding Gold and Silver Ores* (1904); *Silver* (issued by Imperial Mineral Resources Bureau, 1922); Miller and Singewald's *Mineral Deposits of S. America* (N.Y. 1919); *Mineral Industry* (N.Y. annually).

Silver Fir. See FIR.

Silverfish, a name given to the Atherine (q.v.) to artificially bred Goldfish (q.v.), and to minute wingless insects, *Lepisma*, in the order Thysanura.

Silver Thaw, or GLAZED FROST (Fr. *verglas*), the icy face of things in general, including trees, produced sometimes at the beginning of a thaw, or when a fall of rain or a heavy mist occurs while the temperature at the earth's surface is below 32° F. and decidedly lower than the atmosphere a little higher up. A thin shell of ice is rapidly formed over everything subject to the conditions.

Silverton. See BROKEN HILL.

Silver-tree, a tree (*Leucadendron argentea*) of a South African proteaceous genus, has leaves covered with silky hairs which give it a silvery gray shimmer. They are sometimes used for painting on. Old trees are rarely fifty feet high: the usual height is about 20 feet. It is characteristic of the Cape Peninsula. In has been confused with the tropical *Terminalia sericea* (Combretaceæ), also silky-leaved.

Silverweed. See POTENTILLA.

Silvester. See SYLVESTER.

Silybum, or MILK-THISTLE. See THISTLE.

Simancas, a village of Spain, 7 miles SW. of Valladolid, where the national archives of Spain have been kept since the reign of Philip II. (1563). There are more than 30 million documents in all. Pop. 1000.

Simarubaceæ, a family of trees and shrubs, with alternate, generally compound leaves, without stipules; regular, generally hermaphrodite flowers. The species are not numerous; they are found in the tropical parts of Asia, Africa, and America. The whole family is characterised by

great bitterness, and several of the species are used as tonics in dysentery, &c. *Quassia* (q.v.), *Bitterwood* (q.v.), and *Ailanto* (q.v.) belong to it. *Simaruba* is itself a genus with several species, all belonging to tropical America.

Simbirsk, renamed **ULIANOVSK**, a town of Russia, stands on the right bank of the Volga, 350 miles SE. of Nijni-Novgorod. It has two Greek cathedrals, a university (1919), a large trade in wheat, wool, fruits, and potash, and a famous annual fair. The town was rebuilt after destruction by fire in 1864. Kerensky's father was a schoolmaster here, and included among his pupils Lenin (Ulianov), who was born here in 1870. Pop. 68,000.

Simcoe, LAKE, in Ontario between Georgian Bay and Lake Ontario, 30 miles long and 18 broad.

Simeon. See **DURHAM** (**SIMEON OF**).

Simeon, CHARLES (1759–1836), evangelical preacher, born at Reading, was educated at Eton and King's College, Cambridge, was elected to his life-long fellowship at his college in January 1782, that same year took orders, and was appointed perpetual curate of Trinity Church, Cambridge, an office which he held till the close of his life. The impassioned evangelicalism of his preaching at first aroused a bitter and protracted opposition. But he made many converts and came to exercise an enormous influence all over England. He took a foremost part in founding the Church Missionary Society. His influence long survived his death by means of the society he established for purchasing adownsons. His *Horæ Homileticæ* (17 vols. 1819–28; new ed. 21 vols. 1832–33) contains as many as 2536 sermon outlines. See the *Memoirs* by the Rev. W. Carus (1857), *Recollections of Simeon's Conversation Parties* by Abner W. Brown (1862), and the *Study* by H. C. G. Moule (1892).

Simeon Stylites. See **STYLITES**.

Simferopol, renamed **AKMETCHET**, capital of Crimea, 50 miles by rail NE. of Sebastopol, has extensive gardens and vineyards. Pop. 70,000.

Simia, the Latin name for an ape or monkey, used by Linnæus in an almost equally wide sense. Technically, however, *Simia* is now reserved for the genus to which the Orang-utan (*S. satyrus*) belongs. *Simiidæ* includes the Anthropoid Apes; *Simiinæ*, the higher of the two sub-families of *Simiidæ*, comprising the gorilla, chimpanzee, and orang.

Simile. See **METAPHOR**.

Simla, a British sanatorium, the headquarters of the British government in India during the hot months of summer, stands on the southern slopes of the Himalayas, in a beautiful situation, 170 miles N. of Delhi. Its first house was built in 1819, and it was first visited officially by the Indian government in 1827, having since 1864 been regularly made its headquarters every summer. There are here two viceregal residences (the newer one built in 1886), handsome government buildings (1884), a fine town-hall (1886), several European schools, and various public institutions.

Population 27,500 in winter, and about 45,000 in summer.—The *district* has an area of 100 sq. m. and a population of 45,000.—The name *Simla Hill States* is given to twenty-three Indian states, all



View of Central Simla.

small, in the neighbourhood of Simla. Their united area is 5489 sq. m., and their population is 306,718 (1921).

Simms, WILLIAM GILMORE (1806–70), American author, born at Charleston, South Carolina. His earliest volume, *Lyrical and other Poems*, was published in 1827. After *The Vision of Cortes* (1829), *The Tri-colour* (1830), and *Atalantis, a Story of the Sea* (1832), he poured out poems (perhaps the best *Southern Passages and Pictures*, 1839), novels (among them *The Yemassee*, *The Partisan*, and *Beauchampe*), histories, biographies, and magazine articles in rapid succession, almost till his death. His style is crude but vigorous, and his writings display strong imagination and many of the gifts of the born story-teller. There are *Lives by Cable* (1888) and *Trent* (1892).

Simnel, LAMBERT. See **HENRY VII**.

Simois. See **TROY**.

Simon, JULES, French statesman, economist, and author, was born at Lorient (Morbihan), 31st December 1814. He received the names of Jules François Simon Suisse, but on reaching manhood chose the designation of Jules Simon only. After a brilliant educational career, he succeeded Victor Cousin (whose ardent disciple he was) as lecturer on philosophy at the Sorbonne in 1839. He was returned to the Chamber of Deputies for the department of the Côtes-du-Nord in 1848, and took his seat with the Moderate Left. He refused the oath of allegiance to the empire, and by the year 1869 had become one of the most popular chiefs of the Republican party. He was minister of Public Instruction in the Government of National Defence; but in 1873 his measures dealing with secondary education were violently opposed by the clericals, and he resigned. He now became leader of the Republican Left. In 1874 he assumed the direction

of the *Siècle* newspaper; in 1875 he was elected a life-senator; and in 1876 he was appointed prime-minister, taking the portfolio of the Interior. President Macmahon and the Right, however, resented his liberal attitude towards the press, and he forthwith resigned. M. Simon pronounced the funeral oration on M. Thiers. He always showed himself a consistent advocate of Free Trade, and took a prominent part in the revision of the Constitution, but subsequently his Republicanism developed a more conservative character. In 1880 the French Academy elected him a member of the new Supreme Educational Council, and two years later he was elected permanent secretary of the Academy of Moral and Political Sciences. He died at Paris 8th June 1896. Besides editing Descartes, Bossuet, Malebranche, and Antoine Arnauld, and contributing to the *Revue des Deux Mondes* and other periodicals (his last work was *Indices et Portraits*, 1893), Simon was author of *Histoire de l'École d'Alexandrie* (1844-45); *La Liberté de Conscience et La Liberté* (1859); *La Religion Naturelle* (1856); *L'Ouvrière* (1861); *L'École* (1864); *Le Travail* (1866); *La Politique Radicale* (1868); *Souvenirs du 4 Septembre* (1874); *Le Gouvernement de M. Thiers* (1878); *Dien, Patrie, Liberté* (1883); *Une Académie sous le Directoire* (1885); *Mémoires des Autres* (1889); some posthumous autobiographical works; and studies on Thiers, Guizot, Rémusat, Mignet, Michelet, Henri Martin, and others. See Life by Sèché (1898).

Simon, RICHARD, the father of biblical criticism, was born at Dieppe, May 13, 1638. He entered the Congregation of the Oratory in 1659, but soon after withdrew, to return in the later part of 1662. He was sent first to lecture on philosophy in the college of Juilly, but was afterwards appointed to catalogue the oriental MSS. in the library of the Order at Paris. His criticisms upon Arnauld's *Defence of the Perpetuity of the Faith in the Blessed Eucharist* caused great displeasure among the Port-Royalists, and his imprudent meddling with another controversy brought upon his head the wrath of the Benedictines. The scandal occasioned by the appearance of his *Histoire Critique du Vieux Testament* (1678) led to his again withdrawing from the Oratory and retiring to Belleville as curé. In 1682 he resigned his parish, and lived in literary retirement at Dieppe, Paris, and again at Dieppe, where he died April 11, 1712. Few writers of his age played so prominent a part in the world of letters, and especially in its polemics. There is hardly a critical or theological scholar among his contemporaries with whom he did not break a lance—Weil, Spanheim, Le Clerc, Isaac Voss, Du Pin, Jurieu, and Jurieu's great antagonist, Bossuet. His *Histoire Critique* (suppressed through Bossuet's influence, and only printed entire at Rotterdam in 1685) anticipates the most important conclusions of all the later rationalistic scholars of Germany, and also their method of investigation, and, indeed, is the first work which treated the Bible from the point of view of a literary product. For example, he disproves the Mosaic authorship of the Pentateuch, assigning its composition to the scribes of the time of Ezra. Other writings of Simon's are *Histoire Critique du Texte du Nouveau Testament* (Rotterd. 1689); and *L'Histoire Critique des Principaux Commentateurs du Nouveau Testament* (Rotterd. 1693), in which he assails the theology of the Fathers, and particularly that of Augustine, as a departure from the simple and less rigid doctrines of the primitive church. Among the Fathers his most esteemed authority was Chrysostom. Bossuet replied to this last work by his *Défense de la Tradition et des Saints Pères*. Simon frequently published under assumed names

—as his *Dissertation Critique* on Dupin's *Library of Ecclesiastical Writers*, under the name of Jean Renchlin; a work, *Histoire Critique de la Créance et des Coutumes des Nations du Levant*, under the anagram of Monis; and a *Histoire de l'Origine et du Progrès des Revenus Ecclésiastiques*, under the name of Jerome Acosta.

See the Life by K. H. Graf in *Strassburger theolog. Beiträge* (1847); A. Bernus, *Richard Simon et son Histoire Crit. du V. T.* (Laus. 1869), and the same scholar's *Notice Bibliographique* (Basel, 1882).

Simonides, a celebrated Greek lyric poet, was born at Iulis, in the island of Ceos, in the year 556 B.C. He repaired to Athens on the invitation of Hipparchus, and after his death took up his residence in Thessaly, under the patronage of the Aleuadæ and Scopadæ, who appear to have treated him in a very niggardly fashion. Shortly before the invasion of Greece by the Persians he returned to Athens, and devoted his poetic powers to celebrating the heroes and the battles of that momentous struggle in elegies, epigrams, and dirges. He carried off the prize, even from Æschylus, for the elegy on the heroes that fell at Marathon. He won as many as fifty-six times in these poetical contests. He spent his last ten years at the court of Hiero of Syracuse, where he died in 468. Simonides appears to have scandalised his contemporaries by writing for hire; and his great rival Pindar accuses him, apparently not without good reason, of excessive avarice. He brought to perfection the elegy and epigram, and excelled in the dithyramb and triumphal ode; he seems also to have invented the art of artificial memory. The characteristics of his poetry are sweetness (whence his surname of *Meliertes*), polish combined with simplicity, genuine pathos, and power of expression, although in originality he is much inferior to his contemporary Pindar.—Simonides of Ceos must be carefully distinguished from the iambic poet SIMONIDES of Amorgos, who flourished about 660 B.C.

Simonides, CONSTANTINE (1820-67), a Greek of great erudition, who used his marvellous skill in caligraphy partly in forging classical and early Christian manuscripts (though there is no reason to doubt the genuineness of some of his finds). He claimed to possess the History of Egypt of Uranius; to have deciphered some fragments of the New Testament dating from the 1st century, from the Mayer papyri now in Liverpool; and to have written, when at Mount Athos in 1840, the Codex (q.v.) Sinaiticus discovered there by Tischendorf (q.v.) in 1844 and 1859. See Farrer, *Literary Forgeries* (1907).

Simon Magus ('Simon the Magician'), the wicked sorcerer who thought that the gift of God might be purchased with money, and for this was excommunicated by Peter. The word Simony (q.v.) is derived from his name. When first introduced in Acts, viii. 9-24, Simon, apparently about 37 A.D., had already for a long time been a commanding personality in 'the city' of Samaria through his sorceries. Giving himself out to be 'some great one,' he had induced the people 'from the least to the greatest' to call him 'that power of God which is called Great.' Simon and the Samaritans had believed and were baptised under the ministry of Philip the Evangelist; and when the apostles Peter and John conferred on Philip's converts the gift of the Holy Ghost (including apparently the gift of tongues) Simon, hoping for new magical powers, went to the apostles and offered money that he might be enabled to confer the same gift. Peter's reply is known; Simon, rebuked, was submissive, and here the narrative of the Acts (written probably before the end of the 1st century) leaves him. But his penitence was

only temporary. Justin Martyr says Simon afterwards went to Rome in the reign of Claudius as a wonder-worker and was reckoned a god, having a statue erected to him by the senate and people with the inscription 'To Simon the Holy God.' Justin, himself a Samaritan, adds that 'almost all the Samaritans' and 'a few even of other nations' worshipped Simon as the 'First God,' and a woman Helena, who went about with him and had formerly been a harlot, they adored as his 'First Idea.' Irenæus follows Justin in the main, and adds that Simon professed to have appeared among the Jews as the Son, in Samaria as the Father, and to other nations as the Holy Spirit. From Simon, according to Irenæus, 'all sorts of heresies' derived their origin, including a particular Gnostic system. His followers worshipped images of Simon and Helena as Zeus and Athene. Hippolytus, who quotes much from Simon's work *The Great Announcement*, says that Simon encountered Peter at Rome, that he ordered his followers to bury him, promising to rise the third day, but that he never rose. Origen questions whether in his time there were more than thirty Simonians in the whole world. In the pseudo-Clementine *Homilies* and *Recognitions* (in their present form not older than the 3rd century) Simon comes into frequent conflict with Peter at Cæsarea, Antioch, and elsewhere.

Baur in 1831 was the first to observe the indisputable fact that in some portions of these books it is the apostle Paul who is caricatured under the guise of Simon—portions he believed to come from 1st-century Ebionite sources. Others of the Tübingen school went further and traced the whole story of Simon to the antipathy of the Jewish Christians against the apostle Paul, whom they regarded as a pretender (the false as opposed to the true Simon), a 'Samaritan,' a libertine, and a bewitcher of men. Now, however, it is generally agreed that some facts regarding Simon must be accepted as historical, and that likely enough a pseudo-Messiah named Simon appeared in Samaria in the fourth decade of the 1st century. Perhaps Klostermann and Wendt are right in holding that the 'power of God which is called Great' (Gr. *Megalē*) ought to be interpreted according to the Samaritan word *Megala* ('Revealer'). Simon's 'revelation' or new religion had apparently for its main articles a doctrine of the essential oneness of many widely different cults—hence the attempted fusion of Baal, Zeus, the Father, the Son, the Holy Spirit—and a 'syncretistic-gnostic' conception of the world and its creation, together with ethical Antinomianism.

But it is obvious that the story of Simon has received accretions from a variety of extraneous sources. Thus, Justin was wrong about Simon's statue at Rome, the inscription he quotes being almost certainly identical with a dedication (still extant) by a private individual to Semo Sancus, a Sabine deity. The statement of Irenæus that Simon and Helena (called in the Clementines *Selēnē*, 'the moon') were worshipped under the images of Zeus and Athene may rest on a misapprehension of the Syrian Baal and Astarte worship, or on a misunderstanding of the Semitic word *Shem* or *Sem* ('name'). Further, no one now believes that *The Great Announcement* cited by Hippolytus as Simon's dates from so early a period. Opponents have mixed him up with other sorcerers of Cyprus, Cæsarea, and Rome; and his disciples, anxious to combine as many elements as possible in their new world-religion, added to the confusion by their readiness to identify their master with the most incongruous personalities. Simon is a true magician in this at least, that he still eludes our grasp. The legend of Simon and Helena continued to be read in the middle ages: and several traits of Simon may be recognised in 'Doctor Faustus.'

See Baur's *Paul*, and his *History of the Church in the First Three Centuries* (both translated), and earlier works there cited; Hilgenfeld's *Clem. Recognitionen u. Homilien* (1848); Zeller's *Apostelgeschichte* (1854); Lipsius in Schenkel's *Bibel-Lexicon* (1875) and his *Apokr. Apostelgeschichten* (1877); Harnack's *Gnosticismus* (1873), and his *Dogmengeschichte* (1886); F. Legge, *Forerunners and Rivals of Christianity*, vol. i. chap. vi. (1916).

Simonoseki. See SHIMONOSEKI.

Simonstown, on False Bay, 20 miles S. of Cape Town, is the naval headquarters of South Africa; pop. 5400.

Simony (derived from Simon Magus), in English law, means, according to Blackstone, the offence of obtaining orders or a license to preach by money or corrupt practice. But the term is now commonly used to denote the offence of presenting or procuring presentation to a benefice for money. In the canon law this was considered a heinous crime and a kind of heresy. As the canonical punishment, however, was not deemed sufficient, a statute was passed in the time of Elizabeth defining its punishment. A simoniacal presentation was declared to be utterly void, and the person giving or taking the gift or reward forfeited double the value of one year's profit; and the person accepting the benefice was disabled from ever holding the same benefice. Presentation bonds, however, taken by a patron from a presentee to resign the benefice at a future period in favour of some one to be named by the patron, are not illegal, provided the nominee is either by blood or marriage an uncle, son, grandson, brother, nephew, or grandnephew of the patron, and provided the bond is registered for public inspection in the diocese. The result of the statutes is that it is not simony for a layman or spiritual person, not purchasing for himself, to purchase, while the charge is filled, either an advowson or next presentation, however immediate may be the prospect of a vacancy, unless that vacancy is to be occasioned by some agreement or arrangement between the parties. Nor is it simony for a spiritual person to purchase for himself an advowson, although under similar circumstances. It is, however, simony for any person to purchase the next presentation while the church is vacant; and it is simony for a spiritual person to purchase for himself the next presentation, although the charge be occupied. Under powers conferred on them by an act of 1919, the National Assembly of the Church of England have passed a measure which will gradually remove the possibility of simony. The right of patronage to a benefice will be incapable of sale after two vacancies (subsequent to 14th July 1924) have occurred. The restriction does not apply to sales of land to which advowsons are appendant, which are included in the sale. See ADVOWSON, and Cripps's *Laws of the Church and Clergy*.

Simoom, or SIMOON (Arab. *samūm* or *samīn*; from *samm*, 'poisoning'), is a hot, suffocating wind common in the deserts of Africa and Arabia, as well as in Sind and Beluchistan. It is essentially of the same nature as a cyclone: there is a central tract of calm surrounded by violent eddies of intensely heated air, and the entire system keeps moving slowly forward, generally from south to north or from east to west. Its presence is heralded by whirling currents of air, and indicated by the purple colour of the atmosphere. It often carries with it huge rotating columns of sand, or stifling gusts and showers of fine sand. It is highly deleterious to men and animals, causing the sensation of suffocation, together with great pain in the limbs. Spring and summer are the usual times of its occurrence; but it seldom lasts

many minutes, not more than twenty at the outside. See DESERT, STORMS.

Simplicissimus. See GRIMMELSHAUSEN.

Simplon (Ital. *Sempione*), a mountain-pass (6594 feet high) of Switzerland. The Simplon Road, leading over a shoulder of the mountain from Brieg in Valais to Domo d'Ossola (41 miles) in Piedmont, was commenced in 1800 by Napoleon, and completed in 1807 at a cost of £720,000. It is carried across more than six hundred bridges, over numerous galleries cut out of the natural rock or built of solid masonry, and through great tunnels. Close to the highest point is the New Hospice (opened in 1825), one of the twenty edifices on this route for the shelter of travellers. After much preliminary negotiation, the convention between Italy and Switzerland for the construction of a railway tunnel through the Simplon was finally approved at Rome and Bern in December 1896. There are two parallel tunnels, 21,576 yards long, about 60 feet apart, with connections every 670 feet, at a height above the sea of 2312 feet. The Swiss terminus is at Brieg, the Italian at Iselle. Operations were commenced in 1898; early in 1905 the two borings met; the tunnel was opened to traffic in May 1906.

Simpson, SIR JAMES YOUNG, physician, was born at Bathgate, Linlithgowshire, 7th June 1811, a baker's son, the youngest of a family of eight. He early showed a peculiar talent for medical observation and research; and in the prosecution of his professional studies at the university of Edinburgh, which he entered at the age of fourteen, he so attracted the notice of his teachers as to inspire all of them with an active interest in his future career. He took his M.D. in 1832, his thesis on *Death from Inflammation* winning the highest admiration; and in 1835 was elected president of the Royal Medical Society. Professor Thomson chose him as his assistant (1837-38), and employed him in the preparation of his course of lectures on General Pathology. During the illness of the professor he supplied his place in the lecture-room with unusual skill and address. He now began professional practice on his own account, and in 1840 succeeded Professor Hamilton in the chair of Midwifery. This position he held with yearly enhanced distinction, and by the rigidly scientific, while popularly attractive, character of his prelections contributed greatly to the renown of the Edinburgh school, both at home and abroad. He was indefatigable, amid the distracting cares of an extensive practice, in promoting the scientific perfection of his art; and his *Obstetric Memoirs* (2 vols. 1856), edited by Drs Priestley and Storrer, contains the fruits of much patient and ingenious research. Sulphuric ether had been employed in America by Morton to produce Anæsthesia (q.v.) during the extraction of teeth; but to Simpson belongs the credit of first, in March 1847, at the suggestion of a chemist, David Wardie, introducing chloroform as an anæsthetic to the medical world. In 1859 he recommended the stopping of hæmorrhage by Acupressure (q.v.). In his own peculiar field of obstetrics his improvements on the old methods of practice were numerous and valuable; his antiquarian researches are embodied in his posthumous *Archæological Essays* (1872). He was created a baronet in 1866, and died 6th May 1870. A bronze statue was erected in Edinburgh in 1877.

Besides the *Obstetric Memoirs* already mentioned, his medical and archæological works include a volume on *Acupressure* (1864), one on *Homæopathy*, *Selected Obstetrical Works*, *Anæsthesia*, *Clinical Lectures on the Diseases of Women*, and many papers and notices read

before the Royal and Antiquarian Societies of Edinburgh. See the *Memoir* by Duns (1873), and works by his daughter (1897) and Laing Gordon (1897).

Simpson, THOMAS, one of the most eminent of the numerous non-academic mathematicians of England, was born on the 20th August 1710, at Market Bosworth in Leicestershire. His father was a stuff-weaver, and, intending his son to follow the same occupation, gave him little or no education. The son, however, had a taste for study, and embraced every opportunity for gratifying it. In consequence he quarrelled with his father and went to Nuneaton. There he worked at his trade, and eked out his earnings by teaching an evening school and by casting nativities. The last occupation threatening to get him into difficulties, he removed to Derby, where he remained from 1733 to 1735 or 1736. Thence he went to London, and began teaching mathematics. In 1743 he was appointed professor of Mathematics in the Royal Academy at Woolwich, and in 1745 was admitted a Fellow of the Royal Society. He was the author of numerous treatises on algebra, trigonometry, &c. He died on the 14th May 1761. A biographical notice by Dr Charles Hutton, giving some curious details of Simpson's life, is prefixed to Davis's edition (1805) of the *Doctrine and Application of Fluxions*.

Simrock, KARL JOSEPH, a German poet and scholar, whose name is indissolubly associated with the revival of interest in old German literature, was born at Bonn, 28th August 1802, and studied at the university of his native city and at Berlin. His first work was a translation into modern German of the *Nibelungenlied* (1827). Compelled on account of a revolutionary poem to leave the Prussian state service, he devoted himself entirely to literature, especially old Germanic literature, and modernised in excellent style the poems of Walter von der Vogelweide (1833), Wolfram von Eschenbach's *Parzival* (1842), *Reineke Fuchs* (1845), *Die Edda* (1851), Gottfried von Strassburg's *Tristan und Isolde* (1855), the *Heliand* (1856), *Beowulf* (1859), *Der Wartburgkrieg* (1858), Brant's *Narrenschiff* (1872), &c. He also translated Shakespeare's poems and some of his plays, and published *Quellen des Shakespeare in Novellen, Märchen, und Sagen* (3 vols. 1831), in conjunction with Echtermeyer and Henschel; *Novellenschatz der Italiener* (1832); *Rheinsagen aus dem Munde des Volkes und Deutscher Dichter* (1836); a collection of German *Volksbücher* (13 vols. 1844-67); *Das Heldenbuch* (6 vols. 1843-49); his own *Gedichte* (1844); and a considerable number of handbooks. In 1850 he was appointed professor of Old German Language and Literature at Bonn, a post which he held till his death, on 18th July 1876. See a monograph on him by Hoeker (Leip. 1877).

Sims, GEORGE ROBERT (1847-1922), born in London, joined the staff of *Fun* in 1874, in 1877 began his 'Dagonet' contributions to the *Referee*, and also contributed series of papers to the *Weekly Dispatch*. He was a prolific writer on a variety of subjects. Among his plays are *Two Little Vagabonds*, *The Lights of London*, *Harbour Lights*. His novels include *Rogues and Vagabonds*, *Memoirs of Mary Jane*, *Mary Jane Married*, *Memoirs of a Landlady*, *The Ten Commandments*, &c. In 1917 he published a volume of reminiscences.

Simson, ROBERT (1687-1768), was born in Ayrshire, was educated at the university of Glasgow, where in 1711 he was appointed professor of Mathematics, a chair which he occupied for half a century. One of the first subjects to which he turned his attention was the restoration of Euclid's lost treatise on *Porisms*. It is Simson's greatest achievement that he elucidated the nature of the

ancient porisms, though his restoration of them is not complete, but his treatise on the subject did not appear till after his death. His *Sectiones Conicæ*, in five books, was published in 1735; the first three books were afterwards translated into English, and were repeatedly printed. His restoration of Apollonius' *Plani Loci* had been finished about 1738, but was not published till 1749. The work by which he is best known is his *Elements of Euclid*, which appeared in Latin and in English in 1756. It contained the first six books, the eleventh and twelfth, and was the basis of nearly all the editions published for more than 100 years afterwards. In 1761 he resigned his professorship, and his only publication after his retirement was a second edition of the *Elements* (1762), to which he annexed the book of *Data*. In 1776 a large volume, *Roberti Simson Opera quædam reliqua*, was printed at the expense of Earl Stanhope, one of Simson's intimate friends, and liberally distributed. It contains a restoration of Apollonius' two books *De Sectione Determinata*, with the addition of other two *De Porismatibus*, and two tracts on logarithms and the limits of quantities and ratios. See *Memoir by Trail* (1812).

Sin is not simply moral evil as recognised by the awakened human conscience, but guilt before God or the gods. Some doctrine of sin, and of the mode of averting the anger of the deity, of reconciling him, and of escaping from the guilt, is accordingly part of most religions, ancient and modern. Zoroastrianism is a conflict of sin and holiness. The central doctrine of Buddhism turns on the demerit of human actions and human life, which must be purged by transmigration. But in no sacred books is the sense of sin so keen and developed as in the Bible—in the writings of the prophets of the God of holiness, in the psalms, in the gospels, and in Paul's epistles. From Paul's various utterances on the great subject of sin the Christian doctrine professes to be but a development.

Throughout the Scriptures sin appears as that element in man which puts him at enmity with God, and for his salvation from its guilt and power required the work of a Redeemer (see **CHRISTIANITY**). Sin is not defined in Scripture, and it was not till the controversies between Pelagius and Augustine, at the end of the 4th century, that the doctrine received full development. The early Greek fathers regarded sin as opposition to the will of God, and as such involving death as its just penalty. But they did not affirm that the guilt of Adam's sin or the corruption of his nature descended to all mankind. Tertullian, in virtue of his doctrine of Traducianism, was bound to hold that sinfulness had been propagated from Adam to his descendants. But it was reserved for Augustine to maintain, against Pelagius, that Adam's sin completely corrupted his whole nature; that the corruption of his guilt and its penalty death pass to all his children; that man is born not merely corrupt, but in a state of sin, guilt, and liability to punishment; in virtue of Adam's *peccatum originale*, the offspring of Adam is a *massa perditionis*, incapable of knowing, or loving, or serving God, and naturally disposed, without grace, to pursue evil only, the will being enslaved to evil. Pelagius (q.v.) maintained contrary doctrines, and semi-pelagianism insists that in spite of the weakening of his powers through hereditary sinfulness man is yet not wholly inclined to evil. The Greek Church continued to deny hereditary guilt, and to affirm man's will as free as Adam's before the fall. Duns Scotus and his followers admitted that man had lost by Adam's fall *justitia originalis*, but laid stress on the freedom of the will. Thomas Aquinas taught that hereditary sin is truly sin,

and the unbaptised infant is damned. At the Reformation both Luther and Calvin asserted what they regarded as Augustinian and Pauline views. Zwingli looked on hereditary sin as an inherited evil or disease: Arminians and Socinians practically denied hereditary sin altogether. The problems connected with sin are closely akin to those connected with the origin of evil and the freedom of the will. The liberal philosophy of the 19th century together with the advances made in biological, psychological, and other sciences profoundly affected the traditional point of view. Kant had found the origin of sin in the human will. The Hegelians taught that sin was a necessary condition of the development of mankind; and Schleiermacher that the sinful state of man was a disturbance of his nature, not a necessary condition of it. Another school, with its chief representatives in O. Pfleiderer, Dr F. R. Tennant, and Mr S. A. McDowall, has been mainly influenced by the doctrine of evolution. Sin does not begin with a fall from a sinless estate but grows gradually as the race develops. In the evolution of the great 'world plan,' sins are really anachronisms; they are habits surviving from a previous stage of man's development, habits which have come to be regarded as inconsistent with progress.

The doctrine of the Thirty-nine Articles (Art. ix.) is as follows: 'Original sin standeth not in the following of Adam (as the Pelagians do vainly talk); but it is the fault and corruption of the nature of every man, that naturally is engendered of the offspring of Adam, whereby man is very far gone from original righteousness, and is of his own nature inclined to evil, so that the flesh lusteth always contrary to the spirit; and therefore in every person born into the world it deserveth God's wrath and damnation. The Westminster Confession teaches (chap. vi.): 'By this sin' (i.e. the eating of the forbidden fruit) 'they' (i.e. our first parents) 'fell from their original righteousness and communion with God, and so became dead in sin, and wholly defiled in all the faculties and parts of soul and body. They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and corrupted nature conveyed to all their posterity, descending from them by ordinary generation. From this original corruption, whereby we are utterly indisposed, disabled, and made opposite to all good, and wholly inclined to all evil, do proceed all actual transgressions.' Modern psychology, with its analysis of the conscious and subconscious, takes original sin to mean the tendency in man to give way to his lower instincts, instead of sublimating these to a higher end. It is not actual sin but rather the universal disposition thereto.

Sins have been divided into categories, as sins of omission and of commission, deliberate voluntary sins and involuntary sins, sins of infirmity, &c. The 'sin unto death' (1 John, v. 17), generally identified with the unforgivable 'blasphemy against the Holy Spirit' (Matt. xii. 31), or 'sin against the Holy Ghost,' is understood not to mean profane speaking against the person of the Holy Spirit, or resisting his operations, but a state of obstinate, malignant deadness of heart, and unrepentant and unhesitating hatred to all good. The distinction accepted by Catholic theology between mortal and venial sins is explained at **CONFESSION**.

See **ADAM**, **ATONEMENT**, **AUGUSTINE**, **CHRISTIANITY**, **DEVIL**, **ETHICS**, **EVIL**, **FALL**, **HELL**, **PAUL**, **PELAGIUS**, **REINCARNATION**, **SACRIFICE**, **WILL**; also Julius Müller's *Christliche Lehre von der Sünde* (1839-44; Eng. trans. 1877); O. Pfleiderer, *Philosophy of Religion* (Eng. trans. 1886-88); A. Ritschl, *The Christian Doctrine of Justification and Reconciliation* (Eng. trans. 1900); F. R.

Tennant, *The Sources of the Doctrines of the Fall and Original Sin* (1903), *The Origin and Propagation of Sin* (1906), *The Concept of Sin* (1912); W. E. Orchard, *Modern Theories of Sin* (1909); F. J. Hall, *Evolution and the Fall* (1910); S. A. McDowall, *Evolution and the Need of Atonement* (1914); R. S. Moxon, *The Doctrine of Sin* (1922); E. V. Bicknell, *The Christian Idea of Sin and Original Sin* (1922).

Sinai is the name given to the triangular peninsula, now belonging to Egypt, which lies between the Gulf of Suez in the south-west and the Gulf of Akaba in the south-east. Towards the north it is separated from the Mediterranean by a broad belt of drifting sand over which runs the ancient desert road, and now the railway, between Egypt and Palestine. South of this the land gradually rises towards the centre of the peninsula, when, after attaining a height of some 4000 feet, the limestone and sandstone rocks abruptly break off in a series of precipitous cliffs. This almost waterless region is known as Badiet Tih, 'the plain of the wandering.' The road from Gaza crosses that from Suez to Akaba at the important central watering-place of el Nakhl, and then descends by precipitous passes to the foot of the great escarpment. Here a broad stretch of sand and gravel cuts across the peninsula from east to west, and divides the 'plain of the wandering' from the triangle of mountains to the south. This mountain region is in its turn divided into two by the well-watered Wady Feiran. The northern part consists of shelving masses of red sandstone of moderate height, deeply cut into wild and precipitous gorges, in the midst of which lie the ancient Egyptian turquoise and copper mines and the ruined sanctuary of Serabit el Khadem. South of the Wady Feiran rise the great granite peaks which have always been associated with the 'Giving of the Law.' The most northerly peak, Jebel Serbal (6734 feet), has from its majestic appearance been suggested as the site; but Jebel Mûsa (7359 feet), some twenty miles south-east, has the support of tradition. At its foot lies the famous fortress-convent of St Catherine. The adjoining peak, Jebel Katrin (8527 feet), is, according to mediæval tradition, the place of burial of St Catherine. An adjoining peak, Ras Safsaf (6540 feet), has also by some been claimed as the true Mount Sinai. There are also other lofty peaks to the east, such as Jebel Umm Shomer (8449 feet) and Jebel Umm Iswed (8236 feet).

The whole of this mountainous district is desolate and denuded of the trees and shrubs which once flourished in favourable spots. Though apparently waterless, at times there are rain-storms severe enough to produce raging torrents—dangerous to man and beast—in some of the wady beds, and water may usually be obtained in such spots at all seasons by sinking wells in the dry bottoms. A few thousand wandering Bedawin range through the peninsula and find pasture for their scanty flocks in the loftier valleys.

The history of Sinai has now been traced back to the earliest historic times. There is evidence that the Egyptians worked the turquoise mines in pre-dynastic times, but the tablet of King Semerkhet (Ist dynasty), engraved on rock 394 feet above the bottom of the valley in Wady Maghara, and similar tablets of kings of the IIIrd, IVth, and VIth dynasties found in the region of the mines, but now removed to Cairo for safety, prove how intimate was the connection of this region with ancient Egypt. This is further shown by the excavation of Serabit el Khadem, a sanctuary of the moon god which flourished during the XIIth dynasty and was added to in the XVIIIth and XIXth dynasties.

Some writers are inclined to associate this remarkable sanctuary with the Hebrew law-giving, but

all the older authorities support the traditional view that the scene must be set at one of the granite peaks farther south—at Jebel Mûsa or Jebel Safsaf.

Belonging to an age many centuries later, there are many Nabataean (q.v.) inscriptions on the rocks of Sinai.

During the 4th and 5th centuries A.D. many hermits settled in the peninsula, and from the reign of the emperor Justinian (527–563) we read of a fortified hermit-settlement known as 'The Bush.' In the middle ages this convent came to be known as that of St Catherine, and in the 14th century there were actually at one time 280 monks in residence, besides a great many moslem Arabs who were daily fed at their table. Despite many vicissitudes the convent survives—with 20 or 30 monks—to the present day, and its library is world-famous for the valuable manuscripts which have been found there, such as the great Codex Sinaiticus and the Syriac Codex of the Gospels.

During the Great War the peninsula of Sinai was in the hands of the Turks, who made el Nakhl a military centre, and managed to penetrate through the peninsula as far as the Suez Canal before they were finally driven northwards by the British advance in 1916.

See Hull, *Mount Seir, Sinai, and West Palestine* (Lond. 1885); Palmer, *Desert of the Exodus* (Camb. 1871); Stanley, *Sinai and Palestine* (1856); *Ordnance Survey of the Peninsula of Sinai* (3 vols., Southampton, 1869); Euting, *Sinaitische Inschriften* (1892); Petrie, *Researches in Sinai* (London, 1906); Weill, *La Presqu'île de Sinai* (1908); Eckenstein, *A History of Sinai* (S.P.C.K., London, 1921); Dobson, *Mount Sinai, a Modern Pilgrimage* (London, 1925).

Sinaloa, one of the Pacific States of Mexico with an area of 27,557 sq. m. and a pop. of 341,000. Cereal-growing, stock-raising and silver-mining are carried on. The capital is Culiacán (q.v.), 100 miles north-west of which is the small town of Sinaloa, with a pop. of 3000.

Sinapis. See MUSTARD.

Sinclair, MAY, novelist, born at Rock Ferry in Cheshire, and educated at Cheltenham, published her first short story in 1895. Her best known novels, *The Divine Fire* (1904), *The Creators* (1910), *The Three Sisters* (1914), *Mary Olivier* (1919), *The Dark Night* (1924), are characterised by great power, vitality, and sympathy, and are written from a full experience of life that always keeps in touch with contemporary ideas. Her work has had a great vogue in the United States. In *The New Idealism* (1922) she appeared among the philosophers.

Sinclair, UPTON, American writer, was born at Baltimore in 1878. His sensational novel *The Jungle* (1906), in which he exposed the conditions in the meat-packing industry in Chicago, led to reforms. Other works include *The Money Changers* (1908), *Plays of Protest* (1912), *Sylvia* (1913), *The Brass Check* (1920), and *Singing Jail-birds* (1924), and are largely coloured by Socialist propaganda.

Sind, or SINDH (also spelt *Sinde* and *Scinde*), in the north-west of British India, belongs to the presidency of Bombay, and is bounded on the N. by Beluchistan and the Punjab, E. by Rajputana, W. by Beluchistan, and S. by the Indian Ocean and the Rann of Cutch. It contains an area of 46,500 sq. m., with a pop. (1921) of 3,279,377. The seacoast (150 miles) is very low and flat, with the exception of the small portion beyond Karachi (Kurrachee), and is studded with low mud-banks formed by the Indus or with sand-hills, the accumulated drift from the beach. The province is traversed from north to south by the Indus (whence the name; see INDIA, Vol.

VI. p. 97), and includes the whole of its delta. Along each bank of the river is an alluvial tract of great fertility, from 2 to 12 miles wide, and mostly irrigated by artificial canals and water-courses, which, overflowing during the inundations, cover the soil with a silt so rich as to yield two, and sometimes three, crops in a year. The soil, nevertheless, contains in the north so much salt-petre, and in the south so much salt, that after the year's crops have been obtained these substances are extracted for home consumption and export. Between the Indus and its most easterly branch, the Nara, is an alluvial 'doab,' which, from want of irrigation, has become almost a desert. East of this is the Thur, a desert of shifting sand. West of the Indus the country is occupied by the desert of Shikarpur on the north, a desert not of sand, but of alluvial clay, the same as that of the delta, which only requires irrigation to render it fertile; and in the south it is traversed by the Hala Mountains. The climate is remarkably sultry and dry, the province being beyond the action of the south-west monsoon; during the long summer the thermometer averages 95° F., and ranges up to 120°; in winter it falls below freezing-point and rises to 80°. There are generally two harvests per annum; the first, or *rabi* ('spring') harvest, consists of wheat, barley, indigo, oil-seeds, gram, hemp, and tobacco; the second, or *khari* ('autumn') harvest, of rice, millet, oil-seeds, pulses, and cotton. The population consists of the native Sindis, with a large sprinkling of Beluchis and Afghans; the greater portion of them are Mohammedans of the Sunnite faith. The population are almost wholly engaged in agriculture. The trade of the province is concentrated at Karachi (q.v.), the capital. Raw cotton, wool, and various grains are the principal exports. Besides Karachi (pop. in 1921, 216,833) there are the large towns of Hyderabad (81,838), Shikarpur, Larkhana, and Sukkur.

In Sind, as in the Punjab, remains have been discovered of a Chalcolithic civilisation, showing affinities to those of Elam and Sumer, assigned to the 3d millennium B.C. At Mohenjo-daro excavations have disclosed a finely built city, with temples and houses of brick (kiln-burnt and sun-dried), terraces, courtyards, bathrooms, and elaborate drains, crude stone knives and scrapers, copper vessels, jewellery of gold, silver, carnelian and other stones, blue and white glazed faience, stone statues, and great numbers of engraved seals, 'in a style worthy of the best Mycenaean art.' These seals bear inscriptions which await decipherment. Under the city are remains of earlier cities, layer below layer.

About 712 A.D. Sind was conquered by Mohammed Kasim, the general of the khalif, and since that time has been almost entirely ruled by Mohammedan princes. About 871 the khalifs lost their hold upon this province, which became divided between the two native kingdoms of Multan and Mansura. In 1026 Sind was conquered by an officer of Mahmud of Ghazni, but the conquest was not at all a permanent one. A new native dynasty was founded in 1051, and was followed by others in 1351 and 1521. In 1592 the country was conquered by Akbar, the Mogul emperor of Delhi; and in 1739 it was incorporated in the dominions of Nadir Shah of Persia. Under Persian suzerainty Sind was governed by various native dynasties. The rulers of Sind always regarded the British with suspicion, and not without reason, for on the outbreak of the Afghan war in 1838 the British government forced the chiefs of Hyderabad and Khairpur to agree to a treaty which virtually destroyed their independence. And when their Beluchi subjects, resenting this arrangement, took up arms, Sir Charles Napier marched against them, totally routed them at Meeanee (17th February

1843), and at Dabo, near Hyderabad (24th March), and annexed their territories. The British administrators have directed their chief efforts to the development of the commerce of the country, principally by the construction of the Indus Valley Railway and the harbour-works at Karachi.

See five volumes by Sir R. Burton (1851-77), and gazetteers of the province by Hughe (1876), and Aitken (1907).

Sindia, the title of the Mahratta princes or rulers of Gwalior in India. The founder of the family was RANOJI SINDIA, who from a menial station in the household of the Peshwa rose to a high rank in the bodyguard, and after 1743 received in hereditary fief one-half of the extensive province of Malwa. His son, MĀDHAVA RAO (MADHOJI) SINDIA (1750-94), joined the Mahratta confederation, and was present at the battle of Panipat (1761), where he was so desperately injured as to be left for dead; but he recovered. In 1770, along with the Peshwa and Holkar, he aided the emperor of Delhi to expel the Sikhs from his territories, the administration of which was handed over to Sindia, thus making him the most powerful of the Mahratta chiefs. He first came into collision with the British in 1779; but in the war which followed fortune distributed her favours with impartiality, and by the treaty of Salbye (1783) Sindia was recognised as a sovereign prince and confirmed in all his possessions. In 1784 he captured the stronghold of Gwalior, and in the following year marched on Delhi, and subsequently seized Agra, Alighur, and nearly the whole of the Doab (q.v.). The manifold advantages of European discipline had struck him forcibly during the war with the British, and, with the aid of an able French officer, he raised and drilled an army of troops, with whom he reduced Jodhpur, Udaipur, and Jeypore, three Rajput states, and effectually humbled the pride of Holkar. See H. G. Keene's *Mādhava Rao Sindhia* ('Rulers of India' series, 1892).—DAULAT RAO SINDIA (1794-1827) continued his granduncle's policy, and during the troubles which convulsed Holkar's dominions at the commencement of the 19th century ravaged Indore and Poona, but was routed in 1802 by Holkar. Having joined the rajah of Berar in a raid on the Nizam (1803), he brought down upon himself the vengeance of the East India Company. The confederated Mahrattas were routed at Assaye and Argaum by Sir Arthur Wellesley, and were scattered irrevocably at Laswari by Lord Lake. Thereupon Sindia hastened to sign a treaty by which all his possessions in the Doab and along the right bank of the Jumna were ceded to the British. Gwalior was, however, restored in 1805, and from that time became the capital of Sindia's dominions.—During the reign of MUGAT (JANAKJI) RAO (1827-43), a minor, the Gwalior dominions were in such a state of anarchy that the British felt called upon to interfere; a war ensued, and the Mahrattas were routed at Maharajpūr (December 29, 1843) by Lord Gough, and at Panniar by Major-general Grey on the same day. Gwalior fell into the hands of the British, 4th January 1844, and Sindia submitted to the conditions demanded of him, besides maintaining a contingent force of sepoys at Gwalior. During the Mutiny BAJI RAO (1843-86), successor of Mugat, took the field against the Gwalior contingent, which had joined the rebels; but most of his troops deserted him during the battle (June 1), and he narrowly escaped by fleeing to Agra. He was subsequently reinstated by Sir Hugh Rose, and received from the British government substantial marks of its goodwill and approbation. He was succeeded by his adopted son in 1886, when the British cantonment was removed from Gwalior.

Sindibad. See SEVEN WISE MASTERS.

Sine. See TRIGONOMETRY.

Sin-eaters, a class of men formerly employed in Wales and on the Welsh border, in connection with funeral rites, to eat a piece of bread and drink a cup of ale placed on the bier, and so symbolically take upon themselves the sins of the deceased. As soon as this was done the sin-eater 'pronounced the ease and rest of the soul departed, for which he would pawn his own soul,' and so took his way, having freed the dead sinner from the necessity of walking an unquiet ghost. John Aubrey (q.v.) is chief authority for this custom in the 17th century, common then or earlier in Shropshire and Hereford as well as in Wales; but in 1852 it was described as having been regularly practised shortly before that date near Swansea. To many the name has been rendered familiar by the title of a volume of Fiona Macleod's interpretations of the sombre superstitions of the men of the Western Isles. The name may be due to a misinterpretation of Hosea, iv. 8—'They eat up the sin of my people;' and a parallel to the custom may be found in the Levitical 'scape-goat.' But Mr Sidney Hartland is inclined to see in sin-eating, and in the ceremonial use of certain suspicious funeral-cakes, biscuits, and draughts, prescribed by use and wont not merely amongst savage peoples but in India, in some parts of Russia, Germany, Greece, Italy, and France, as well as in Yorkshire, Shropshire, and Pembroke, the softened survival of a genuine cannibal feast at which the actual flesh of the deceased relative or friend was more or less solemnly consumed by the mourners. (See *The Legend of Perseus*, 1894-96.)

Sinecure, usually an office which has revenue without employment. In the canon law a sinecure is an ecclesiastical benefice, such as a chaplainry, canonry, or chantry, to which no cure of souls is attached, and where residence is not required. The strictest kind of sinecure is where the benefice is a donative, and is conferred by the patron expressly without cure of souls, the cure either not existing, or being committed to a vicar. Sinecure rectories were abolished in 1840. Sinecure offices were formerly very numerous in the English public service. They were used to enrich ministers of state and their families; Sir R. Walpole, for example, presented his son Horace to three or four sinecure places which brought him in a large income. The number of such places has been greatly diminished by modern reforms; the stewardship of the Chiltern Hundreds (q.v.) and some other offices of merely nominal profit are retained, because by accepting one of them a member of the House of Commons is enabled to vacate his seat.

The Norman crown took over some 1500 manors, townships, hundreds, honors, or baronies, which were administered first by bailiffs (*ballivi*) and afterwards by stewards (*senescalli*), whose function was to administer those areas as the sheriffs—to whom they were not subject—did the counties. They were eminently distinguished for extortion, and their powers were gradually curtailed. Under Charles II. it was resolved to discontinue as a rule the appointment of stewards of the manors, &c., and give to lessees the rights of the king as lord of the manor; a few stewardships, latterly some twenty, surviving down to modern times as honorary offices, presents to royal favourites. One was the Chiltern Hundreds, which, sold under the Commonwealth, reverted to the crown at the Restoration, and from 1679 to 1710 were leased, the rents being apparently treated as fee farm rents and the rights to them sold on that footing. A few rents are still paid to the crown, but since 1710 the remuneration, powers, and duties of stewards have

become trifling. The fictitious use of stewardships, as offices of profit under the crown, for enabling members of parliament to escape from posts they cannot resign, began in 1750, the grants being now made by the Chancellor of the Exchequer. Other stewardships than that of the Chiltern Hundreds that have been used in this way are those of Old Shoreham in Sussex (1756-99), East Hendred in Berks (1763-1840), Poynings in Sussex (1841-43), Hempholme in Yorks (1845-65), and—the only one besides the Chilterns now employed in this way—Northstead in Yorks, first used for parliamentary convenience in 1841. Escheatorships of Munster and of Ulster used to be taken advantage of in the same way. For perpetual pensions, see PENSIONS.

Sines, birthplace of Vasco da Gama, a small seaport on the Bay of Sines, at the south end of Portuguese Estremadura.

Sinestra, or VAL SINISTRA, a valley of the lower Engadine in the Swiss canton of Grisons, opening into the valley of the Inn, famous for a dozen mineral springs containing arsenic, iron, boric acid, lithium, iodine, and bromine.

Sinew. See TENDON.

Singakademie, a famous and influential choral society of Berlin founded in 1790 for the purpose of studying and practising choral music, 'not for the sake of amusement and pleasure, but with serious artistic aims.'

Si-ngan-fu (also spelt Sian, Si-gan-foo, Se-gan, and Hsi-an-fu), the capital of the Chinese province of Shen-si and a great administrative and commercial centre, was already well known to history in B.C. 2205 as 'the well-watered city' (owing to its wells). Under names as various as Wei-nan, Yung-chow, Kwan-nuy, Yung-ling, and Gan-se, its history extends continuously down to the present time from the days of the Chow dynasty, 1100 years before Christ, when it was already the capital of China; as it was in those of Shi-hwang-ti, the monarch who in 214 B.C. began the Great Wall. It was the centre of Nestorian influence in the 7th and 8th centuries of our era, as extant inscriptions yet testify; and Marco Polo knew it as Ken-jan-fu, then 'a place of great trade and industry.' The capital of the empire under at least three dynasties, it is even now one of the first cities in size, dignity, and importance. Its walls are almost as high and imposing as those of Peking; its four celebrated gates are handsomer and better fitted for defence. Admirably situated for trade, it stands near the Wei, the principal affluent of the Hoang-ho, where three great trade-routes radiate, on the great loess plateau that slopes southward and eastward from the high tablelands of Mongolia. Its position on the roads to Ili, Yarkand, and Kashgar gives it strategic importance, and many historical events have taken place around it. Its walls withstood several assaults of the Mohammedan rebels in 1868-71, and sustained a two years' continuous siege; but during the rebellion it suffered greatly, and has only of late completely recovered. During the operations in 1900 by foreign troops for the relief of the beleaguered legations in Peking, it was to Si-ngan-fu that the Dowager-Empress carried the Emperor and court for a time.

The streets of Si-ngan-fu are relatively wide, well-paved, and clean; the shops and warehouses are large and well-packed; silk, tea, and sugar are gathered hither and re-exported, being exchanged in Kan-sü, Turkestan, Kuldja, and Tibet for rhubarb and other drugs, musk, wool, and furs; and there is everywhere an appearance of energy, bustle, and prosperity. Of the population, which may amount to as much as a million, some 50,000 are Moham-

medans, and there are many Mongols, Tibetans, and other Asiatic foreigners.

The place is singularly rich in fine old temples and objects of antiquarian interest. Here are the oldest Moslem mosque in China, built more than 1100 years ago; a temple to Lao-tsze; 'the Forest of Tablets'—incised inscriptions (mostly Han dynasty), emblems, and historic scenes; a life-sized image of Confucius; the 'Thirteen Classics,' cut in stone under the Tang dynasty; and in the Manchu quarter or 'city' a palace site probably as old. But to westerners by far the most interesting relic is the large stone tablet, erected in 781 A.D., discovered by a native workman and re-erected in 1625, which bears in Chinese characters a record of the establishment of Christianity by Nestorians here in 635, and of the fortunes of the faith when other religions were making rapid headway. There is also a recapitulation of the story in Chinese verse. A Sino-Syriac inscription gives the date of the erection, and both in Estrangelo and Chinese characters are the names of many bishops, priests, and other personages, including the Nestorian patriarch of the time, the bishop or pope of China, and the mission staff in and about the city. There are in all nearly 2000 inscribed characters on the stone, which have been deciphered and read without much difficulty or uncertainty. The stone is a slab 9 feet high by 3 wide, and 1 thick. It stands (since 1907) in the Forest of Tablets. In that year the Danish traveller General Frits Holm obtained a replica, now in Rome, of the Chingchiaopei ('luminous worship monument') as it is called, of which he has given reproductions to many museums.

The progress, great extension, and ultimate decay of Nestorian missions in central and eastern Asia will be found in the article NESTORIUS, as also at GREEK CHURCH. In rumours as to the numbers and influence of the Nestorian Christians in these regions, reflected with odd distortions and exaggerations, we have perhaps to seek all that was historical in the earlier forms of the myth of Prester John (q.v.).

Singapore, a British dependency in Asia, the most important of the Straits Settlements (q.v.), consists of the island of Singapore (27 miles long, 14 broad; area, 217 sq. m.), separated from the southern extremity of the Malay Peninsula by a strait only half a mile wide at its narrowest, and of a great number of very small islands along its shores. In 1923, a causeway connecting Singapore with Johore was opened. The surface of the island is undulating, the highest point reaching 520 feet only. The climate is hot and moist, but the soil is not particularly fertile; nevertheless the island is perpetually clothed with verdure, and yields good crops of coffee, pine-apples, coconuts, aloes, and every kind of fruit, especially East Indian fruit (e.g. mango-steen and durian). Gambier, pepper, and nutmegs, formerly the staple crops, have been superseded by rubber. This island was purchased in 1824 from the sultan of Johore for £12,500 and a life-rent of £5000. Pop. of island (1881) 172,993; (1901) 228,555; (1921) 419,912.

The capital of the dependency, Singapore, is the only town on the island. It occupies a pleasant site on the south-east coast, on the Strait of Singapore, the principal waterway for vessels trading between eastern Asia and India and Europe. This city was founded by Sir Stamford Raffles in 1819 as an emporium for British trade in the East Indies, and it has since that time advanced and grown in prosperity till it has become the most important trading-place in the south-east of Asia, its only competitor being Batavia in Java, from which it is 600 miles distant. Singapore is a picturesque, well-built town, with

fine public buildings and all kinds of appliances in the nature of public works. It possesses a governor's residence, St Andrew's Protestant cathedral (1861-70), a Roman Catholic cathedral, Mohammedan mosques, Hindu temples, Chinese joss-houses, Raffles museum (1823), the supreme law-courts, post-office, hospitals, gaol, barracks, fine botanical and zoological gardens, a race-course, polo ground, &c. It is defended by numerous batteries and forts, and is a naval coaling station and dépôt. After the Great War further fortifications were built after considerable discussion and opposition. The harbour is spacious and safe and remarkably easy of access, while the dock accommodation is extremely extensive; the King's Dock (opened in 1913), 879 feet long, 100 feet wide, and 34 feet deep, is the largest east of Suez. It is a free port, no duties being levied except on petroleum, tobacco, spirits, wines, and beer. The annual trade of Singapore has increased at a remarkable rate since the city was founded. The total trade in 1823 was under £2,000,000; in 1851 about £4,000,000. The exports were valued at 7½ million pounds in 1887, at 27½ millions in 1910, and at 64½ millions in 1924; the imports were valued at 9½ millions in 1887, at 31½ millions in 1910, and at 74½ millions in 1924. Para rubber and tin account for two-thirds of the exports, while the chief imports are cotton piece goods, sugar, tobacco, rice, machinery, and coal. There is a considerable inter-settlement trade. Singapore is a port of call for passenger liners to the Far East. The population has grown at the same rate as the commerce. In 1824 the town had about 10,000 inhabitants; (1850) 50,000; (1881) 140,000; (1901) 200,000; (1921) 350,000, of whom two-thirds were males, mostly Chinese immigrants. The death-rate has been much reduced by sanitary and medical measures, especially in the matter of malaria. The climate, in spite of Singapore being situated little more than 1° N. of the equator, is uniform and agreeable, the nights being particularly cool and refreshing. The thermometer ranges between 67° and 94° F. and has a mean of about 82°. The rainfall varies from 65·6 to 92·2 inches in the year. There was a former town on the site of the present city, founded by Malay converts to Hinduism from Java to Sumatra, apparently in the 12th century; but it had wholly disappeared when Sir S. Raffles laid the foundations of the existing Singapore (i.e. 'Lion City'). It was made the capital of the Straits Settlements in 1830, superseding Penang.

Singer, ISAAC. See SEWING MACHINE.

Singhara Nut. See TRAPA.

Singing. See MUSIC, OPERA, ORATORIO, SOLFA SYSTEM, SOLFEGGIO, SONG, SOUND, THROAT, VOICE.—For Singing-flames, see FLAME.

Single-stick. See FENCING.

Single-tax. See GEORGE (HENRY), TAX.

Sing Sing (officially since 1901, OSSINING), a village of New York, on the left bank of the Hudson (here 3 miles wide, and called Tappan Bay), 31 miles by rail N. of New York City. It contains many villas and a number of boarding-schools, and has some busy manufactories; but it is most widely known as the site of the large state-prison which rises from the bank of the river, and has been built since 1825. The Croton Aqueduct rests here on an arch of masonry with a span of 88 feet. Pop. (1920) 10,739.

Sinigaglia. See SENIGALLIA.

Sinister. See HERALDRY, and BATON-SINISTER.

Sin-kiang, or the 'New Dominion,' a great Chinese province formed by uniting Eastern Turkestan, Ili, Zungaria, and the western part of

Kansu. See articles under these heads. Area about 550,000 sq. m.; pop. 2,000,000 (Turks and Chinese); capital Urumtsi.

Sinking Fund, a fund formed by setting aside income every year to accumulate at interest for the purpose of paying off debt. A sinking fund for payment of the national debt of Britain was begun in 1716 by Sir Robert Walpole. Certain taxes which had been laid on for limited periods were then rendered perpetual, for the purpose of paying the interest of the funded debt. They produced more than enough for this purpose, and the surplus was laid aside, that it might accumulate into a fund for extinguishing the debt. It appeared to operate well, since, in 1728, after it had existed for twelve years, debt was wiped off to the extent of £6,648,000. It was not observed that, during the wiping off, new debt had been created to about the same extent, so that the nation was just in the position in which it would have been had it neither borrowed nor repaid. An historical experiment with a sinking fund was started in 1786 by the younger Pitt, who found himself faced by a National Debt of nearly 250 millions sterling. After executing a host of administrative and fiscal reforms, Pitt, influenced by the theories of a contemporary statistician, Dr Richard Price (q.v.), planned to have a surplus of one million sterling (afterwards increased) in the annual budget. This sum was to be handed over each year to a body of commissioners who should gradually buy over the debt and ultimately extinguish it. But in the French Wars budget surpluses gave place to deficits, and yet Pitt, anxious to maintain public confidence, retained the sinking fund, and borrowed the money to pay over to the commissioners. As this money was largely at a higher rate of interest than the debt it was meant to redeem, it followed that the sinking fund was only adding to the total debt. This burden continued to grow, and not till 1813 was the fallacy exposed. In that year Dr Robert Hamilton, in a treatise on the national debt, estimated the actual loss occasioned by the sinking fund at over 12½ millions sterling. Complications ensued when Vansittart borrowed from the sinking fund in 1820 and 1821. The whole scheme was condemned and eventually abandoned in 1829, when the Chancellor, Henry Goulbourn, established what has come to be called the 'old sinking fund' based on the annual realised surplus, if any. What was known as 'the new sinking fund' was started by Sir S. Northcote (Lord Iddesleigh) in 1875, the permanent charge for annual debt expenses being fixed at 28 millions. This sum was intentionally above that required, but any excess was to be used for debt redemption. Its working would therefore be cumulative, if further borrowing was not indulged in. But Northcote had to borrow and the fixed rule was not observed. The scheme was altered several times, but by 1914 had become of no effect, although the 'old sinking fund' remained legally valid. A Finance Act of 1923 abolished Northcote's scheme and established a new fund of a fixed amount to be devoted annually to debt redemption, the fund to be included in the yearly expenditure. It amounted to 60 million pounds in 1926-27. There are several other financial expedients similar in effect to the principal sinking funds, viz. terminable annuities, issues from the Consolidated Fund, payments for death duties, Conversion Loan sinking fund, Funding Loan sinking fund, Victory Bonds sinking fund, &c. See NATIONAL DEBT; and Nash, *Sinking Fund and Redemption Tables* (1884).

Sinn Fein. See GRIFFITH (ARTHUR), IRELAND (pp. 209-10).

Sinningia. See GLOXINIA.

Sinope (Turk. *Sinub*), a town of northern Anatolia, stands on a rocky tongue projecting into the Black Sea, 220 miles W. by N. of Trebizond. It has two harbours, one presenting the finest anchorage along the southern coast of the Black Sea. The town is surrounded by ancient Byzantine walls, and has a ruined castle built under Byzantine influence. The bay was the scene of a naval engagement on 30th November 1853, when a Turkish squadron was destroyed by the Russian fleet. The ancient city of Sinope was founded by a colony of Milesian Greeks, and for several years shared with Byzantium the supremacy of the Euxine. It was made by Pharnaces the capital of the kingdom of Pontus in 183 B.C. The great Mithradates, who was born within its walls, raised it to a lofty pitch of splendour. But in 72 B.C. it capitulated to Lucullus, and in 45 B.C. was made a Roman colony. After belonging successively to the empire of Trebizond (from 1204) and the Seljuks, it was conquered by the Turks in 1461. Sinope was the birthplace of Diogenes the cynic. Pop. 9000.

Sinter, the name given by German mineralogists to those rocks which are precipitated in a crystalline form from mineral waters. Sinter is of various forms, kidney-shaped, knotted, tuberos, botryoidal, tubular, stalactitic, shrub-like, or pronged, and is occasionally distinguished by its chief component, as Calc-sinter, Siliceous sinter, Iron-sinter, &c. Calc-sinter, which is a variety of carbonate of lime, composed of concentric plane parallel layers, appears under various forms; it is deposited with extraordinary rapidity by many springs, a peculiarity frequently made use of to obtain the incrustation of objects with a coating of this substance. Siliceous sinter is mostly found in intermittent hot springs, as in the Geysers (q.v.) of Iceland. Iron-sinter occurs in old mines and in coal-beds, where it is formed from iron pyrites through the agency of the atmosphere. The tubular conglomeration of grains of sand half-melted by lightning (*blitz*) is also known as Blitz-sinter, or Fulgurite (q.v.).

Sinus, in Anatomy, a term for the air cavities contained in the interior of certain bones—as the frontal, ethmoid, sphenoid, temporal, and superior maxillary. The frontal sinuses are two irregular cavities extending upwards and outwards, from their openings on each side of the nasal spine, between the inner and outer tables of the skull, and separated from one another by a thin bony septum. They are related to the prominences above the root of the nose called the superciliary ridges. They are not fully developed till after puberty, and vary considerably in size, being usually larger in men than in women and young persons. When very much developed they give a receding appearance to the forehead. They are larger in Europeans than in Negroes, and are very imperfectly developed in the Australians, whose peculiar want of vocal resonance is apparently due to this deficiency. They communicate on each side of the upper part of the nostril by a funnel-shaped opening, which transmits a prolongation of mucous membrane to line their interior. These sinuses are much more highly developed in certain mammals and birds than in man. Sir Richard Owen observes that 'they extend backwards over the top of the skull in the ruminant and some other quadrupeds, and penetrate the cores of the horns in oxen, sheep, and a few antelopes. The most remarkable development of air-sinuses in the mammalian class is presented by the elephant; the intellectual physiognomy of this huge quadruped being caused, as in the owl, not by the actual capacity of the brain-case, but by the enormous

extent of the pneumatic cellular structure between the outer and inner plates of the skull.' The sphenoidal sinuses are two large irregular cavities, formed, after the period of childhood, in the body of the sphenoid bone. They communicate with the upper part of the nose, from which they receive a layer of mucous membrane. Like the frontal sinuses, they serve to lessen the weight of the skull, and to add to the resonance of the voice. The ethmoid sinuses lie in the lateral masses of the ethmoid bone. They communicate with the cavities of the nose. Their main use is to diminish the weight of the forepart of the skull. That part of the temporal bone which forms the projection behind the ear is termed the *mastoid process*. The interior of this process is hollowed out with air-sinuses which communicate with the tympanum or middle ear, and through it with the nose. The superior maxillary sinus commonly known as the *Antrum of Highmore* (anatomist, 1613-84, who first accurately described it) is the largest of the sinuses, and the only one present in the infantile skull. Its uses are the same as those of the others, and, like them, it communicates with the nasal cavities.

The term sinus is also applied to certain channels for the transmission of venous blood. These are merely dilated veins formed by the separation of the layers of the dura-mater and lodged in grooves on the inner surfaces of the cranial bones. In Surgery the term *sinus* is nearly equivalent to *Fistula* (q.v.).

Sion, or **SITTEN**, capital of the Swiss canton of Valais, stands in a picturesque situation in the valley of the Rhone, 16 miles NE. of Martigny by the Simplon Railway. It has a mediæval appearance, owing to three ruined castles perched on the crags above the town, and its cathedral, the church of a bishop since the 6th century. Pop. 6000.

Sion College, on the Victoria Embankment, London, was founded in 1623 as a college (though not for teaching purposes) and almshouse, on the site of a priory in London Wall, and the college was incorporated by charters of 1630 and 1664. In 1884 the almsfolk became out-pensioners, and two years later the college with its fine theological library was transferred to the new building on the Embankment. The college was founded originally for the benefit of the clergy of the city and adjoining parishes, but in 1919 the membership was extended to several of the southern dioceses. For Sion House, see **ISLEWORTH**. See Pearce, *Sion College and Library* (1913).

Siout. See **SIUT**.

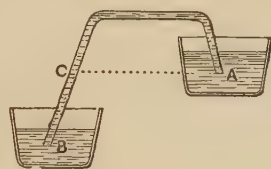
Sioux (pron. *Soo*), the principal tribe of the Dakota (i.e. 'confederate') family of American Indians (q.v.), now settled mostly in South Dakota and Nebraska. Forced by the Chippewas south and west, they made their first cession of lands to the United States government in 1830, and in 1837 ceded all their lands east of the Mississippi, and in 1849-51 those in Minnesota. For all these lands annuities were promised, which were, however, allowed to fall into arrears; and meanwhile the Indians were demoralised by the introduction of whisky. In 1862 a number of famishing men broke into a government warehouse, and so began a desperate war which desolated thousands of square miles of territory, cost a thousand whites their lives and the government \$40,000,000, and ended in the execution of the leaders. After some years of further disgraceful mismanagement and wrangling between the various government departments, the Santee Sioux were placed on a small reservation near Yankton, where they have developed into industrious and peaceful farmers. Meanwhile the hostile Sioux had retired to the northern parts of Dakota, where, under Sitting Bull, they gathered the young

braves who were exasperated by the government's failure to send supplies to the several agencies. The war which began and ended in 1876 is chiefly memorable for the disaster in which General Custer (q.v.) perished; it was ended in a few months, and Sitting Bull took refuge in Canada, but in 1880 was induced by the Dominion officials, on a promise of pardon, to surrender. The Brulé Sioux and the Ogallalla Sioux were afterwards settled on the Rosebud and Pinewood agencies in South Dakota. In 1890 there was a general rising of the Indians in the North-west, under a 'Messiah'; and in its course Sitting Bull was slain—whether killed in fight or slaughtered was questioned—on 15th December.

Sioux City, capital of Woodbury county, Iowa, on the east bank of the Missouri River (here crossed by a bridge 2000 feet long), 128 miles (by rail) above Omaha and 512 W. by N. of Chicago. It has good public buildings and schools, great stock-yards and packing-houses, machinery and electrical works, factories, mills, potteries, &c., and is the centre of a large agricultural and stock-raising district. Pop. (1880) 7366; (1900) 33,111; (1920) 71,227.

Sioux Falls, capital of Minnehaha county, South Dakota, and the largest town in the state, 241 miles by rail SW. of St Paul, is on the Big Sioux river, which here falls 90 feet, providing water power for flour mills and factories. There are several machine shops, and much quarrying is done. Here are several educational institutions. Pop. 25,200.

Siphon, a bent tube for drawing off liquid from one vessel to another. When in action the tube must be itself full of the liquid, so that the quantities of liquid in the two vessels form one continuous liquid mass. In accordance with the principles of Hydrodynamics (q.v.), there will be, in these circumstances, a flow of liquid along the tube until either the free surfaces of liquid in the two vessels are brought to the same level, or the one



vessel or the siphon becomes emptied of liquid. If it is desired merely to empty one vessel, a second vessel is not necessary. The principle on which the siphon acts will be readily seen by consideration of the figure. The two free surfaces are at the atmospheric pressure, but are at different levels. Take C at the same level as A. Then the pressure at A is obviously greater than the atmospheric pressure, while the pressure at C is less than the atmospheric pressure by the amount of pressure due to the column of liquid between C and the free surface in the lower vessel. Hence there must be a flow of liquid from A to C along the tube—i.e. from vessel to vessel. In the upper part of the siphon the liquid is sustained by the pressure of the atmosphere on the free surface, just as in the Barometer (q.v.). If then the siphon reaches higher above the free surface than the height of the barometer column of liquid used, the continuity of liquid will be broken at the bend, and the siphon will cease to act. Thus a siphon for water cannot be higher than 33 feet above the water surfaces; and a siphon for mercury is similarly limited to 30 inches. To bring it into working condition, a siphon is usually filled by suction applied (either by the mouth or by a pump) at the one end, the other end being immersed in the liquid; or it is first filled with the liquid and then placed in its proper position. In the general case, two vessels containing the

same liquid at different upper levels and connected by a filled siphon-tube will have the liquid flowing through the siphon-tube in the one direction or the other until the upper levels in the two vessels become the same, whatever the relative lengths of the siphon-arms; provided that this result be not rendered impossible by a breach in the continuity of inflow into the siphon, as where the free surface of the liquid comes to sink to the level of the inflow end of the siphon, whereupon air is drawn in and the flow ceases.

Siphonophora. See HYDROZOA.

Sippara. See BABYLONIA.

Sipunculus, a genus of worms belonging to the class Gephyrea. The body is cylindrical, unsegmented, without appendages or bristles, with tentacles around the mouth. The food-canal is spirally coiled, and ends anteriorly. The sexes are separate. A common species is *Sipunculus nudus*, which lives in the sand on the shores of the North Sea, the Atlantic, and the Mediterranean. It measures from 6 to 10 inches in length. The animal swallows the sand for the sake of the organic matter therein contained.

Sipylos, a mountain of Lydia, near Smyrna, with ancient rock-sculptures, showing Hittite influence, among them the figure of Niobe (q.v.).

Siquijor, an island of the Philippine group, 25 m. SW. of Bohol. The inhabitants raise coconuts, tobacco, maize, rice, and cocoa.

Sir (Fr. *sieur* and *sire*, contracted from *seigneur*; from Lat. *senior*, 'elder'), a term originally corresponding to *dominus* in Latin. It was at one time the practice to use the same title in addressing the clergy, a familiar instance being Sir Hugh Evans in the *Merry Wives of Windsor*. To so great an extent did this usage obtain that a 'Sir John' came to be a common sobriquet for a priest. 'Sir' was here a translation of *dominus*, the term used for a bachelor of arts, originally in contradistinction from the *magister*, or master of arts, but eventually extended to the clergy without distinction. Used along with the Christian name and surname, 'sir' is now applied exclusively to knights and baronets. Standing alone it is a

common complimentary mode of address used without regard to rank. *Sire* is an older form of *sir*, formerly used in addressing royalty.

Sirach. See ECCLESIASTICUS.

Siracusa. See SYRACUSE.

Sirajganj, a town in Pabna district, Bengal, near the main branch of the Brahmaputra, 150 miles NE. of Calcutta. Pop. 25,000.

Sir-darya. See JAXARTES.

Siren, a genus of tailed Amphibians, represented by one species—*Siren lacertina*—living in swamps in the southern states of North America. The animal is eel-like, of a dark lead colour, one to two feet long, without hind-limbs, with four-toed weak fore-limbs, with three pairs of persistent external gills, with no teeth except on a small patch on



Siren lacertina:
a, head on larger scale.

the roof of the mouth. The food seems to consist of worms and insects.

Siren, an instrument which produces musical

sounds by introducing a regularly recurring discontinuity into an otherwise steady blast of air. Seebeck's siren consists of a large circular disk pierced with small holes at equal intervals apart in the same concentric circle. The disk is made to rotate more or less rapidly upon its axis; and while it is so rotating a nozzle, through which a strong blast of air is driven by means of a bellows, is brought to bear directly upon any desired circle of holes. When a hole is opposite the nozzle a puff of air escapes; when an unpierced portion of the disk comes before it the air is checked. Thus the blast of air is broken up into a succession of puffs, whose number per second is exactly equal to the number of holes which pass in front of the nozzle in one second. Knowing the rate of rotation per second of the disk and the number of holes in the circle that is being used, we can readily calculate the frequency of the musical note produced (see SOUND). By shifting the nozzle to bear upon a different circle of holes we get a different note for the same rate of rotation.

In Cagniard de Latour's siren the blast of air whose interruption gives the note also drives the siren. Fig. 1 shows the upper surface of the siren, SS, resting on the cover of the wind-chest, AA. In fig. 2 the instrument is shown in vertical section through the line *nn* of fig. 1. The blast enters by the pipe, BB. The cover of the wind-chest is pierced with exactly the same number

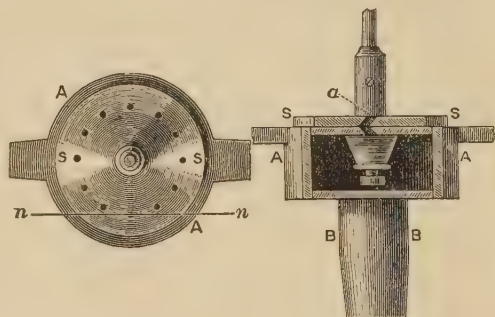


Fig. 1.

Fig. 2.

of holes as the disk, the only difference being that the holes pierced obliquely in both disk and wind-chest cover are oppositely directed in their obliqueness, as shown at *a* in fig. 2. When the corresponding holes are in apposition the blast of air is driven through all the holes, and by its impact on the obliquely cut walls of the holes in the disk forces the disk round. This brings the unpierced part of the disk opposite to the holes in the cover, and the air is cut off until the holes again come into apposition. The stronger the blast the more quickly will the disk be driven and the higher the note produced. A much more powerful tone can be obtained from this form of siren than from Seebeck's, inasmuch as all the holes are used simultaneously. Von Helmholtz's Double Siren is a combination of two of these on the same axis, each siren, by a suitable arrangement of concentric rings of holes which can be closed or opened at pleasure, being able to sound four distinct notes, singly or simultaneously. It is an invaluable instrument for demonstrating the laws of beats and combination tones (see SOUND). Other forms of siren used in fog-signalling are described under LIGHTHOUSE.

Sirenia, an order of aquatic mammals now represented by the dugong (*Halicore*) and the manatee (*Manatus*). Another form, Steller's sea-cow (*Rhytina stelleri*), was exterminated during

the 18th century. In the Miocene and early Pliocene seas there seem to have been abundant Sirenians, many of which belonged to the genus *Halitherium*. As the dugong, the manatee, and Steller's sea-cow (see RHYTINA) are described in separate articles, it is enough to state here that the Sirenians form a very distinct order, that in spite of their superficial resemblance they have certainly no near affinities with Cetaceans, that at present we must be content to regard them as old-fashioned and, it is to be feared, moribund types, occupying a lowly position in the Mammalian series. The name, which suggests mermaids, seems to refer to the appearance of the dugong, when it raises its head above the water or carries its young one under its arm.

Sirens, sea-nymphs in Greek Mythology who sat on the shores of an island between Circe's isle and Scylla, near the south-western coast of Italy, and sang with bewitching sweetness songs that allured the passing sailor to draw near, but only to meet with death. In Homer there are two, in later writers three, Ligeia, Leukosia, and Parthenope, or Aglaopheme, Molpe, and Thelxiepeia. If any seaman could resist the enticements of their magic music they themselves were doomed to die, but Ulysses or the Argonauts alone succeeded in doing so. In the *Odyssey* we read how Ulysses, by the advice of Circe, stopped the ears of his companions with wax, and lashed himself to a mast, until he had sailed out of hearing of the fatal songs. The Argonauts got safely past because Orpheus protected them by the stronger spell of his own singing, whereupon the sirens threw themselves into the sea and were transformed into rocks. The Latin poets give them wings, and in works of art they are often represented as birds with the faces of maidens, and are provided with musical instruments. According to J. P. Postgate (*Cambridge Journal of Philology*, vol. ix.), the original meaning of the word is 'bird.' In later days they are represented on tombs as singers of dirges for the dead, and more generally as symbolising the magic power of eloquence and song. Parallel conceptions are the Mermaid (q.v.) of western Europe and the Lorelei (q.v.) of the Rhine. See Miss Harrison's *Myths of the Odyssey in Art and Literature* (1881).

Sirhind, a tract in the Punjab, being the north-eastern part of the plain between the Jumna and the Sutlej, which is watered by the great Sirhind Canal (main branch finished in 1882) and its branches. Sirhind, which is not an administrative division, contains five British districts (one being Umballa) and nine native states (including Patiala). It is named from an ancient town in Patiala, now in ruins.

Sir-i-kol, a great lake of the Pamir (q.v.).

Sir-i-pul, a river, city (75 miles NE. of Maimana; pop. 15,000), and district in Afghan Turkestan.

Sirius, or the *Dog-star*, the brightest star in the heavens, is situated in the constellation *Canis Major*, and is visible in the winter months, being due south at midnight on the last day of the year. From its brightness the inference was made that Sirius was one of the nearer stars. By a comparison of its position about 1700 A.D. with that given in Ptolemy's Catalogue, 200 A.D., Halley found that it had a considerable proper motion, i.e. progressive motion relative to neighbouring stars, and this confirmed the view that Sirius was comparatively near. Many attempts were made to measure its distance. At length they were successful, and its distance has now been found to be 540,000 times that of the sun, or 50 million million miles. This is correct to within 5 per cent. The luminosity of Sirius is thirty times that of the

sun, i.e. it emits thirty times as much light, and at an equal distance would appear thirty times as bright as the sun. It is a blue star, of spectral type Ao, and its 'effective temperature,' which may be roughly defined as that near its surface, is about 11,000° C, about double that of the sun. In 1844 Bessel found that Sirius has a small oscillatory motion which he attributed to its revolution around an invisible companion. This was confirmed by other astronomers, and Auwers found that the period of this revolution was fifty years. In 1862 Alvan Clark, while testing a large object glass, detected a faint star at an angular distance of 7" from Sirius. This proved to be the till then invisible companion. Since this date the companion has been followed in some of the largest telescopes, and the period of revolution of fifty years verified. As the centre of gravity of the system should have no oscillatory but only progressive motion, it has been possible to calculate its position. Further, from the measured angular distance the linear distance between the two bodies can be calculated, and is found to be twenty times that of the earth from the sun. From these data the mass of Sirius has been calculated as 2.3 times that of the sun, and that of the faint companion as 1.0 of the sun. The light emitted by Sirius is 17,000 times the amount from the faint companion. It follows that the faint companion must have very low surface luminosity, or must be of small size. Spectroscopic observation shows that the companion is of high surface luminosity, and, attributing its faintness to its small size, its diameter is found by Eddington to be only 25,000 miles, while that of Sirius is 1,500,000 miles. This small size implies a density of 53,000 times that of water. Such a density seems at first sight incredible, but is explained by Eddington on the modern theory of the constitution of matter in which an atom consists of a nucleus round which electrons are circulating as the planets circulate round the sun. The compression of ordinary matter can only be pushed to the extent of bringing these miniature planetary systems into contact. But at the high temperatures inside stars, electrons are stripped from their nuclei, and compression to a much greater extent is possible. Eddington pointed out that the small size and high density of the companion of Sirius admitted of verification on the theory of relativity. In the sun the lines of the spectrum are shifted slightly towards the red, and a similar shift, but of considerably greater amount, owing to the greatly increased force of gravity at the surface, was to be expected. This extremely difficult observation was carried out by Adams with the 100-inch telescope at the Mount Wilson Observatory, and the displacement predicted by Eddington was confirmed.

Sirocco (Ital. *Scirocco*), a dust-laden dry wind coming over sea from Africa; but also applied to any south wind, often moist and warm, as opposed to the Tramontana or north wind, from the hills. See STORMS.

Sisal-hemp, or HENEQUEN, a fibre got from the leaves of certain species of Agave (q.v.)—*A. fourcroydes*, *A. sisalana*, *A. Cantala*—introduced into commerce in Mexico in 1839, and named from the small port of Sisal in Yucatán, whence it was first exported. Besides Mexico, Central and South America, the West Indies and Bahamas, it is now grown in East Africa, India, Indo-China, and the Philippines. The fibre, removed by machinery, is in strands of 3 to 5 feet long, nearly white, stronger and woodier than hemp.

Siskin (*Chrysomitris*), a genus of perching birds belonging to the family Fringillidae, the true finches. The best-known species is the Common

Siskin (*C. spinus*), which occurs from Britain eastward to Japan. This species breeds in the centre and north-east of Scotland, and is a familiar winter visitor to England and Wales. It is also common in some parts of Ireland. The siskin usually builds its nest, which is made of twigs



Siskin (*Chrysomitris spinus*).

and roots lined with moss, high in the branches of fir and birch trees. Two broods are reared in a season. The prevailing colour is yellowish green, with yellow and black markings on the upper and white on the under surface; the female being dingier than the male. The siskin is a common cage-bird.

Sisley, ALFRED (1839-99), French painter, was born in Paris, his family being of British origin. Poverty and ill-success were his lot during his lifetime, but now his position as an able exponent of Impressionism (q.v.) is secured. His art is essentially intimate, his landscapes being full of spontaneity and charm.

Sismondi, JEAN CHARLES LÉONARD SIMONDE DE, a historian of Italian descent, was born at Geneva on 9th May 1773. The French Revolution drove the family first to England and then to farm-work in Italy; but in 1800 Sismondi himself went back to Geneva, and, having obtained certain municipal offices, applied himself to his favourite literary pursuits. He was introduced to Madame de Staël, and became one of the intimates of her circle, like Benjamin Constant and Schlegel. Whilst in the company of this lady he formed the beginning of a fast friendship with the celebrated Countess of Albany, widow of the Pretender and mistress of Alfieri. His *Histoire des Républiques Italiennes du Moyen-Âge* (16 vols. 1807-18) placed him in the first rank among contemporary historians. The events of the Hundred Days brought about one of the most memorable passages in his life—an interview with Napoleon. In 1813 appeared his *Littérature du Midi de l'Europe* (Eng. by Roscoe); and in 1819 he began his second great work, *Histoire des Français*, with which he was occupied until his death. As a historian Sismondi was distinguished more for industry than for natural gifts or graces of style. He took a lifelong interest in political economy: his first book on this subject, *De la Richesse Commerciale* (1803), is written from the standpoint of the *Wealth of Nations*; but in a later book, *Nouveaux Principes d'Économie Politique* (1819), he modified his views so far as to adopt a more decidedly moral or socialistic attitude. Amongst other products of his unwearying industry and perseverance may be named *Histoire de la Renaissance de la Liberté en Italie* (2 vols. 1832), *Histoire de la Chute de l'Empire Romain* (2 vols. 1835), and an abridgment (1839) of the twenty-nine volumes of his *Histoire des Français*. Sismondi died at Chêne near Geneva on 25th June 1842.

See *Vie et Travaux de Sismondi* (Paris, 1845); Sainte-Beuve's *Nouveaux Lundis* (vol. vi.); and collections of his own *Lettres Inédites* (1863 and 1878).

Sissoo Wood. See ROSEWOOD.

Sisterhoods, in the common sense of the word are those communities which are not enclosed, and whose life is one of active labour. St Vincent de Paul founded in 1633, assisted by Madame Le Gras, the first superior, the Society of 'Filles de la Charité,' and so laid the foundation of all modern religious communities who lead an active life devoted to various works of charity. The great need of such a society had become so obvious that the holy see, which had hitherto discouraged every attempt of a kindred character, solemnly approved of 'The Daughters of Charity' in 1655. In their constitution it was enacted that the community was 'to consist of girls, and widows unencumbered with children, destined to seek out the poor in the alleys and streets of cities.' In their founder's words, they were 'to have for monastery the houses of the sick; for cell, a hired room; for their chapel, the parish church; for their cloister, the streets of the town or wards of the hospital; for enclosure, obedience; for grating, the fear of God; for veil, holy modesty.' The order spread with wonderful rapidity over the world. After five years' probation the sisters take vows, renewable every year; their habit is gray-blue cloth, with large white collar, and white *cornette* for the head.

The 'Petites Sœurs des Pauvres' were founded in 1840 at St Servan, in Brittany, by the Abbé le Pailleur and Marie Jamet (1820-93), a poor needle-woman. The institute, formed for the care of the aged, destitute, and sick poor, is still in great measure supported by scraps of food and other alms which the sisters beg day by day from house to house. The 'Sœurs de Bon Secours' (of Troyes) were also founded in 1840, by Abbé Miller, canon of the cathedral at Troyes, for the purpose of nursing the sick in their own homes. Another order of 'Bon Secours' Sisters (of Notre Dame) was founded in 1824 by Archbishop Quélen. A heroic sisterhood was formed in 1868 by Cardinal Lavigerie, called 'of the African Mission,' for the care of Arab orphans and the reception and education of negro children rescued from slave-dealers.

After France, Ireland has by far taken the lead, both in the rapid growth of such societies and in the number of women she has given to the work. During the prevalence of the penal laws in Ireland it was impossible for a woman in the dress of a sister to be seen in the streets. But on their repeal in 1782 and 1793 the fire of charitable enthusiasm in Irishwomen broke out and spread the more rapidly for its long repression. The 'Irish Sisters of Charity' were founded in Dublin in 1815 by Mary Aikenhead, daughter of a gentleman of good Scottish family who had settled in Cork. The society is on the same lines as that of St Vincent de Paul, but entirely distinct from it, and the sisters are occupied in almost every kind of charitable work—orphanges, hospitals, penitentiaries, schools, convalescent homes, blind asylums, and certified industrial schools for girls under government. The other great sisterhood in Ireland is that of the Sisters of Mercy, founded in 1831 in Dublin by Catharine M'Auley. The object of this institute is 'all works of mercy, corporal and spiritual, especially education.'

Of sisterhoods belonging to the Anglican communion the first foundation was made in 1845 by Dr Pusey and Lord John Manners (afterwards Duke of Rutland), who, assisted by a few friends, opened a small house in Albany Street, Regent's Park, to receive a few women desiring to devote themselves to charitable works. The sister of Lord Inchiquin gave a powerful impulse to the movement, and now the Sisters of Mercy are engaged in all kinds of charitable works—missions in the worst parts of London, schools both for the

poor and for others, convalescent hospitals—and have houses in various parts of England. Other sisterhoods are the Sisters of the Poor, founded in 1851, of St Margaret's (1854), founded by Dr Neale (q.v.), of the Holy Cross (1857), of St Peter's (1861), of the Church (1870) at Kilburn; and there are a large number of smaller sisterhoods in England.

The first Protestant sisterhood in America was organised in 1852 by Mr Muhlenberg, New York, and took charge of St Luke's Hospital, founded in 1859. Since then organisations of the kind have multiplied, the later ones following very closely the Roman Catholic model.

See MONACHISM, NUNS, and for Protestant Deaconesses, DEACON.

Sistine Chapel, so called as having been built for Sixtus IV. in 1473–81, is the private chapel of the popes in the Vatican, and is the scene of the great religious ceremonies at which the pope in person assists. It is an apartment 133 feet long by 43 feet wide, the height being greater than the width, and was designed by the Florentine architect Giovanni de' Dolci. The screen separating the congregation from the area reserved for pope and cardinals is a specimen of magnificent Renaissance marble decoration, and so is the tribune for the singers; but the main glory of the building lies in the frescoes with which the walls and ceiling are covered. Six subjects from the life of Moses occupy one wall, and six scenes from the life of Christ the opposite one, painted by the best Tuscan and Umbrian masters—Botticelli, Roselli, Ghirlandajo, Signorelli, Pinturicchio, Perugino—but Michelangelo's 'Creation,' 'History of Noah,' 'Prophets,' 'Sibyls,' on the ceiling, and his stupendous 'Last Judgment' on the altar wall, are specially noteworthy. The floor is adorned with a marble pavement in the 'Cosmatesque' style; and beneath the frescoes the marvellous tapestries of Raphael used on great occasions to be displayed. The celebrated Sistine Chapel choir of men's voices, founded by Gregory the Great, sings without instrumental accompaniment in a style that has long been famous throughout the world.

Sis'tova (Bulg. *Svištov*), a town of Bulgaria, on the south bank of the Danube, about 35 miles above Rustchuk. It carries on tanning, cotton-weaving, and wine-growing, and does a large trade in cereals. Here peace between Austria and Turkey was concluded in 1791; the Russians burned the place in 1810, and crossed the Danube into Bulgaria close by in 1877. Pop. (1920) 11,847.

Sistrum, a wire rattle used in ancient Egyptian religious ceremonies. See EGYPT, fig. 9.

Sisybrium. See HEDGE-MUSTARD, ROCKET.

Sisyphus, in Greek Mythology, son of Æolus, father of Glaucus, and husband of the Pleiad Merope; only in post-Homeric legends, from his cunning, the father of Odysseus. He is said to have been founder and king of Ephyra, afterwards Corinth, and both he and his whole house were notorious for their wickedness. Homer does not give the reason for his punishment in the lower world, but some later accounts make it his disclosure to the river-god Asopus that it was Zeus who had carried off his daughter; others, his wholesale robbery and murder of travellers. He was condemned to roll an immense stone from the bottom to the summit of a hill, which, whenever it reached the top, rolled down again, and so the task of Sisyphus had to be begun anew.

Sitapur, a municipality with (1921) 21,584 inhabitants in Oudh, 52 miles NW. of Lucknow. The place has a cantonment, and is the headquarters of a district in the Lucknow division of Oudh.

Sitka, the former capital of Alaska, is on the west coast of Baranof Island, a deep harbour dotted with islands in front, and snow-clad mountains rising behind. Its principal buildings are the Greek church and the old Russian palace. Pop. 1200.

Sitten. See SION.

Sittingbourne, a brick-making market-town of Kent, on Milton Creek, 11 miles ESE. of Chatham and 45 of London. In olden days it was a great halting-place for Canterbury pilgrims and for kings and others on their way to the Continent. Pop. (1921) 9340.

Sitting-Bull (1837–90). See SIOUX.

Sitwell, a family of genius, the daughter and sons of Sir George Sitwell, who, born in London in 1860, was educated at Eton and Christ Church, Cambridge, sat in parliament for Scarborough (1885–6, 1892–5), and is best known as the biographer of William Sacheverell (*The First Whig*, 1894). EDITH SITWELL, born at Scarborough, was educated privately. She edited *Wheels* (1916–21), an annual anthology of new modes of verse. Her own volumes are *The Mother and Other Poems* (1915), *Clowns' Houses* (1918), *The Wooden Pegasus* (1920), *Children's Tales* (1920), *Bucolic Comedies* (1923), *Sleeping Beauty*, *Troy Park* (1925), *Elegy on Dead Fashion* (1926). In imagination Miss Sitwell is of the kindred of Blake and Keats, but the new world she introduces her readers to is expressed in terms of a new notation, difficult by its newness—a beautiful world, seen by flashes, kaleidoscopic rather than coherent, yet apparently quite a valid world. As a verse technician her touch is certain. *Twentieth Century Harlequinade and Other Poems* (1916) is a joint work of Edith Sitwell and her brother OSBERT SITWELL, who was born in London in 1892, was educated at Eton, and in 1913–19 served in the Grenadier Guards. His own works in poetry, satire, fiction, and criticism—*Argonaut and Juggernaut*, *The Winstonburg Line* (1919), *Who Killed Cock Robin?* (1921), *Out of the Flame* (1923), *Triple Fugue* (1924), *Discussions on Travel, Art, and Life* (1925), *Before the Bombardment* (1926), show satirical and descriptive power and wit. The younger brother, SACHEVERELL SITWELL, born at Scarborough in 1900, and educated at Eton and Balliol, has interested himself in the culture and art of 18th-century Italy, and shows a faculty of seeing, fantasy, and a vivid style in *The People's Palace* (1918), *The Hundred and One Harlequins* (1922), *Southern Baroque Art* (1923), *The Thirteenth Caesar* (1924), *Ecalt the Eglantine and Other Poems* (1926), *All Summer in a Day: An Autobiographical Fantasia* (1926).

Sium. See SKIRRET.

Siut, or ASSIUT, as it is now called, the chief city of Upper Egypt, stands on the west bank of the Nile, about 200 miles by rail from Cairo. It has some fine mosques, an American mission-school and hospital, a European hotel, and well-built dwelling-houses. The inhabitants are chiefly Copts. The population is about 51,000 in number, mostly traders, and there are local manufactures of polished red and black earthenware, ostrich-feather fans, carved ivory, and scarves woven with silver. There is a certain amount of trade with Darfur and Senaar. Assiut stands on the site of the town which the ancient Egyptians called Siut, and still retains its ancient name with the addition of the Arabic definite article. The Greeks knew the city as Lycopolis, the Town of the Wolf, from the animal which was worshipped there. Very little remains of the Greco-Egyptian town; but in the cliffs, at the foot of which the town stands, there are many rock-hewn tombs of nobles of the XIth

and XIIth dynasties; among others is the tomb of Hepzefa, with the famous inscriptions of the endowments to the priests of the temple of Siut for services to be performed for his benefit after his death. From the top of the cliffs there is a fine view over the valley of the Nile.

Śiva (a Sanskrit word, literally meaning 'happy,' 'auspicious') is the name of the third god of the Hindu Trimūrti (q.v.) or triad, in which he represents the characters both of Destroyer and Reproducer. The name Śiva, as that of a deity, is unknown in the Vedic hymns, but established as such in the epic poems, Purāṇas and Tantras. The *Saivas*, or worshippers of Śiva, assign to him the first place in the Trimūrti; and to them he is not only the chief deity, but the deity which comprises in itself all other deities. Thus, in the *Śiva-Purāṇa*, he is addressed as Brahmā, Viṣṇu, Indra, Varuṇa, as the sun and the moon, as earth, fire, water, wind, &c.; but even in the Purāṇas relating to Viṣṇu his power is exalted in praise, and he is addressed with the utmost awe. Śiva is doubtless a combination of an Aryan god, Rudra the lord of the storm which brings death as well as healing, and a non-Aryan deity of pastoral life—his phallic attributes being doubtless derived from the pre-Aryan indigenous belief. The symbol of Śiva is the Linga (q.v.), emblematic of creation, which follows destruction. From each of his numerous attributes or characteristics he derives a name or epithet. He has five heads (hence his name *Pañcānana*, 'the five-faced'); three eyes (hence his name, *Trīnetra*, &c., 'the three-eyed'), one of which is on his forehead, and indicates his power of contemplation; and in the middle of his forehead he wears a crescent. His hair is clotted together, and brought over the head so as to project like a horn from the forehead. On his head he carries the Ganges, whose course he intercepted by his hair, when this river descended from heaven, so as to enable the earth to bear its fall. Round his neck he carries a garland of human skulls. In his hands he holds the trident, a club or pole, armed at the upper end with transverse pieces, representing the breastbone and ribs adjoining, and surmounted by a skull and one or two human heads. Among his weapons are a bow, a thunderbolt, and an axe. As the destroyer of the world, he is also called Kāla ('Time' or 'Death'), and represented as of black colour. One of his representations is also half-male and half-female, emblematic of the indissoluble unity of the creative principle. He is clothed in a deer-skin; or he also holds a deer in one of his hands; or he sits on a tiger-skin, or is clothed in it. When he rides, the bull Nandi is his beast of burden, whom he also carries as an emblem in his banner. He resides on the wonderful mount Kailāsa, the northern peak of the Himālaya, where he also rules over the north-east quarter. His principal wife is variously called Devī, Durgā, Umā, and Kālī, and is the great goddess of modern worship; she delights in human sacrifice (see THUGS), and her character is clearly derived from the pre-Aryan worship of a great goddess of the life of nature and fertility; she is practically unknown to the Vedic literature. One of his chief attendants is Taṇḍu, who is one of the original teachers of the arts of dancing and mimicry, whence Śiva is the patron of dancers. Besides Taṇḍu, a host of other attendants and companions, together with demons and other beings, surrounding him, are named by the Purāṇas. Amongst the principal achievements of this god is his conflict with the god Brahmā, who was originally possessed of five heads, but lost one through exciting the anger of Śiva by disrespectfully addressing him. Śiva is especially worshipped under the symbol of the Linga; but there are

periods at which homage is paid to him also under other forms, corresponding with the description given above. Śiva and Viṣṇu are nowadays in their male and female forms practically the gods of the Hindu population. Like Viṣṇu, Śiva has a thousand names by which he is addressed; some derived from his exterior attributes have been mentioned before; among the others the principal are Īśa or Īśvara, 'lord'; Maheśa or Maheśvara, 'the great lord'; Śankara, 'the conferrer of happiness'; Rudra, 'the terrible,' or Mahārudra, 'the very terrible'; and Mahādeva, 'the great god.' See INDIA, Vol. VI. p. 106.

Sivaji (1627–80), the founder of the Mahratta power in India. See MAHRATTAS.

Sivas, a city of Anatolia, is situated on the Kizil Irmak (anc. *Halys*), 170 miles SW. of Trebizond, and is a dirty, decayed place. Pop. 35,000. It is built on the site of the ancient *Sebasteia*, from which it derives its name.

Siwa. See AMMON, OASES.

Siwalik Hills. See HIMALAYA, Vol. V. p. 715.

Siwash, or PUTRID SEA. See CRIMEA.

Six Acts, six repressive measures passed in England in 1819 to prevent seditious assemblies and unauthorised military training, punish seditious libels, increase the power of the magistrates, and further restrict the liberty of the press. They were very unpopular, and are known as the 'Gagging Acts.'

Six Articles, STATUTE OF, an enactment of Henry VIII. (1539), commonly called the Bloody Statute, to compel the uniform profession of the following six doctrines: (1) The Real Presence of Christ in the Eucharist, and Transubstantiation; (2) the sufficiency of communion in one kind only; (3) the unlawfulness of the marriage of priests; (4) the obligation of vows of chastity; (5) the propriety of retaining private masses; (6) the expediency and necessity of auricular confession. In spite of the threatened penalties, only twenty-eight persons suffered death under the statute throughout the whole reign. See HENRY VIII.

Six Nations. See IROQUOIS.

Sixtus, the name of five popes, of whom two call for particular notice, Sixtus IV. and Sixtus V. The former (originally named Francesco della Rovere), born July 22, 1414, was the son of a fisherman in Celle, a small village near Savona. He was a pupil and friend of the celebrated Cardinal Bessarion, and, having entered the Franciscan order, gained the highest reputation throughout Italy as a preacher. On the death of Paul II. in 1471, Rovere, who had risen to be general of his order, was elected to the Roman see. His inordinate partiality for his relatives exhausted the papal treasury, and led to many questionable exactions, and to gross abuses in the dispensation of church patronage. But the worst imputation upon his memory is his connivance in the Pazzi conspiracy against the Medici (q.v.) at Florence. In many respects, however, his administration was liberal and public spirited. He did much to foster learning and to encourage art, and contributed notably to the improvement and decoration of the city. He built the Sistine chapel and the Sistine bridge across the Tiber, took a zealous interest in augmenting the Vatican library, and was a munificent patron of the great painters of the day. In 1482 he entered into an alliance with the Venetians against the Duke of Ferrara, which led to a general Italian war, and ended in a dissolution of the Venetian alliance, an event so mortifying to the pope that his death is said to have been caused by chagrin, August 13, 1484. His successor was Innocent VIII.—SIXTUS V., one of the most able

and vigorous occupants of the Roman see, originally named Felice Peretti, was born (December 13, 1521) near Montalto, of poor parents. He early entered the Franciscan order, was ordained at Siena in 1547, won a great name as an eloquent preacher, and gradually rose, through the offices of inquisitor-general in Venice and vicar-general of the Franciscan order, to be cardinal (Cardinal Montalto) in 1570. Shortly after the accession of Gregory XIII. (1572) he began to lead a retired and studious life, but after this period of forced inactivity, was elected successor to Gregory in 1585. The rule of Sixtus was most active and energetic, and was marked by vigorous measures of improvement in every department of administration, ecclesiastical as well as civil. His first care was to repress the prevailing license and disorder of the city of Rome, and of the papal states generally, by breaking up the bands of outlaws by which both were infested. He reformed the administration of the law and the disposal of public patronage; and he entered upon numerous projects for the moral and material improvement of Rome. He erected the library buildings of the Vatican, built the Lateran Palace, finished the Quirinal, besides restoring and rebuilding many churches. He found an empty pontifical treasury; yet by judicious retrenchment and heavy taxation he secured within the first years of his short pontificate a surplus of some 5 millions of crowns. To the Jews (q.v.) he extended full liberty to trade and celebrate their own worship throughout his dominions. The great aim of his foreign policy was to advance the cause of the Roman Catholic Church in every quarter of Christendom, against the Huguenots in France, against the Lutherans in Germany, and against Queen Elizabeth in England. At the same time he entertained a deep jealousy and apprehension of the designs of Spain. Amongst other reforms in church matters he fixed the number of the College of Cardinals at seventy, and reorganised the separate congregations of cardinals. Under his authority were published a new edition of the Septuagint and an edition of the Vulgate, the latter famous from the multiplicity of its errors, subsequently corrected in the edition of Clement VIII. Sixtus died on 27th August 1590, and was followed in the papal chair by Urban VII.

Many of the popular stories regarding him are derived from Gregorio Leti's *Vita di Sisto V.* (2 vols. Lausanne, 1669), a work of no authority. See the general works of Ranke and Gregorovius; also Tempesti, *Storia della Vita e Gesti di Sisto V.* (2 vols. Rome, 1754); Lorentz, *Sixtus V. und seine Zeit* (Mainz, 1852); and Baron Hübner, *Sixte V.* (Paris, 1870; Eng. trans. 1872).

Sizar, the name of an order of students at Cambridge and Dublin universities, so called from the allowance of victuals (*size*) made to them from the college buttery. Duties of a somewhat menial kind, such as waiting upon the fellows at table, were originally required of the sizars, but these have long since gone into disuse. At Oxford there was formerly a somewhat similar order of students denominated Servitors.

Size. See GLUE, and GELATINE.

Skagen, CAPE, or THE SKAW, the most northerly point of Jutland, with a lighthouse 148 feet high, and the small port of Skagen.

Skager-Rak, an arm of the North Sea lying between Denmark and Norway, and connecting with the Kattegat, is 140 miles by 70. The depth is much greater on the Norwegian coast (200 fathoms), where the current runs west, than on the Danish (30 to 40 fathoms; easterly current).

Skagway, a port in the part of southern Alaska which was claimed by Canada but in 1901

awarded by the Commission to the United States, at the mouth of the Skagway River and the head of the Lynn Canal. It was settled in 1897 during the Klondike gold-rush, but afterwards declined in importance. Pop. 800.

Skald signifies in old Norse a poet. The name was given specially to that class of poets who exercised their art as a vocation requiring a learned education—i.e. a knowledge of the construction of verse, and of the enigmatical imagery, roughly shaped out of obscure tradition, to which Scandinavian poets were prone. The principal aim of the Skaldic poetry was to celebrate the deeds of living warriors or of their ancestors. Very few complete Skaldic poems are extant; but there are a great number of fragments preserved, partly in the younger Edda (q.v.), partly in the Sagas and the Heimskringla. See SNORRI STURLASON.

Skat, a game played with thirty-two cards as in Piquet (q.v.), and said to have been invented in 1817 in Altenburg, whence it rapidly spread into other parts of Germany and beyond the borders of the fatherland. Each of three players receives ten cards, the two others being laid aside (hence the name—from old French *escart*, 'laying aside'). The values of the cards and the rules of the game are expounded in numerous works.

Skate, the popular name of several species of Ray (q.v.). The Common Skate (*Raia batis*), known in Scotland as the *Gray Skate* and in the south of England as the *Tinker*, is plentiful on most parts of the British coasts. The Burton Skate (*R. marginata*) is another of the British species. On American coasts numerous species occur—e.g. on the east, the 'Tobacco-box' Skate (*R. erinacea*), the Briar-skate (*R. eglanteria*), the Smooth or Barn-door Skate (*R. levis*); on the west, *R. inornata*, and the large *R. binoculata*, which attains a length of 6 feet. But a revision of the species of skate is necessary. Skates are voracious fishes, feeding along the bottom. Their egg-cases or mermada's purses are often thrown up on the beach. They are often caught on the



Common Skate (*Raia batis*).

lines, but great numbers are now brought to market by the trawlers. The greatly expanded pectoral fins are eaten, but the flesh tends to be coarse.

Skating. Progression on ice is accomplished by means of instruments composed of steel blades which are fastened to the soles of the boot, and which are called skates. In early times the shin bones of animals were bound to the feet, and skaters glided over the frozen surface on these by propelling themselves with the aid of a spiked stick. At a later period the iron or steel blades were introduced, the cutting edge of which enabled the wearer to disperse with the stick, and to push off with one foot and glide on the other with alternate strokes. In England the Fen country, owing to the relative frequency of ice in that district, became the great home of skating. Now skating, both speed and figure, is an organised sport in Britain as throughout Europe and in North America. In Britain the ruling body of the sport is the National Skating

Association founded at Cambridge in 1879 and transferred to London in 1894. Internationally the International Skating Union, founded in 1892, is the governing body of international amateur skating.

Skates are now of three kinds—viz. those made for speed-skating, those for figure-skating, and those for games played on skates. A skate for general use may be had, and is satisfactory, though in any particular branch the specialised skate necessarily remains the best. Skates were formerly constructed by inserting the steel blade into a wooden bed, which was approximately shaped to the foot and bound to it by means of leather straps. Modern skates are made entirely of metal, and are fixed either by screws passing through plates (to which the blade is attached) into the sole of the boot, or they are fixed to the boot by various mechanical devices which enable the skate to be quickly and firmly attached, and as quickly removed.

The blades of skates for speed-skating are made very thin, about $\frac{1}{16}$ th of an inch, somewhat longer than the foot, and very slightly convex along the whole length of that part of the blade which comes in contact with the ice. The blades are now most often set in tubes, while the foot rests also on tubular supports, lightness, speed, and strength being thus at one and the same time secured. Races on skates are brought off on tracks having, over the longer distances, one or more turns. Some fastest times (all on straight courses) are: 500 metres (547 yd.)—43 $\frac{1}{2}$ sec., by O. Mathiesen (Norway), at Davos, 17th January 1914; 1000 metres (1093 yd.)—1 min. 31 $\frac{1}{2}$ sec., by O. Mathiesen, at Davos, 31st January 1909; 1 mile (with the wind)—2 min. 27 $\frac{1}{2}$ sec., by F. W. Dix (England), at Cowbit, Lincolnshire, 6th February 1912; 1 mile (without the wind)—2 min. 36 sec., by J. Nilsson (United States), in the United States, 1895.

Skates for figure-skating are generally solid in their several parts, the tubular pattern not here being in vogue. Their blades, as distinct from the blades of speed-skates, are broader and deeper, rounded at both toe and heel, and (to facilitate the making of turns and curves) with a curvature along the whole length equal to that of a circle having a radius of from five to seven feet. The Edinburgh Skating Club (1642) is the oldest club for encouraging figure-skating in Britain, but the figures skated were of an elementary character until after the formation of the Skating Club, London (1830), whose 'Skating Club Figures' induced a mode of skating peculiar to Great Britain. The mode is known as the 'English style' and consists of large and bold curves and turns, executed with power and quietness, while the body of the skater is held upright, and the knee of the travelling leg kept quite straight. In distinction from it is the 'international style,' a style, except in Britain, followed everywhere. Its basal feature is an absence of repression, a complete freedom in the use of the limbs being permitted, and in consequence of this it is possible to execute, beyond the ordinary figures, certain difficult figures (some displaying astonishing acrobatic dexterity) such as could not be carried through in the restricted English style. Which style produces the more graceful skating continues matter of debate. Of the many movements (over three hundred) in figure-skating some eight might be said to be fundamental. They are straight-ahead skating, straight-backward skating, the turn to right, the turn to left, skating on the outside edge forward, skating on the inside edge forward, skating on the outside edge backward, skating on the inside edge backward. Except the 'edges' these movements are largely self-explanatory. In the out-

side edge forward the skater, starting, say, on his right foot, describes a wide semicircle to the right, then a similar semicircle on his left foot to the left, and so on alternately. In the inside edge forward the movement is in a sense reversed; the skater, starting again on his right foot, describes a wide semicircle to the left, then a similar semicircle on his left foot to the right, and so on alternately. In the backward edges the forward edges are skated backwards. Waltzing on skates, as all dancing on ice, is really a form of figure-skating.

At St Moritz, Davos Platz, and Grindelwald there are excellent ice rinks. And in countries where there is little natural ice the building of artificial ice-rinks has done much to develop skating.

Hockey on skates is described at HOCKEY; the skates used (it being necessary to unite speed and power of rapid turning in a single skate) are really a compromise between the speed- and the figure-skate; most often they are tubular in design. In sailing on skates a sail arrangement is attached to the body, which forms, so to speak, a mast; speeds of thirty, sometimes forty, miles an hour can be attained.

Wheeled skates were in use on roads in Holland as far back as 1770; but it was only after the introduction of the circular running roller-skate, invented in 1865 by Mr Plimpton of New York, that speed- and figure-skating became common on roller-skates. As to the use of roller-skating as an introduction to ice-skating opinion is divided.

There is a *Bibliography of Skating* (1898) by F. W. Foster. See N. and A. Goodman, *Handbook of Fen Skating* (1882); D. Adams, *Skating* (1889); Heathcote, Tebbutt, and Witham, *Skating* (1892); Monier-Williams, *Figure-skating* (1892); Tebbutt, Read, and Tebbutt, *Skating* (1897, revised as *Skating and Bandy* by Benson, 1921); Benson, *English Figure Skating* (1908); Syers, *Art of Skating* (1912); Cobb, *Figure-skating in the English Style* (1913); Yglesias, *Figure-skating* (1913); Meagher, *Guide to Artistic Skating* (1919); Crawley, *Skating* (1920); Meyer, *Skating* (1922); and a good German book, *Spüren auf dem Eise*, by D. Diamantidi and others (A. Hölder, Vienna). On roller-skating there are works by 'Rinker' (1909), Monahan (1909), Burchell (1909), J. F. Davidson (1910), Hewett (1910), J. Williams (1910).

Skean-dhu. See DIRK.

Skeat, WALTER WILLIAM (1835–1912), a learned Early English scholar, was born in London, and educated at King's College School and Christ's College, Cambridge, graduating as fourteenth wrangler in 1858. He became Fellow of his college in 1860, and four years later Mathematical Lecturer there; filled for some time curacies at East Dereham and Godalming; in 1878 was elected the first Elrington and Bosworth professor of Anglo-Saxon at Cambridge, and re-elected to a Christ's College fellowship in 1883. He was the first director of the Dialect Society (established 1873), and by his exhaustive labours on Langland and Chaucer, and innumerable editions of Early English works, he contributed more than any scholar of his time to a sound knowledge of Middle English and English philology generally.

Skegness, a little watering-place of Lincolnshire, 22 miles NE. of Boston. Pop. (1921) 9251.

Skeleton, a general term for the more or less hard parts of animals, whether forming an internal supporting framework—an endoskeleton—or an external exoskeleton, often useful as armour. The term includes so many different kinds of structure and material that it is necessary to take a survey of representative types.

Skeleton of Invertebrates.—Many of the Protozoa have shells of lime (see FORAMINIFERA), or of flint (see RADIOLARIA), or of some organic substance, such as acanthin. These are formed by the living

matter of the units, in the case of the lime and flint shells from materials absorbed from the surrounding water, but in what precise way we do not know. Almost all Sponges (q.v.) are supported by loose or firmly fused spicules of lime or of flint, or have, as in the bath-sponge, an interwoven supporting skeleton of 'horny' fibres. The spicules or fibres are formed by cells in the middle stratum of the sponge. Among Coelenterates various forms of skeleton, both external and internal, both limy and 'horny,' are represented by the different kinds of Coral (q.v.). With few exceptions these skeletons are produced by cells belonging to the outer layer or ectoderm of the animal. Worms have little that can be called a skeleton, for the tubes, calcareous or otherwise, in which many sedentary worms are sheltered, have no vital connection with the animals which make them. Echinoderms tend to be very calcareous; lime is deposited in the mesodermic tissue of the body in almost any part, though predominantly near the surface. Most Arthropods have well-developed exoskeletons, cuticles formed from the epidermis, consisting in great part of an organic basis of chitin, on which, in Crustaceans and most Myriopods, carbonate of lime is also deposited. As this cuticle is not always restricted to the outside of the animal, but sometimes extends inwards, an apparent endoskeleton arises—e.g. in the lobster, the king-crab, and the scorpion. Most Molluscs have shells in which carbonate of lime occurs along with an organic basis conchiolin, and in cuttle-fish there is a remarkable development of cartilage around the nerve-centres in the head—an analogue of the skull in Vertebrate animals. From this rapid survey it will be seen that the skeletons of Invertebrates are very varied both in structure and in composition; if we except a few doubtful hints of a supporting axis, there are no homologies between the skeletons of Invertebrates and Vertebrates; to the latter, moreover, that form of tissue which we call bone is exclusively restricted.

Skeleton of Vertebrates.—Here we must distinguish first of all between the external exoskeleton and the internal endoskeleton. The scales of fishes, the scales and scutes of reptiles, the scales, claws, and even feathers of birds, the remarkable bony armature of armadillos, the scales of pangolins, the claws of carnivores, the quills of porcupines, and even the hair of ordinary mammals illustrate the variety of structures which may be included within the anatomical conception of an exoskeleton. All these structures are formed in the epidermis, or in the dermis, or in both combined. Tortoise-shell and the scales of reptiles are epidermic; the scutes of crocodiles and the plates covering armadillos are dermic; the scales of Elasmobranch and Ganoid fishes are due to both layers. But it is difficult to carry out any rigidly logical classification. Thus, the dorsal shield of a tortoise is physiologically an exoskeleton, but structurally it is in great part formed from the dorsal vertebrae and from what in other animals form the ribs. The ventral shield of a tortoise is formed from dermal bones, and the so-called abdominal ribs of crocodiles arise as ossifications in the fibrous tissue which lies underneath the skin and above the muscles. The teeth of Elasmobranch fishes are undoubtedly homologous with the dermal denticles or skin-teeth which occur over the skin, and the teeth of mammals are started by enamel germs which sink in from the epidermis of the mouth.

The Vertebral Column.—In a primitive Vertebrate animal like the lancelet the body is supported by a median dorsal axis, and, apart from slight supports for the mouth, the pharynx, and the median fin, this is all the skeleton. The median dorsal axis, which in the lancelet has not even the

firmness of cartilage, is called the notochord, and is one of the constant characteristics of the skeleton of Vertebrates. There is a hint of it in the proboscis of *Balanoglossus* (q.v.) and in *Cephalodiscus* (q.v.); it is more distinct in the tail of young Ascidians (q.v.), and persists throughout life in Appendicularia; in the lancelet, in the hag, and in the young lamprey it is an unsegmented rod with a

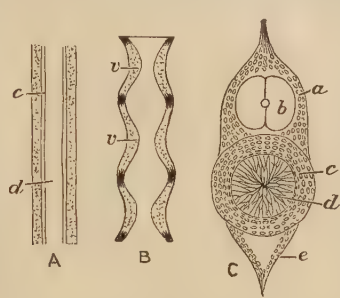


Fig. 1.

A, unsegmented notochord (d), its sheath (c). B, notochord in process of being constricted by its sheath, the parts marked (v) corresponding to the centres of two adjacent vertebrae. C, section of a young vertebral column: d, the notochord; c, its sheath; b, the spinal cord protected by neural arches (a); beneath are inferior processes (e).

yet no vertebral bodies. These begin in the Elasmobranch fishes, in which the notochord is, in part at least, constricted by the encroachment of its sheath, and divided into vertebrae. In the bony Ganoids, such as *Lepidosteus*, the vertebrae are ossified, and so they are more or less thoroughly in all the higher Vertebrates. Yet it is not the notochord which is ossified, but its sheath; the notochord in all higher Vertebrates being merely a provisional structure, an internal scaffolding around which its 'substitute,' the backbone, is built. Each vertebra generally consists of the substantial body or centrum, the neural arches which form a tube for the spinal cord and meet above it in a neural spine, the transverse processes which project laterally and are usually connected with ribs, and the articular processes which bind vertebra to vertebra so that a firm and yet flexible backbone results.

A breastbone or sternum to which the ribs are ventrally united occurs in many Reptiles and in all Birds and Mammals. It arises from a cartilaginous tract uniting the ventral ends of the ribs. In Amphibians also there is a breastbone, but there are no distinct ribs, and it is not certain that we can compare this sternum with that of higher Vertebrates.

The Skull.—In a young Vertebrate animal the cavity in which the brain lies is surrounded by a membranous sheath, but this is gradually replaced, first by a gristly brain-box, and afterwards in most cases by an almost entirely bony skull. Let us first consider the gristly brain-box or chondro-cranium. (a) Its foundation is formed from two pairs of cartilaginous plates—posterior parachordals and anterior trabeculae—which lie beside and in front of the notochord. These are extended upwards by a further formation of cartilage; the end of the notochord may also help a little: the result is a cartilaginous brain-box. (b) But to the sides of this are added a pair of cartilaginous nasal capsules in front, and a similar pair of auditory capsules behind. (c) About the mouth there are some lip or labial cartilages, which may help in forming the skull; but much more important is a series of cartilaginous 'branchial arches' (never more than

simple sheath; in the adult lamprey there are above the notochord rudimentary arches of cartilage forming a trough in which the spinal cord lies; in cartilaginous Ganoid fishes, such as the sturgeon, in the *Chimæra* type, and in the Dipnoi cartilaginous arches appear both above and below the notochord, but there are as

eight pairs), which loop round the pharynx, running between the primitive gill-clefts. Of these arches the two most anterior, which are called the mandibular and the hyoid arches, are of great importance in the development of the skull; the others form supports for the pharynx, and are permanently important only in Fishes and in gilled Amphibians. In Elasmobranch fishes the mandibular and hyoid arches do not form any direct part of the gristly brain-box, but in the Teleosteans and thence onwards they, or the bones which replace them, contribute directly to the upbuilding of the skull. To follow the history of the arches, which undergo numerous transformations, is one of the most difficult and interesting tasks of comparative anatomy. (d)

When a bone develops in direct relation to a pre-existent cartilage which it replaces, it is often called a primary or 'cartilage bone'; and there are many regions of the cartilaginous brain-box which in the course of development are thus replaced by bones. But there are other bones which develop independently of pre-existent cartilage. They invest the cartilaginous brain-box on its roof, on its floor, and on its sides. They are comparable to the dermal ossifications or scutes which occur in Ganoid fishes and many other animals, and they are often called secondary or 'membrane' bones. In structure they are of course indistinguishable from 'cartilage bones'; in origin too they are in one way the same, for all bones arise from a (periosteal) membrane of bone-making cells; but 'cartilage bones' are at one time represented by cartilages, whereas 'membrane bones' never are.

To sum up, the skull is formed (a) from the parachordals and trabeculae at the end of the notochord, (b) from the adjacent sense-capsules of the nose

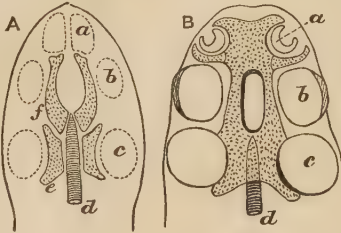


Fig. 2.

A, cartilaginous rudiments of the skull: parachordals (e), trabeculae (f), anterior end of notochord (d), auditory capsule (c), eye-rudiment (b), nasal capsule (a). B, a slightly more advanced state; the nasal and auditory capsules have fused with the brain-box; the eyes (b) have no skeletal capsules.

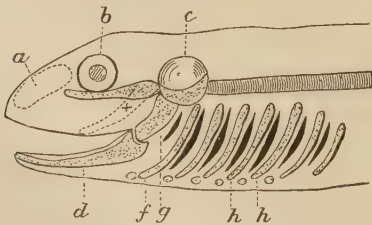


Fig. 3.—Diagram showing the branchial arches of the Embryo:

d and g, parts of first or mandibular arch; f, part of second or hyoid arch; behind these the arches (h) separating gill-clefts; a, c, the nasal and auditory capsules; (b) the eye.

and the ear, (c) from the more or less intimately associated mandibular and hyoid arches, (d) from the ossification of the gristly brain-box due to (a), (b), and (c), but also from 'membrane bones' or investing bones which arise independently of pre-existent cartilages. There is no skull in Tunicates or in the lancelet; it is cartilaginous in Cyclostomata and Elasmobranchs; centres of

ossification and investing bones begin with the Ganoid fishes, and are numerous in Teleosteans and in all higher animals. In the development of the individual there is a parallel progress.

Theory of the Skull.—About the beginning of the 19th century Oken and Goethe independently suggested what is known as the vertebral theory of the skull—that the skull is comparable to a number of vertebrae. To this Owen lent his authority, but it has been disproved by the subsequent discoveries of comparative anatomy and embryology (see SKULL).

The Appendicular Skeleton.—Somewhat apart from the axial skeleton are the limbs and the girdles to which these are attached. No secure conclusion has yet been reached as to origin of the limbs of Vertebrates. In the simplest forms—the Tunicates, the lancelet, the Cyclostomata—there are none, and there is a very marked difference between the fin-like limbs of fishes and the fingered and toed limbs which occur in almost all higher backboned animals. According to Gegenbaur, the pectoral and pelvic girdles are structures comparable to the branchial arches, and he supposed that the primitive limbs were made up of modified fin-rays comparable to those which support the unpaired fins of fishes. According to Dohrn the limbs are residues of a longitudinal series of segmentally arranged outgrowths, perhaps comparable to the appendages of a typical Annelid worm (see FISHES, VERTEBRATA). According to others, the limbs are concentrations of two lateral fin-folds.

The pectoral or shoulder-girdle consists of a dorsal shoulder-blade or scapula, a ventral coracoid, with the articulation for the arm between them, and of a forward-growing collar-bone or clavicle. The pelvic or hip-girdle consists on each side of a dorsal ilium, a ventral ischium, with the articulation of the leg between them, and of a third pubic portion. The fore-limb—from Amphibians onwards—consists of a humerus articulating with the girdle, a lower arm composed of radius and ulna lying side by side, a wrist or carpus of several elements, a hand with metacarpal bones in the palm and with fingers composed of several joints or phalanges. The hind-limb—from Amphibians onwards—consists of a femur articulating with the girdle, a lower leg composed of tibia and fibula lying side by

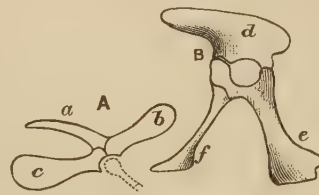


Fig. 4.

A, diagram of half of an ideal pectoral girdle: a, clavicle; b, scapula; c, coracoid. B, diagram of half of the pelvic girdle of an alligator: d, ilium; e, ischium; f, pubis.

side, an ankle region or tarsus of several elements, a foot with metatarsal bones in the sole and with toes composed of several joints or phalanges. Distinct from all the other bones are a few little 'sesamoids' which are occasionally developed within tendons and near joints, notably, for instance, the knee-pan or patella.

The Skeleton of Man.—As the bones of all the chief parts of the human body are described in separate articles, we need not do more than unify these by reference to a diagram of the entire skeleton (fig. 5). Altogether there are more than 200 bones, but some which are originally distinct become fused with their neighbours.

In the vertebral column there are originally thirty-three vertebrae, but in adult life the normal number is twenty-six, for, while the first twenty-four remain distinct, five (the twenty-fifth to the twenty-ninth

inclusive) unite to form the sacrum supporting the hip-girdle, and the four hindmost fuse more or less completely in a terminal tail-piece or coccyx. Seven cervicals support the neck; twelve dorsals form the

small beak-like bone—the coracoid—which is separate in Birds and Reptiles, but reduced to a mere process of the scapula in all Mammals except the Monotremes. Stretching from the breastbone to shoulder-blade is the curved collar-bone or clavicle.

The skeleton of the leg also includes thirty bones—in the thigh the femur, which articulates with the hip-girdle; in the lower leg the shin-bone or tibia and the splint-bone or fibula, which articulate with the femur at the knee-joint, where there lies a little 'sesamoid' bone—the patella; in the ankle region seven bones, then five metatarsal bones forming the sole of the foot, and five toes with the same number of phalanges as in the fingers. The pelvic girdle consists in early life of three paired bones—large dorsal ilium, a posterior ischium, an anterior pubis on each side—but these unite about the twenty-fifth year into single haunch-bone, with the socket of which the thigh articulates. See ARM, HAND, SHOULDER-JOINT, FOOT, LEG, PELVIS, RIBS, SKULL, and SPINAL COLUMN; for literature, see the works referred to in the article ANATOMY. Skeletons other than human will be seen under the headings of ANTHROPOID APES, BAT, BIRD, ELK, FISHES, HESPERORNIS, ICHTHYOSAURUS, IGUANODON, MEGATHERIUM, PLESIOSAURUS, &c.; and skulls at BABIROUSSA, CARNIVORA, DOG, RODENTIA, &c.

Skelligs, three rocky islands on the south-west coast of Ireland, lying 10 miles SW. of Valentia island. On one of the rocks stands a lighthouse, the light of which is 175 feet above high-water, and visible 18 miles at sea. On Great Skellig (710 feet high) are the ruins of a monastery.

Skelmersdale, a town of Lancashire, $4\frac{1}{2}$ miles from Ormskirk; pop. 6700.

Skelton, JOHN, an early satirical poet, is supposed to have been born about 1460, most probably in Norfolk, although generally said to have been sprung from a Cumberland family. He studied at Cambridge, perhaps also at Oxford, and received from each the academical honour of laureate. He was appointed tutor to the young prince Henry, and early acquired such reputation for learning that Erasmus styles him 'the one light and ornament of British letters.' He took holy orders in 1498, and became rector of Diss in Norfolk, but seems later to have been suspended for keeping a concubine; although Fuller tells us how, on his death-bed he protested 'that in his conscience he kept her in the notion of a wife, though such his cowardliness that he would rather confess adultery (then accounted but a *venial*) than own marriage, esteemed a capital crime in that age.' Wood tells us that he 'was esteemed more fit for the stage than the pew or pulpit,' and Churchyard says 'his talke was as he wraet.' Already he had produced some translations, and elegies upon Edward IV. and that Earl of Northumberland murdered by a Yorkshire mob in 1489; but now he struck into an original vein of satirical vernacular poetry, in rattling verses of six, five, and even four syllables, with quick-recurring rhymes, overflowing with grotesque words and images and unrestrained jocularity, and lightened up by bright gleams of fancy. His bent leaned strongly towards satire, and in this kind his chief productions were *The Bouge of Courte*, *Colyn Cloute*, and *Why come ye*

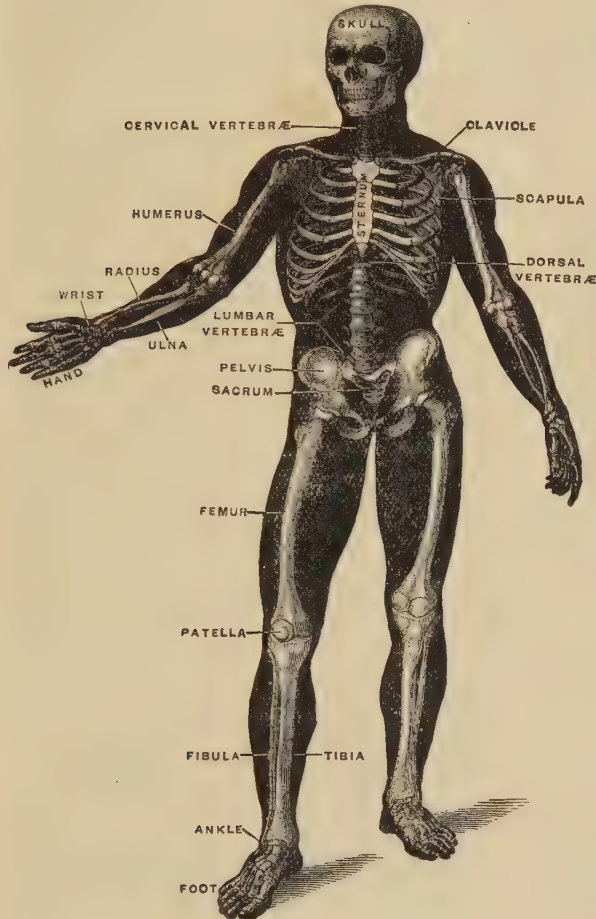


Fig. 5.—Human Skeleton.

greater part of the back and bear ribs; five lumbar occur in the loins; these are followed by the sacrum and the coccyx (see SPINAL COLUMN).

The ribs, or elastic arches of bone which bound the chest, are normally twelve on each side. Most of them articulate dorsally with the bodies of two adjacent vertebrae and with the transverse processes of the posterior one; ventrally the first seven pairs are connected with the median breastbone by means of intervening cartilages, while the posterior five pairs are more or less free (see RIBS).

The skull consists in early adult life of twenty-two separate bones, but originally there were more, and as life continues the number may be further reduced by fusion. For the various bones, see SKULL.

The skeleton of the arm includes thirty bones—in the upper arm the humerus, which articulates with the shoulder-girdle; in the forearm the radius and ulna, which articulate with the humerus at the elbow; the wrist of eight carpal bones; the five metacarpals of the palm; the five digits, of which the four fingers have each three joints or phalanges, while the thumb has two. The important bone of the pectoral girdle is the shoulder-blade or scapula. To this, at the shoulder-joint, there is fused a

nat to Courte. Of these the first is an allegorical poem showing striking power of characterisation; the second, a vigorous and unsparing attack on the corruptions of the church, of which he himself says, 'though my ryme be ragged, tattered and jagged, rudely rain-beaten, rust and moth-eaten, if ye take well therewith, it hath in it some pyth;' the last is a sustained invective against Cardinal Wolsey. He attacks with the most plain-spoken boldness his arrogance, avarice, and incontinence, and does not spare even his 'gresy genealogy' and the 'bocher's stall.' Wolsey felt the sting, and tried to arrest his libeller, but Skelton fled to the sanctuary in Westminster, where Abbot Islip sheltered him till his death, June 21, 1529. Of his other poems the chief are *Phyllipp Sparowe*, a young girl's lament for a pet bird killed in a convent of black nuns at Carowe near Norwich, an amusing but rather profane *jeu d'esprit*, which Coleridge called 'an exquisite and original poem;' *The Tunnyng of Elynour Rummyng*, a vigorous burlesque picture of low life, its heroine an ale-wife at Leatherhead in Surrey; the *Garlande of Laurell*, a long but less successful poem; and *Magnyfycence*, the only one of his Interludes that has survived. Skelton's reputation for wit, if not ribaldry, was so great that a wretched book of 'merye tales' was popularly linked with his name: as undeserved is Pope's phrase—'beastly Skelton'—written on occasion of a reprint in 1736 of the first collected edition (1568). The only good edition is that by the Rev. A. Dyce (2 vols. 1843). A selection edited by Richard Hughes (1924) is based on Dyce.

Skene, WILLIAM FORBES, an erudite Scottish historian, was born at Inverie on Loch Ness, June 7, 1809, the second son of Scott's friend, James Skene (1775–1864). He had his education at Edinburgh High School, in Germany, and at the universities of St Andrews and Edinburgh, afterwards, in 1834, becoming a Writer to the Signet in Edinburgh. In 1879 he received the D.C.L. degree from Oxford, and in 1881 he succeeded Hill Burton as Historiographer for Scotland. He died on the 29th August 1892. Among his most important works are *The Highlanders of Scotland* (2 vols. 1837), *The Dean of Lismore's Book: a Selection of Ancient Gaelic Poetry* (1861); *Chronicles of the Picts and Scots* (1867); Fordun's *Cronica Gentis Scotorum* (2 vols. 1871); *The Four Ancient Books of Wales* (2 vols. 1868); *Celtic Scotland, a History of Ancient Alban* (3 vols. 1876–80); and *Memorials of the Family of Skene of Skene* (New Spalding Club, 1887).

Skepticism. See SCEPTICISM.

Skerries, a name applied to several groups of isolated rocky islets round the coasts of Great Britain, more especially a group about 2 miles off the north-west coast of Anglesey, having a lighthouse 117 feet high. See also PENTLAND FIRTH.

Skerries, an Irish seaport, 18 miles N. by E. of Dublin. Pop. 1800.

Skerryvore, the chief rock of a reef which lies 10 miles SW. of Tyree and 24 W. of Iona. This reef, which stretches 8 miles west-south-westward, is composed of compact gneiss, worn smooth by the constant action of the waves, and was long a terror to mariners, having caused the loss of one ship annually for forty years previous to 1844. The Northern Lighthouse Commission had long intended the erection of a lighthouse on Skerryvore, the only point of this dangerous reef which could afford the needful foundation; but the difficulty of landing on the rock, from the immense force (3 tons to the superficial foot) with which the Atlantic waves beat upon it, caused the delay of the scheme till 1838. The design and superintend-

ence of the building were entrusted to Alan Stevenson, who followed generally the mode adopted by his father, Robert Stevenson, in the construction of the Bell Rock Lighthouse, and completed his work in 1844. The lighthouse is 138½ feet high; at the base 42, and at the top 16 feet in diameter. The revolving light can be seen 18½ nautical miles away. The cost was £86,977. See the book by A. Stevenson (1848).

Ski. See SNOW-SHOES.

Skibbereen, a market-town of the county of Cork, Ireland, 54 miles SW. of Cork, at the terminus of a branch-line, with a little trade in agricultural produce. It suffered terribly during the famine of 1846–47. Pop. 3000.

Skiddaw, a mountain (3054 ft.) of Cumberland, flanking the east side of Bassenthwaite Water, and 5½ miles NNW. of Derwentwater and Keswick.

Skimmer, or SCISSORS-BILL (*Rhynchops*), a genus of long-winged sea-birds belonging to the Gull family (*Laridae*). Their most distinctive feature is the long, thin bill with the lower half longer than the upper. There are only three known species, occurring respectively in Asia, Africa, and America. Darwin describes the American skimmers, or, as they are also called, Shearwaters (*R. niger*), as skimming along the surface of the water, generally in small flocks, ploughing up small fish with their projecting lower mandible, and securing them with the upper half of their scissors-like bills. See GULL.

Skin. The skin forms a complete covering for the outer surface of the body, and consists of two distinct layers, of which the outer is termed the *epidermis*, *cuticle*, or *scarf-skin*, and the inner the *corium* or *cutis vera*. Moreover, the skin contains certain structures termed 'tactile corpuscles,' by means of which the properties of bodies are revealed to the sense of touch; and associated with the skin there are such accessory organs as hair, nails, sebaceous glands, and sweat-glands.

The *epidermis* is non-vascular, and forms a protective covering for the *cutis vera*. It varies in thickness from $\frac{1}{4}$ th to $\frac{1}{2}$ th of an inch, being

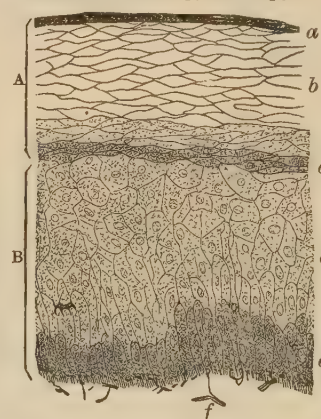


Fig. 1.—Section of Epidermis from the Human Hand, highly magnified (Ranvier):

A, horny layer, consisting of a, superficial horny scales; b, swollen out horny cells; c, stratum lucidum; B, rete mucosum, consisting of d, prickly cells; e, elongated cells near corium; f, a nerve-fibre.

thickest in the palms of the hands and soles of the feet. In structure it consists of cells, closely adherent to each other by their margins, and arranged in many irregular layers. The individual cells vary in shape, being perpendicular in the deepest layer, and passing by various transitions into a surface stratum of hardened flattened cells, which are constantly being thrown off by desquamation; fig. 1 shows the various transitions. In many of the cells, even of white races, pig-ment granules are found, and these account for the tawny colour of the skin. A section of the epidermis of a Negro's leg, showing the cells of the horny and mucous layers, will be found

ment granules are found, and the tawny colour of the skin. A section of the epidermis of a Negro's leg, showing the cells of the horny and mucous layers, will be found

at Epidermis (q.v.). If a large portion of the epidermis be removed, the process of repair is slow, and proceeds from the edges of the wound, but recovery is quicker if any of the deeper cells of the layer remain. Skin-grafting aims at transplanting small portions of healthy epidermis—including its deeper layers—to denuded surfaces, and when the grafts take root the raw surface is much more speedily covered because the healing process spreads from each graft (see RHINOPLASTIC OPERATIONS). Nails (q.v.) and Hair (q.v.) are growths of the epidermis.

The *cutis vera*, *corium*, or *true skin* is a vascular and sensitive structure, everywhere covered by the epidermis. It rests on a layer which in most places contains fat—the *panniculus adiposus*—and to this layer the corium is sometimes loosely, sometimes firmly, attached. In structure the true skin consists of an interlacing network of white fibrous tissue with a mixture of elastic fibres. On its deep aspect the meshes are more open, and contain lumps of fat. In this way the corium gradually blends with the subcutaneous layer, and so its thickness is not definite, but is generally regarded as varying from $\frac{1}{16}$ th to $\frac{1}{4}$ th of an inch. Wherever hairs occur bundles of muscular fibres are found. The outer surface of the corium is characterised by furrows, which also affect the epidermis. The largest furrows are found opposite the flexures of joints. Finer furrows may be seen on the backs of the hands; while on the skin of the palms and soles ridges with intervening furrows form patterns which are characteristic of each individual. These patterns are permanent, and do not materially change from infancy to adult life (Galton). The latter furrows are due to the fact that the outer surface of the corium is beset with small elevations termed *papillæ* (fig. 2). These are most fully



Fig 2.—Compound Papillæ of Surface of Hand:
a, base of a papilla; b, b, their separate processes. Magnified 60 diameters.

developed where touch is finest, and they fit into corresponding depressions on the under surface of the epidermis. The deeper layers of the corium are plentifully supplied with blood-vessels, which form a fine network of capillaries from which loops pass into most of the papillæ. Lymph vessels are also numerous, and as these communicate freely with the inter-cellular spaces, wounds which penetrate the cuticle may readily admit septic substances into the circulation. Fine nerves are also supplied to the corium for distribution to the 'touch corpuscles' found in certain papillæ. As a rule papillæ with touch corpuscles have no capillary loop, and thus we distinguish 'vascular' and 'tactile' papillæ. The hair-follicles also receive nerves, and fine varicose nerve-fibrils pass into the deeper layers of the epidermis. *Sebaceous glands*, found wherever hairs are present, pour their secretion into hair-follicles at a short distance from the mouth, unless the hair be small, when the gland may open on the surface of the skin, and the hair project through its duct. Being outgrowths of the hair-follicles they are accessory structures to the epidermis, although the body of the gland is lodged in the corium. They are specially abundant in the

scalp and face—some of the largest being found on the side of the nose. Their secretion consists of the fattily degenerated and disintegrated cells which line their interior (see ACNE).

Sweat-glands are found at various depths beneath the corium. Each gland is a coiled-up tube, of which the *duct* is that part leading in a corkscrew manner through the corium and epidermis to the surface. These glands are also outgrowths of the epidermis, and they are lined by epithelial cells. They are most numerous where there is no hair, but they occur everywhere in connection with the skin. Krause states that 2800 open on a square inch

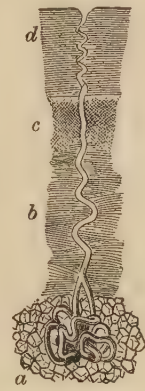


Fig. 3.—Magnified view of a Sweat-gland, with its duct (Wagner):

a, the gland surrounded by fat cells; bcd, its duct, passing through corium and epidermis.

of skin from the palm; half as many on a similar area on the back of the hand; fewer on the surface of the forehead; 1100 on breast and forearm; while from 400 to 600 are found on the square inch of the lower limbs and back of the trunk. The sweat is naturally *alkaline*, although it may be found acid owing to the presence of fatty acids derived from the decomposition of sebum. In prolonged sweating the secretion becomes neutral and again alkaline. It is colourless, of a saltish *taste*, and its odour, which is due to volatile fatty acids, varies with different parts of the body. Coloured sweat is among the phenomena of nervous affections, and instances of blue and bloody sweats are on record. In jaundice the sweat may contain bile-pigment.

Ceruminous glands are found in the auditory passage, and have such a close resemblance to sweat-glands that the former may be regarded as modifications of the latter. They yield an adhesive bitter secretion—the wax—which

protects the drum of the ear from insects, dust, &c.

The most important function of the skin, Touch (q.v.), is separately treated. Regarded as a protective covering, the skin possesses the combined advantages of toughness, resistance, flexibility, and elasticity; the connective framework being the part which mainly confers these properties, although the epidermis co-operates with it. The subcutaneous layer of fat, and the modifications of epidermis in various forms, as hairs, wool, feathers, scales, &c., serve for the preservation of warmth, and occasionally (when they occur as claws, talons, &c.) as means of offence or defence. The skin is the seat of a twofold excretion—viz. of that formed by the sudoriparous glands and that formed by the sebaceous glands. The fluid secreted by the sudoriparous glands is usually formed so gradually that the watery portions of it escape by evaporation as soon as it reaches the surface; but in certain conditions, as during strong exercise, or when the external heat is excessive, or in certain diseases, or when the evaporation is prevented by the application of a texture impermeable to air, as, for example, oiled silk, or the material known as mackintosh, or india-rubber cloth, the secretion, instead of evaporating, collects on the skin in the form of drops of fluid. When it is stated that the sweat contains urea, lactates, extractive matters, &c., and that the amount of watery vapour exhaled from the skin is, on an average, 2½ lb. daily, the importance of the sudoriparous glands as organs of excretion will be at once manifest. Moreover, there is reason to believe, from the experiments of Scharling, Gerlach,

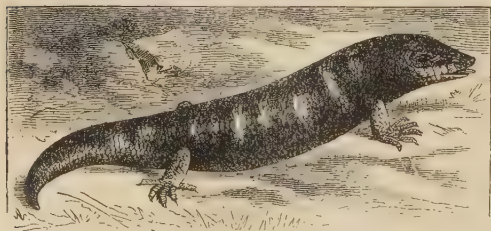
and others, that the importance of the skin as a *respiratory* organ is far from inconsiderable, very appreciable quantities of carbonic acid being exhaled hourly by the external surface of the body. In the amphibia, in which the skin is thin and moist, the cutaneous respiration is extremely active, and that the respiratory function of the skin in the higher animals is also considerable is proved not only by measuring the excreted carbonic acid, but by the fact that if the skin is covered by an impermeable varnish, or if the body is enclosed, all but the head, in a caoutchouc dress, animals soon die, as if asphyxiated, their heart and lungs being gorged with blood, and their temperature before death gradually falling many degrees.

The skin is, moreover, an organ of absorption: mercurial preparations, when rubbed into the skin, have the same action as when given internally. Thus potassio-tartrate of antimony, rubbed into the skin in the form of ointment or solution, may excite vomiting, or an eruption extending over the whole body. The effect of rubbing is probably to force the particles of the matter into the orifices of the glands, where they are more easily absorbed than they would be through the epidermis. It has been proved by the experiments of Madden, Berthold, and others, that the skin has the power of absorbing water, although to a less extent than occurs in thin-skinned animals, such as frogs and lizards. This fact has a practical application. In severe cases of dysphagia—difficult swallowing—when not even fluids can be taken into the stomach, immersion in a bath of warm water, or of milk and water, may assuage the thirst. Sailors, also, when destitute of fresh water, find their urgent thirst allayed by soaking their clothes in salt water.

The more important *diseases* of the skin are noticed in special articles. See also ALBINOS, BATHS, NERVOUS SYSTEM, TASTE, TOUCH. The colour of the skin as a race-feature is dealt with at ETHNOLOGY. Peculiarities in the skins of various animals are treated in the articles on those animals (HIPPOPOTAMUS, RHINOCEROS, &c.). For skins as articles of commerce, see FURS, LEATHER. For the stuffing of animals, see TAXIDERMY.

SKIN-CASTING is a popular term for processes which vary not a little in degree and even in nature. In most cases the outer layer of the epidermis tends to die away, and is separated off either very gradually and in small pieces at a time, or in large shreds, or in a continuous slough (see SNAKES). The moulting of feathers and the casting of hair are analogous. In the moulting or 'ecdysis' of Crustaceans and other Arthropods, what is cast is the cuticle—a product of the underlying epidermis. See CRAB, CRAYFISH, CRUSTACEA.

Skink (*Scincus*), a genus of lizards in North Africa, Arabia, Persia, and Sindh. The species burrow and run about swiftly in dry sandy places.



Skink (*Scincus officinalis*).

They live on insects, and are eaten by snakes and larger lizards. The Common Skink (*S. officinalis*) of the Sahara and Egypt is about 8 inches long. It has a wedge-shaped snout, two pairs of rather

strong limbs, small eyes, and smooth scales with bony scutes beneath. It is yellowish or brownish above (salmon-coloured in youth), with each scale spotted; the under-parts are whitish. Its skin is in great repute for imaginary medicinal virtues; indeed, skink-powder is a panacea. Other skinks or Scincidae are the African Mabuia (*M. vittata*, the 'poisson de sable,' is semi-aquatic); the genus Chalcides or Seps (some of which have vestigial limbs, in adaptation to burrowing); the common Australian *Trachysaurus rugosus*; the large *Cyclodius gigas* of New Guinea and the Moluccas, nearly 2 feet long. See LIZARDS.

Skinner, JOHN, the author of 'Tullochgorum,' was born in the parish of Birse, Aberdeenshire, 3d October 1721, the son of the schoolmaster there. He graduated at seventeen at Aberdeen, taught in the parish schools at Kenmay and Monymusk (where he left the Presbyterian for the Episcopal Church), and in 1740 went as private tutor to Shetland, where he married the daughter of the Episcopal clergyman. In 1742 he was ordained a deacon, and placed at Longside, where he ministered for sixty-four years. In 1746 his house was pillaged and his chapel burned by the Hanoverian soldiery, although Skinner was no Jacobite, and was one of the few who, so far as he could, complied with the terms of the Toleration Act—for which, however, he had to receive the absolution of his bishop, the church at large regarding compliance as sin. The Act of 1748 he and his people evaded for the most part, and in 1753 he was imprisoned for six months. At some period before 1789 he became dean of the diocese; and he died at Aberdeen, in his son's house, 16th June 1807.

Skinner is remembered only by a few songs. He published *An Ecclesiastical History of Scotland* (2 vols. 1788), and several controversial writings; and other works appeared posthumously, including those wrought out after the theory of John Hutchinson (q.v.). His *Poems* were collected in 1809 (3d ed. 1859), the best being 'The Ewie wi' the Crookit Horn' and 'Tullochgorum'—praised by Burns, in a friendly letter to Skinner (1787), as 'the best Scotch song Scotland ever saw.' See the *Life* by the Rev. Dr Walker (2d ed. 1883).

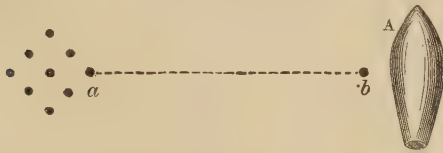
His son, JOHN SKINNER, Primus of Scotland, was born at Longside, 17th May 1744, in 1753 shared his father's imprisonment, and graduated at Aberdeen at the age of sixteen. In 1763, when only nineteen—for the same reason as in the case of Dr Chalmers, because he was 'a lad of pregnant parts'—he was ordained and placed in charge of Ellon, with a stipend of £25 a year, eked out by farming. Eleven years later he was called to Aberdeen, where by 1776 his congregation had so increased as to compel his removal to a larger house at Longacre, where the upper floor as usual was fitted up as a 'meeting-house'—the large 'upper room' in which Dr Seabury was consecrated in 1784. By this time Skinner had been made coadjutor-bishop (1782), and in 1787 he became bishop of the diocese, and in 1788 primus. The death of Prince Charles Edward, which occurred in this last year, was the solution of the church's Jacobite difficulty; and the leading part in obtaining the Relief Act of 1792 fell to the primus. Skinner proved a wise and successful administrator, and his great influence was exerted invariably for the real good of the church. He died on 13th July 1816, and was succeeded as bishop by his son. See the *Life* by Dr Walker (1887).

Skipton, a market-town in the West Riding of Yorkshire, is finely situated in the broad and fertile valley of the Aire, 26 miles NW. of Leeds. The capital of Craven, it is a gray-looking place, with manufactures of cotton and woollen goods, and is an important station on the London Midland and Scottish line. The castle, once the chief seat of

the Cliffords (q.v.), is of two periods, the reigns of Edward II. and Henry VIII., and is partly a ruin, partly inhabited. The church has some interesting monuments; and there are also a public hall (1861), a grammar-school (1548; rebuilt in 1876-77), a girls' high school, and a saline spring. Bolton Abbey (q.v.) is 6 miles distant. Pop. (1851) 4962; (1921) 12,013.

Skirret (*Sium Sisarum*), a perennial plant of the family Umbelliferae, a native of China and Japan, but long cultivated in gardens in Europe for its roots, which are tuberous and clustered, sometimes 6 inches long, and as thick as the finger. They are sweet, succulent, and nutritious, with a somewhat aromatic flavour, and when boiled are a very agreeable article of food. A kind of spirituous liquor is sometimes made from them. Good sugar can also be extracted. Skirret was at one time more cultivated in Britain than it is at present, although there seems to be no good reason for its having fallen into disrepute. Worledge called it the 'sweetest, whitest, and most pleasant of roots.' It is propagated either by seed or by very small offsets from the roots. It has a stem of 2 to 3 feet high; the lower leaves pinnate, with oblong serrated leaflets, and a heart-shaped terminal leaf, the upper ones ternate with lanceolate leaflets.

Skittles, a game usually played in a covered shed, called a skittle-alley, about 60 feet in length. The skittles are made of hard wood of the shape shown at A in the fig., and they are placed upon



the floor of the shed in the order shown at *a*. The player, standing at *b*, trundles a wooden missile, shaped like a small, flat cheese, from 7 to 14 lb. in weight, and tries to knock down the whole of the skittles in as few throws as possible. The game is very similar to the American bowls, which is played with ten pins arranged in the form of a triangle; and the missile, a round wooden ball, is rolled along a carefully constructed wooden floor. The game of skittles (*Kegel*) with round balls is zealously played in most parts of Germany, but with great local variations. Thus in Silesia there are sometimes fifteen or seventeen pins, though the usual number is nine; and in some places the round balls have holes in them for the fingers of the player—so that they are thrown rather than trundled. Sometimes the pins have different forms and values, one being called the king; and there are many ways of arranging them. The game seems to be of ancient Germanic origin, and to have come from Germany to the Netherlands, England, and France. It is described by Hugo von Trimberg, rector of a monastery at Bamberg in the second half of the 13th century (when there were only three pins). The old English game was called Kails (Sir Philip Sidney has *Keels*; in Scotland *Kyles*—all apparently derived from the German *Kegel*), and was played, not with a ball or disc, but with a short club—according to Strutt, 'with a sheep's leg-bone.' There is a learned monograph on the game by Rothe (Halle, 1879). See also BOWLS.

Skobelev, MICHAEL DMITRIEVITCH, Russian soldier, born in 1841, entered the Russian guards when twenty, fought through the war of the Polish rising (1863), and in 1866 was called to join the general staff. During the years 1871-75 he was on active duty in Asia, preparing for and then taking

part in the conquest of Khiva and conquering Khokand. In the Russo-Turkish war of 1877-78 he bore a conspicuous part: in the stormings of Plevna he commanded the left wing and entered that position at the head of his army corps; and he took prisoners the so-called Shipka army of the Turks and captured Adrianople. In 1880 he was back again in Asia; and it was he who commanded at the storming of the Turkoman stronghold Geok Tepe (24th January 1881). Skobelev was one of the recognised leaders of the aggressive and militant wing of the Pan Slavist agitators; but he died suddenly on 7th July 1882, at Moscow, before he could put his ambitious schemes into execution.

See *Personal Reminiscences of General Skobelev*, by Nemirovitch-Dantchenko (Eng. trans. 1884), and the *Life in German* by Ossipovitch (Hanover, 1887).

Skoplje (Turkish, *Üsküb*; Greek, *Skopeia*), an old capital of Serbia, recovered from Turkey in 1912, stands on the Vardar, 130 miles by rail N.W. of Salonika. It has an Orthodox archbishop and a Catholic bishop. Pop. 41,000.

Skoptsy. See RUSSIA (*Raskolniks*).

Skowhegan, a town of Maine, capital of Somerset county, on the Kennebec, 37 miles by rail NNE. of Augusta. The Kennebec falls provide power for electric plant, and there are manufactures of woollens, timber products, paper, rugs, and flour. There is some cattle-raising, while agriculture and dairy-farming are important. Pop. 6000.

Skriabin, ALEXANDER (1872-1915), Russian composer, studied under Taneieff and Safonoff at the Moscow Conservatoire, and lived variously at Moscow, Beatenberg in Switzerland, and Brussels, besides making many concert tours as pianist. His compositions (mostly for the piano, and containing nothing for the voice) can be grouped roughly into three periods—the first, up to Op. 25 (1897), includes the First Symphony, the Sonatas Nos. 1, 2, and 3, and numerous books of Preludes; the second, up to Op. 52 (1908), the Second and Third Symphonies, the Sonata No. 4, a *Fantasia*, the *Poème Satanique*, and further Preludes; the third, up to Op. 74 (1915), the Fourth and Fifth Symphonies (*Poème de l'Extase* and *Prometheus*), the Sonatas Nos. 5 to 10, a *Poem-Nocturne*, *Vers la Flamme*, &c. In his second period, Skriabin throws off the influences of Chopin and Liszt that characterise the earlier works, and his style becomes rapid and luminous, but it is not until the third period that he definitely associates music with theosophy (experimenting, too, in combinations of music with colour, light, and perfume), and finally abandons the use of key-signatures, building up whole pieces round a single chord, which is regarded as the tonic for the time being.

See the *Studies* by Eaglefield Hull (1916; rev. 1922) and Swan (1923).

Skua, or SKUA GULL. See GULL.

Skull. The skull is divided into two parts, the cranium and the face. In human anatomy it is customary to describe the former as consisting of eight and the latter of fourteen bones; the eight cranial bones, which constitute the brain-case, being the *occipital*, two *parietal*, *frontal*, two *temporal*, *sphenoid*, and *ethmoid*; while the fourteen facial bones, which surround the cavities of the mouth and nose and complete the orbits or cavities for the eyes, are the two nasal, two superior maxillary, two lachrymal, two malar, two palate, two inferior turbinated, vomer, and inferior maxillary. The bones of the ear, the teeth, and the Wormian bones are not included in this enumeration. The lower jaw articulates with the temporal bones by means of a diarthrodial joint (see JOINTS), but all the others are joined by *sutures*. On the base of the

cranium the occipital and sphenoid bones articulate by means of a plate of cartilage (synchondrosis) in young subjects; in adults this becomes bony union. Sutures are named from the bones between which they are found, but to those around the parietal bones special names are given—e.g. interparietal or *sagittal*; occipito-parietal or *lambdoid*; fronto-parietal or *coronal*; parieto-temporal or *squamous*. During adult life many of the sutures close by bony union and disappear, but both the age at which this occurs and the order of its occurrence are subject to variation. Wormian bones are irregular ossifications found in relation to the sutures of cranial bones, but seldom seen in relation to the bones of the face. They are most frequent in relation to the lambdoid suture, and seldom one inch in diameter. The closure of a suture stops the growth of the skull along that line, and in order to compensate for this defect an increase of growth may occur at right angles to the closed suture and thus irregularities of form may result: for example, closure of the sagittal suture stops transverse growth, but the skull continues to grow in the longitudinal and vertical directions, with the result that a boat-shaped cranium is produced—scaphocephaly. Irregular forms may be produced artificially by pressure applied early in life. This is best seen among certain American tribes who compress their children's heads by means of boards and bandages. The bones of the skull are pierced by holes (*foramina*), and similar holes are found in relation to the adjacent margins of bones. Most of these foramina are situated

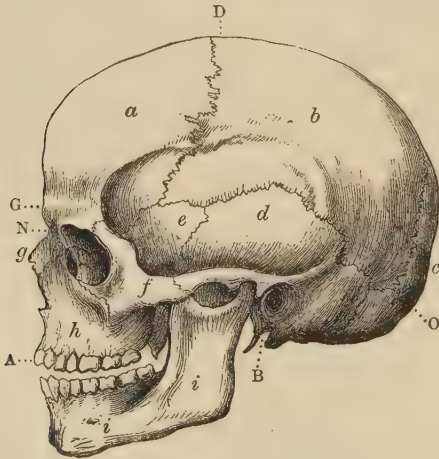


Fig. 1.—Side View of Human Skull:

a, frontal bone; *b*, parietal bone; *c*, occipital bone; *d*, temporal bone (squamous portion); *e*, sphenoid bone; *f*, malar bone; *g*, nasal bone; *h*, superior maxillary or upper jaw bone; *i*, inferior maxillary or lower jaw bone. BD, height of cranium; GO, length of cranium; BN, basinasal length; BA, basialveolar length. (These measurements are supposed to be made in a straight line from point to point.)

in the base or floor of the skull, and are for the ingress of arteries and the exit of veins, lymph vessels, and cranial nerves. The largest of these foramina—the foramen magnum—is found in the occipital bone. It is situated immediately above the ring of the atlas vertebra, and through it the continuity between the brain and spinal cord is established, and further, it transmits the vertebral arteries which enter to supply blood to the brain. Compared with the skulls of animals, the form of the human skull is modified (1) by the proportionately large size of the brain and the consequent expansion of the bones which surround it; (2) by the smaller size of the face, especially of the jaws, so that the face of man, instead of projecting in

front of, is *under* the forepart of the cranium; (3) by the *erect attitude*, which places the base of the skull at a considerable angle with the vertebral column, and, in consequence of a development backwards from its point of articulation with the vertebrae, the skull is nearly balanced on the summit of the vertebral column. Hence the orbits look forwards and the nostrils look downwards. The development of the skull is a subject of great interest, not only in itself, but as throwing light on many points which the study of the adult skull would fail to explain. At a very early period of foetal existence the cerebrum is enclosed in a membranous capsule external to the dura mater, and in close contact with it. This is the first rudiment of the skull, the cerebral portion of which is consequently formed before there is any indication of a facial part. Soon, however, four or five processes which jut from it on either side of the mesial line, grow downwards, incline towards each other, and unite to form a series of inverted arches, from which the face is ultimately developed. Imperfect development or ossification of these rudimentary parts of the face give rise to 'harelip' and 'cleft-palate,' or in very extreme cases to the monstrosity termed 'Cyclopean,' in which, from absence of the frontal processes, the two orbits form a single cavity, and the eyes are more or less blended in the mesial line.

The cartilage, formed at the base of the membranous capsule, is speedily followed by the deposition of ossific matter at various points of the capsule, which soon becomes converted into flakes of bone; while the intervening portions, which remain membranous, permit the skull to expand as its contents enlarge. Then follows the appearance of osseous nuclei in the cartilage at the base, corresponding to the future occipital and sphenoid bones. Lastly, the various bones, some originating in membrane, and some in cartilage (see OSSIFICATION), approach one another by gradual enlargement, and become united in various ways, so as to form a continuous, and ultimately an unyielding bony case, which is admirably adapted for the defence of the brain, for sheltering the organs of special sense, and for being attached to the ligaments and muscles by which the skull is supported

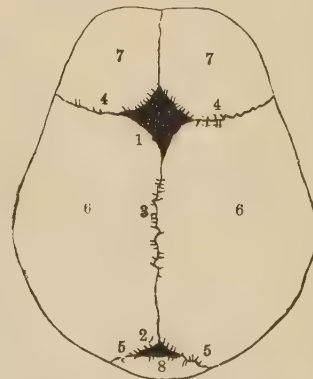


Fig. 2.—Human Skull at Birth, from above:

1, anterior fontanelle; 2, posterior fontanelle; 3, sagittal suture; 4, 4, coronal suture; 5, lambdoid suture; 6, 6, parietal bones; 7, 7, two halves of the frontal bone, still ununited; 8, occipital bone.

shown in fig. 2), and two lateral fontanelles on either side (as shown in fig. 3), which do not close till the second year after birth, and sometimes remains open much longer. The deficiency

and moved on the spine. At the period of birth most of the principal bones have grown into apposition with their neighbours, forming the sutures; but one large vacancy remains at the meeting-point of the parietal and frontal bones, which is termed the anterior fontanelle (so called from the pulsations of the brain, which may be here seen resembling the rising of water at a spring or fountain. There are two fontanelles in the mesial line (as

of the osseous brain-case at this position not only facilitates delivery, but also acts to some extent like a safety-valve during the first months of infantile life, at which time the brain bears an unusually large proportion to the rest of the body,

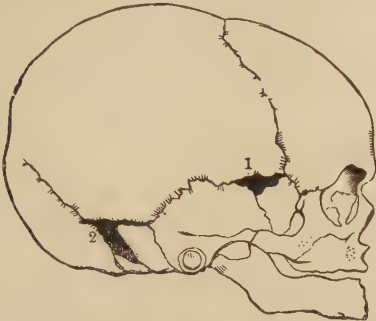


Fig. 3.—Human Skull at Birth (side view):
1, 2, lateral fontanelles.

and is liable to sudden variations of size from temporary congestion, and other causes. The sutures remain distinct long after the closure of the fontanelles, and serve a purpose both in permitting an increase of the size of the cranium by the growth of the bones at their edges, and in diminishing and dispersing vibrations from blows, and thus contributing to the security of the brain.

The number of centres of ossification in the skull is tolerably constant; each bone having a certain number. After the sutures have been formed, and the skull has acquired a certain thickness, a process of resorption commences in the interior of the bones, and reduces the originally dense structure to a more or less cellular or cancellated state. The interior thus altered is called the *Diploë*, and by this change the weight of the skull is much diminished while its strength is scarcely affected. The *diploë* usually begins to be apparent about the tenth year, and is most developed in those skulls which are thickest. A continuation of the same process of resorption which causes the *diploë* gives rise to the formation of the cavities known as the frontal and sphenoid sinuses. The formation of the *diploë* divides the walls of the cranium into three layers—viz. an outer tough layer; an inner dense, brittle, and somewhat glass-like layer, known as the vitreous table or layer; and the intervening cancellous *diploë*. *Diploë* is absent from the cribriform plate of the ethmoid bone and from the roof of the orbital cavities, and thus these are the thinnest parts of the cranium. The growth of the skull after the seventh year proceeds slowly, but a slight increase goes on to about the age of twenty. The skull-bones are freely supplied with blood from arteries which pass from the dura mater internally and the pericranium externally, through the numerous foramina observed on both surfaces; the blood being returned by veins which take various directions.

The fact that concussion of the brain scarcely ever proves fatal, unless there is also fracture of the skull, affords the most distinct evidence that the skull is constructed in such a manner that so long as it maintains its integrity it is able to protect its contents from serious lesion. This marvellous protective power is due to its rounded shape, whereby its strength is increased, and in consequence of which blows tend to glide off it without doing material damage. Moreover, the curved lines or ridges which may be traced round the skull tend to strengthen it. The weakest part

of the skull is at the base. Hence, notwithstanding its removal from exposure to direct injury and the protection afforded by the soft parts, fracture takes place more frequently at the base than at any other part of the skull, fracture often taking place here even when the skull was not broken at the part struck. There are two points in the architecture of the bones of the face which deserve especial notice—viz. (1) the great strength of the nasal arch; and (2) the immobility of the upper jaw, which is fixed by three buttresses—the

nasal, the zygomatic, and the pterygoid.

The base of the skull, whether seen from within or from below, presents many objects of physiological interest in relation to the nervous system. As seen from within, the base presents on each side three fossæ, corresponding to the anterior and middle lobes of the cerebrum and to the cerebellum. These fossæ are marked, as is the whole skull-cap, by the cerebral convolutions, and they contain numerous 'foramina' and 'fissures' which give passage to various sets of nerves and blood-vessels. The external or outer surface of the base of the skull, if we consider it from before backwards, is formed by the palate processes of the superior maxillary and palate bones; the vomer; the pterygoid and spinous processes of the sphenoid and part of its body; the under surface of the temporal bones; and the occipital bone. The most important of the parts which it presents are named at fig. 4.

The *Morphology of the Skull* is the highest and most difficult problem of comparative anatomy, and has cost the most extraordinary labour for its solution. Goethe and Oken independently suggested that the skull was to be regarded as the modification of a series of four vertebræ, and this 'vertebral theory' was worked out in the most elaborate detail by Owen and other anatomists (see SKELETON). Huxley, however, in a celebrated Croonian Lecture (1858), revised and extended the hitherto neglected embryological observations of Rathke, proposed an unanswerable destructive criticism of the archetypal theory, and may be said to have thus definitely placed the newer view in the way of general acceptance. An enormous amount of detailed research, for which we are indebted chiefly to Parker in England and Gegenbaur in Germany, has established the newer theory on the sure ground of actual observation.

Taking first the simple unsegmented cartilaginous cranium of a skate or dog-fish, with its appended jaws and branchial arches, we find that in development, though the notochord extends into the region

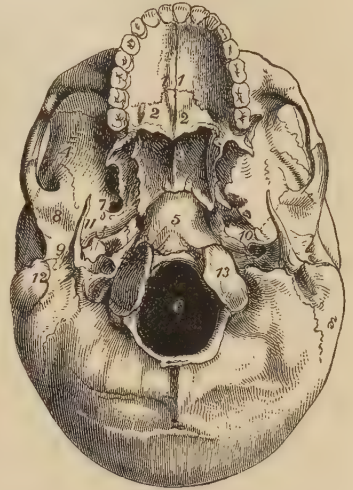


Fig. 4.—Base of the Human Skull :

- 1, 1, hard palate; 2, 2, palate bones; 3, vomer; 4, zygomatic fossa; 5, basilar process of the occipital bone; 6, foramen magnum; 7, foramen ovale; 8, glenoid fossa; 9, external auditory foramen; 10, carotid foramen of the left side; 11, styloid process; 12, mastoid process; 13, one of the condyles of the occipital bone.

of the head, the vertebræ stop altogether short of it; but that on each side of the cranium there arise a pair of cartilaginous bars—the *trabeculæ* or 'rafters' of the future skull—and three pairs of cartilaginous capsules, nasal, ocular, and auditory, form round the developing sense-organs; the nasal capsules immediately unite with the ends of the *trabeculæ*, which are meanwhile uniting below, and growing up at the sides to form the brain-case. The auditory capsules become united with the *trabeculæ* by the appearance of two new masses of cartilage—the *parachordals*—the eyes of course remaining free. At first there are no jaws, but a series of seven or more similar vertical cartilaginous bars or arches, considerably resembling the *trabeculæ*, between which slits open into the pharyngeal cavity. The first pair of these arches develops an ascending process, which passes above the developing mouth, and becomes the 'palato-ptyergoid' arch or upper jaw, the original portion remaining as the mandible. The second pair of arches—the 'hyoid'—becomes more or less modified usually to aid in supporting the jaws and floor of the mouth, while the remaining pairs become little modified, and serve throughout life to support the gills.

The more complex bony skulls of higher vertebrates are now in principle readily understood. The chondro-cranium and subjacent arches in all cases develop in the same way, although reduction and even atrophy of the gill arches subsequently takes place. The bones, although similar in the adult, originate in two utterly distinct ways, either by actual ossifications in the substance of the chondro-cranium and jaws, or by the ossification of overlying dermis, and are hence known as cartilage bones and membrane bones respectively—the latter corresponding to the dermal bones and teeth of ganoid and elasmobranch fishes. In mammals a further extraordinary specialisation takes place: the ends of the mandibular and hyoid arches lose their suspensory function, are taken up during development into the interior of the ear capsule, and are metamorphosed into the auditory ossicles.

Various Forms of the Skull.—Age.—At birth the existence of the fontanelles has already been referred to. The frontal and parietal eminences are especially prominent, and the mastoid process is absent. The face is only one-eighth of the bulk of the cranium, whereas in the adult the face is equal to one-half. During the first seven years the skull grows rapidly, and by this time many parts have attained definite size. At the period of puberty the face and regions of the air-sinuses undergo expansion. The face elongates owing to the growth of teeth and the increase in the size of their alveolar sockets. In old age the skull may become lighter and thinner or the reverse. Loss of the teeth and absorption of their sockets result in diminution of the size of the face, and thus the upper jaw recedes, while the chin becomes prominent.

Sex.—It is not always possible to determine the sex from the skull; but, as a rule, the skull of the male has more strongly marked muscular impressions, while the mastoid processes, superciliary ridges, and air-sinuses are more pronounced than in the female, whose skull generally retains the leading features of a young skull.

Race.—In comparing the skulls of different races of mankind it is necessary to have recourse to various methods of measurement, and these are usually conducted on the skulls of adult males. The following is a short summary of these methods. (a) *Cranial Capacity.*—This is obtained by filling the cranial cavity with shot, and then measuring the quantity in a graduated vessel, special precautions being observed in order to obtain equable results. The capacity of normal human crania

varies from 60 to 110 cubic inches—the average in all races being 85 cubic inches—e.g. Eskimo, 91.5; European, 90.3; Chinese and Mongols, 87.3; African Negroes, 82.4; Native Australians (aboriginal),

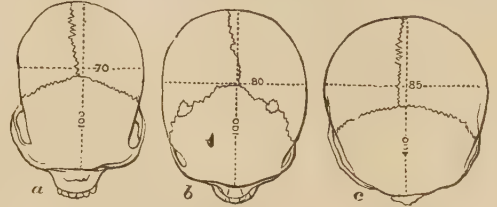


Fig. 5.—Typical Crania seen from the Vertex :

a, Negro, index 70, Dolichocephalic; b, European, index 80, Mesaticephalic; c, Samoyed, index 85, Brachycephalic. (After Tylor.)

79.3; Andaman Islanders, 78.1. The average capacity of female skulls is 10 per cent. less than that of male skulls. (b) *Linear measurement of the horizontal circumference of the cranium.* In the adult European male the average is 20.7 inches, and in the female 19.6 inches. (c) A third method is by comparison of the relative length, breadth, and height of the cranium. The standard of maximum length is taken as 100, and thus $\frac{100 \times \text{breadth}}{\text{length}} = \text{index of breadth or cephalic index}$; and on this basis skulls are classified in three groups—viz.:

Brachycephalic = breadth-index above 80.
Mesaticephalic = " " from 75 to 80.
Dolichocephalic = " " below 75.

In a similar way the proportion of height to length may be calculated, and a *height-index* established. It varies less than the breadth-index—e.g.:

	Breadth	Height
Mongolians of Siberia and Central Asia.....	88	73
Andaman Islanders.....	82	77
Chinese.....	79	75
English.....	76	71
Native Australians (aboriginal).....	71	71
Fiji Islanders.....	66	74

(d) *The Degree of Projection of the Jaws.*—We have seen that the human skull, when compared with the skulls of lower animals, presents a small face extended vertically, and thus placed under the anterior part of the cranial box. Prominent jaws therefore indicate an approach to an animal type, especially when associated with a receding forehead. The degree of projection is expressed by

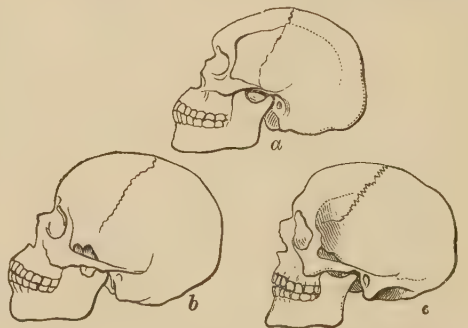


Fig. 6.—Lateral View of three typical Skulls:

a, Australian, prognathous; b, African, mesognathous; c, European, orthognathous. (After Tylor.)

the *gnathic index* of Flower, and is obtained by comparing the basi-alveolar length with the basinasal length. When the gnathic index is below 98, skulls are said to be *orthognathous*; from 98 to 103, *mesognathous*; above 103, *prognathous*—e.g.:

	Gnathic Index.
English	96
Chinese	99
Eskimo	101
Fiji Islanders	103
Native Australians (aboriginal)	104

(e) The form of the nasal skeleton and its anterior openings is also subject to variation, and so its height and width may be measured, and the relation between the two expressed as a nasal index.

Nasal index below 48 = leptorhine.
" from 48 to 53 = mesorhine.
" above 53 = platyrhine.

For example :

	Nasal Index.
Eskimo	44
English	46
Chinese	50
Native Australians (aboriginal)	57

(f) In a similar way the form of the orbit is subject to variation, but this is of less consequence than the nose. Other measurements of the face skeleton are also made. A time-honoured measurement, long thought to be sufficient in itself for founding a classification of races, was the *Facial Angle* of the Dutch anatomist Peter Camper (q.v., 1722-89). This was obtained by drawing one line from the centre of the forehead to the most projecting part of the upper jaw just above the incisor teeth, and another from the opening of the ear to the base of the nasal opening; between these was contained the facial angle.

For the relation of craniometry to the science of man, see ETHNOLOGY and works there cited. See also the articles ANTHROPOMETRY, ANTHROPOID APES, BRAIN, MAMMALS, MAN, PHRENOLOGY, SKELETON, VERTEBRATA; Huxley's *Croonian Lecture* (1858); Huxley's *Anat. of Verteb. Animals* (1871); Parker's *Morphology of the Skull* (1877); and for summary, Balfour's *Embryology* (vol. ii.); Broca, *Instructions Craniologiques et Craniométriques*; Flower, *Cat. of Mus. of Roy. Coll. Surg. of Eng.* (part i. 1873-79); Turner, *Challenger Reports, Zoology*, x. (1888); Schmidt, *Anthropologische Methoden* (1888); Benedikt, *Kraniometrie und Kephalometrie* (1888). For the illustrative tables in this article we are indebted to the summary in Quain's *Anatomy* 10th ed., and Thomson's article on Physical Anthropology in Cunningham's *Text-Book of Anatomy*.

Skulpin. See DRAGONET.

Skunk (*Mephitis*), a genus of small carnivorous quadrupeds of the family Mustelidæ. The body is elongated, and usually much arched; the tail long, and thickly covered with long, fine hair; the head small, with thick, blunt snout; the legs short, and the paws comparatively large, with five incompletely divided toes. The general colour is black and white. The power, characteristic in some degree of all the Mustelidæ, of forcibly discharging the fetid secretion of the Anal Glands (q.v.) is in the skunks enormously developed. All the species are American, and, as they differ little in habit, the Common Skunk (*M. mephitis*) may be taken as typical of the whole genus. The common skunk—an animal about the size of a cat—has fur of a glossy black; on the forehead is a patch of white diverging into two lines which extend the whole length of the back and meet again in the beautiful bushy tail. The under surface of the tail is also white, and, as it is usually carried erect or laid over against the body, the white is regarded by some naturalists as a 'warning colour.' Thus according to Belt: 'The skunk goes leisurely along, holding up his white tail as a danger-flag for none to come within range of its nauseous artillery.' The common skunk is found throughout North America, but is most abundant in the Hudson Bay region. It chiefly frequents high-lying, bushy, or even rocky districts and the banks of rivers, remaining concealed in its burrow by day, but emerging at dusk in search of the worms, insects, birds, and small mammals

which form its food. Its movements are slow and leisurely. It never attempts to run away if pursued, for, feeble and defenceless as it looks, it is



Common Skunk (*Mephitis mephitis*).

most efficiently protected by the possession of a nauseous fluid, the discharge of which neither man nor beast will wittingly provoke. Should an unwary intruder venture too near, the skunk turns its back, erects its tail, and, by means of a muscular contraction, ejects the contents of its anal pouches with a force which carries them to a distance of from 8 to 10 feet. So penetrating is the evil odour of this fluid that it is perceptible a mile off, and has been known to cause nausea in persons within a house with closed doors from which the animal was a hundred yards distant; and so persistent is it that clothes defiled by it can only be purified by prolonged hanging in smoke. It is said that the fluid has irritating properties which excite severe inflammation of the eyes, and cases are cited of Indians who have thus lost their eyesight. The skunk is hunted for its fur, which is in considerable demand; but the hunter must be careful to avoid alarming the animal, and thus causing it to discharge its obnoxious fluid. Skunks usually raise from six to ten young in a season. If taken young they are easily tamed and make pretty pets, for they are cleanly in habit and rarely emit their offensive secretion save when provoked. The Long-tailed Skunk (*M. macrura*) is found in central and south Mexico, and a much smaller species (*M. putorius*), with four white stripes, ranges from the southern states to Yucatán and Guatemala.

Skupsh'tina, the national assembly of the Serbians. See SERBIA.

Skutari. See SCUTARI.

Sky. See ATMOSPHERE, CLOUDS, DUST, and METEOROLOGY.

Skye, an island of Inverness-shire, the second largest of the Hebrides, is separated from the mainland by a channel $\frac{1}{2}$ mile wide at the narrowest, Kyle Rhea. Its extreme length, south-south-eastward, is 49 miles; and its breadth varies from 7 to 25 miles; but on account of the extraordinary number of inlets at all parts of the island no point is above 4 miles from the sea. Area, 643 sq. m.; pop. (1841) 23,082; (1881) 16,889; (1921) 11,608. Skye is for the most part mountainous and moory, but it contains some pleasant tracts of arable and pasture land, and one considerable plain, formerly the bed of a lake, in the parish of Kilmuir, where some ruins of a religious house called after St Columba were found. The rocks are mainly volcanic of Tertiary age; and the principal mountains are the Coolin Hills (not Cuchullin), which stretch irregularly from south-west to north-east, terminating in the sharp peak of Sgurr-nan-Gillea (3167 feet) above Sligachan. Another peak, Sgurr Dearg, has been found to be the highest of the range (3234 feet), but Sgurr-nan-Gillea will still be regarded as the chief of the Coolin Hills. The serrated outline of these hills arrests the eye at a great distance, and forms the dominant feature in the view

at almost every point round the island, and far out at sea. The most famous scene in this region is Cornisk ($1\frac{1}{2} \times \frac{1}{2}$ mile), the 'stern, dread lake' of Scott's *Lord of the Isles*. Glen Sligachan, ascending $5\frac{1}{2}$ miles from the head of Loch Sligachan, is by many considered the grandest glen in the Highlands. The fantastic Quiraing (1779 feet) and the Storr (2360), in the north of the island, offer splendid scenery, as also do many points along the coast—here columnar basalt formations on a grand scale, and there cliffs 1000 feet high, over which leap many waterfalls, and whose bases are frequently worn into deep caves, some of them of historical interest. One, near Portree, afforded a refuge to Prince Charles Edward; another, on the west coast, was the temporary prison of Lady Grange. The largest arms of the sea are Lochs Bracadale, Dunvegan, and Snizort.

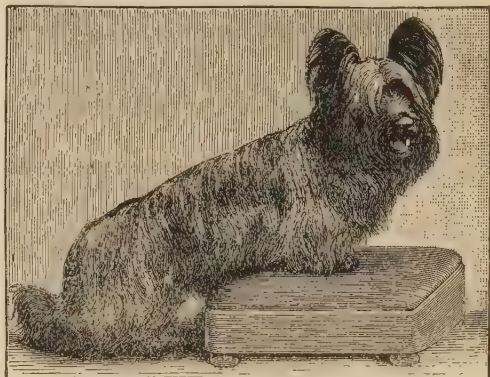
The coasts abound in fish, the most important being herring, salmon, cod, and ling; besides oysters are found in several places. The cod and ling fishery is chiefly confined to Lochs Dunvegan and Snizort. There are no rivers of any magnitude; but salmon and sea-trout are got in some of the principal streams, and trout in most of the fresh-water lochs. Deer are not numerous, nor grouse. West Highland cattle are reared to a considerable extent, but sheep-farming on a large scale predominates. The rainfall averages 65 inches, but the climate is mild and healthy. Agriculture in Skye, being comparatively unprofitable, owing to the moisture of the climate, is falling into entire neglect on some of the chief sheep-farms. The soil, however, is in many places excellent, and capable, in dry seasons, of yielding good cereal crops, while for turnips it is peculiarly suited.

The inhabitants are for the most part poor and ill-housed, but well-behaved and intelligent. At one time they contributed largely to the British army—not less than 10,000 private soldiers, it has been calculated, during the long war with France. The number of soldiers now sent from Skye is very small. In the districts where the men practise fishing nearly the whole of the adult males go to the east coast fisheries in summer, while from all parts of the island young men and women go to the south in search of field-labour. Potatoes and fish are the general diet, meat being a rare luxury. The population is chiefly Celtic, with, however, a considerable Norse admixture. Gaelic is still universally spoken, but is gradually giving place to English. Lord Macdonald's seat, Armadale Castle in Sleat, is one of the most beautiful in all its surroundings to be seen on the Scottish coasts. At Macleod of Macleod's ancient castle of Dunvegan, perched on a headland, Dr Johnson 'tasted lotus' (1773) and Scott slept in the 'Fairy Room' (1814). The principal port of Skye is Portree, a picturesquely situated village of 900 inhabitants, to which steamers regularly ply from Glasgow, and from Kyle of Lochalsh and Mallaig, in connection with the Skye Railway and Mallaig Railway. Other villages, also calling-points of the steamers, are Kyleakin ('Hakon's Strait'), Broadford, and Dunvegan. 'Talisker' whisky is made at Carabost at the head of Loch Bracadale. Diatomite is found in Trotternish, and manufactured for explosives. A seam of oil-shale was discovered in 1913. In 1926 the splitting up into small holdings of the whole of the Macleod estate was completed.

See Alexander Smith's *Summer in Skye* (1865); Robert Buchanan's *Hebrid Isles* (1883); J. A. Macculloch's *The Misty Isle of Skye* (1905); and for mountaineering, *Island of Skye* (ed. Steeple, Barlow, and MacRobert, 1923).

Skye Terrier, a breed of dogs supposed to be the outcome of a cross between the native dog of Skye and a Maltese terrier, landed from a passing

ship—a statement difficult to believe and impossible to prove. Though long known in Scotland, where he was in some places used as a working terrier, it is only of late years that the Skye terrier has



Skye Terrier.

become common over the whole of England. The chief beauty of the Skye is its long and graceful coat, which requires so much attention that it is better suited for a town life than a country one. In its proper place, the Skye is a bright and cheerful companion. The modern Skye should be very low at the shoulder, not above 9 or 10 inches high, with as long a body as possible; many good specimens measure 40 inches from nose to tip of tail. The coat should be very long and abundant, nearly touching the ground, but hanging quite straight, without any curl. Colour varies from a dark blue to a light gray. The weight should be about 20 lb. The Skye terrier is divided into two varieties, Prick-eared and Drop-eared. Though many admirers claim working properties for the Skye, as now bred, it should only be regarded as an ornamental dog. The Paisley or Clydesdale terrier is a Skye with a light-coloured and silky coat, and is kept entirely as a house-dog.

Skyros, or **SCYRO**, an island of the Grecian Archipelago, the largest of the northern Sporades, 24 miles N.E. of Eubœa. Length, 17 miles; area, 79 sq. m. Skyros is very mountainous in the south, the mountains being covered with forests of oaks, firs, and beeches; but the northern part, though also hilly, has several fertile plains, which produce fine wheat and grapes for wine. The only town is Skyro, or St George, on the east coast. This island is associated with the legends of Achilles and Theseus. In 469 B.C. Cimon the Athenian conquered it and carried off to his native city the bones of the hero Theseus. It was likewise celebrated for its goats and its variegated marble. Rupert Brooke was buried here in 1915. Pop. about 3500.

Slade, FELIX (1790–1868), of Halsteads, Yorkshire, was an antiquary and art collector, and bequeathed to the British Museum his valuable collections of engravings and of Venetian glass. He also left by will money to found art professorships at Oxford, Cambridge, and at University College, London. Amongst Slade professors have been Ruskin, Sidney Colvin, and W. B. Richmond.

Slags, sometimes called *Scorie*, are fused compounds of silica with lime, alumina, and other substances. Blast-furnace slag is usually little else than a silicate of lime and alumina. In smelting processes the slag floats on the top of the molten metal, and is run off or raked off as 'waste material,' provided that the metal has been practically all

extracted from it. Many slags which were thrown away in early times have been profitably smelted again in modern days, owing to the amount of metal left in them. Some slags form an opaque glass, but other varieties are more stone-like in appearance, while some are beautifully crystallised. In Great Britain many millions of tons of iron blast-furnace slag are annually produced. Until comparatively recent times this was considered useless material, but it is now utilised in several ways. By the action of steam upon it in the melted state it is made into fine threads or filaments called 'slag wool' or 'silicate cotton.' This is a bad conductor of heat and sound, and is used as a covering to boilers, and to prevent sound passing through floors. It is also employed for fireproof netting. In some cases blast-furnace slag has been made into serviceable bricks and large blocks for building, as well as into paving setts. On the Continent a useful building cement, or substitute for mortar, has been made from it. The slag from the manufacture of steel from Cleveland pig-iron by the basic process contains about 17 per cent. of phosphoric acid, and forms a valuable fertiliser for sour, peaty, and clay soils.

Slander is an injury to a person's character and reputation caused by spoken words, or in some other fugitive form such as sounds, looks, signs, or gestures. It is to be noticed that oral unlike written defamation is only actionable (1) on proof of actual, or, as it is technically termed, special damage; (2) in the following specific cases: (a) statement that the plaintiff has committed a criminal offence, (b) an assertion that he is suffering from an unclean and contagious disease, (c) defamatory words spoken in the way of his business or profession. To impute unchastity to a woman was not in itself actionable unless (it is said) the words were spoken in London, when by the custom of the city an action would lie thereon; but the Slander of Women Act (1891) makes the mere imputation a ground of procedure. The remedy for slander is an action at law for damages. To prove the truth of the alleged slander is a complete answer, and the defence of privilege may also be set up. The criminal law affords no protection against slander, nor will any 'indictment lie for mere words not reduced into writing, unless they be seditious, blasphemous, grossly immoral, or uttered to a magistrate in the execution of his office, or uttered as a challenge to fight a duel, or with an intention to provoke the other party to send a challenge.' This radical distinction between written and spoken defamation is not recognised in Scots law. See LIBEL, TORT; Odgers, *The Law of Libel* (1911); Sir F. Pollock, *The Law of Torts* (12th ed. 1923); Gatley, *Law and Practice of Libel and Slander in a Civil Action* (1924).

Slang embraces not only peculiar jargons or dialects, such as Gypsy, Canting or Flash, Back-slang, and Shelta or Tinkers' Talk, but also a vast number characteristic of trades, pursuits, and positions in every class of society; so that we may agree with Professor A. Barrère, that perhaps the best general definition at which one can arrive is that 'Slang is a conventional tongue with many dialects, which are, as a rule, unintelligible to outsiders.' In its extended sense it is difficult to draw the line between technical terms—as for instance those used on the turf or in sport—and slang, especially when equivalents for them are wanting in correct English. Any kind of shibboleth used to distinguish a class, be it of students, clergymen, authors, or the most fashionable circles, is correctly called slang.

The chief elements of all slang consist first of absolutely foreign words, including those manu-

factured; as when a costermonger says 'molty kerteever,' from the Ital. *molto cattivo*, for 'very bad,' or a street-vagabond uses the Romany *telled* ('taken'), for 'arrested.' The other is the substitution of English words for equivalents, as when we hear 'brass,' for impudence, 'timbers' and 'pins' for legs, 'claret' for blood, and 'tile' for a hat. Thus it is often rough metaphor or poetry. A certain proportion of slang words after performing, as it were, quarantine, receive a clean bill of health, and are admitted to that great port the dictionary. Some make a reappearance in recognised language. Thus *humbug* was long treated as pure slang, but is now generally used even by the most correct writers. Very little slang is to be found in Greek or Latin (though Aristophanes and Martial often approach it), or in any European language until the middle ages. François Villon (15th century) wrote ballads in an *argot* which was by far the most copious and perfected in Europe. In Germany *Rotwälsch* (*wälsch*, 'foreign' or 'Italian,' *rot* being either from *rot*, 'red,' or *rotte*, 'a gang') can be traced back to the 13th century. Martin Luther wrote a preface to a dictionary of the jargon used by the thieves of his time, in which half the words are Hebrew, derived from the receivers of stolen goods and their Yiddish dialect. In Italy there was a *lingua furbesca*; and in Spain the *Tunanesca* which was largely mixed with Spanish Gypsy, itself a very much corrupted Romany. English Canting, or the language of the dangerous and vagabond classes, which in a great measure preceded all other forms of slang, did not before the end of the 15th century embrace more than 150 or 200 words. Harman, a magistrate who in 1567 published a vocabulary of Slang or Canting, declares explicitly that it was only within thirty years of his time of writing that the dangerous classes had begun in England to use a separate language at all.

Shelta (q.v.) is spoken by tinkers. Shakespeare, it should be noted, makes Prince Hal speak of a tinker's language. Yiddish (Ger. *Jüdisch*, 'Jewish') is a strange compound of very corrupt Hebrew and ancient or provincial German, spoken by Jews. It is extensively spoken in the East End of London. It is in Germany a language of some importance. Hotten was the first to show and illustrate the curious fact that among street-musicians and costermongers a very corrupt and singular form of Anglo-Italian had become current. Still more strangely, it has come to be considered by tramps as the lowest and most vulgar means of expression. The keeper of a tramps' lodging-house after hearing a Cambridge professor speak Gypsy and Tinkers' Slang made no remark, but hearing him speak Italian said, 'Well, I'd never a-supposed you'd been down as low as that.'

The Dutch language during the time of the Georges contributed a good many words, such as *boefer*, 'a buffer;' *blink*, 'to drink.' In America a still greater number was derived from this source (e.g. sleigh, from *slé*), which have since come over to England. Some confusion has resulted from the fact that owing to its great resemblance to other northern languages philologists have often thought they had discovered in English slang words of Saxon or Danish origin which were really Dutch, and often Dutch slang. There still remains much to be done as regards investigation in this field. About the beginning of the 19th century, when there was much attention paid to such subjects, and many fast or fashionable men affected to be familiar with vulgar life, there sprang up, it is said, about Leadenhall in London, and bearing that name, that which was afterwards known as Back-slang. This consisted of words spelled backwards, such as *top* for pot, *yennep* for penny, *nig*

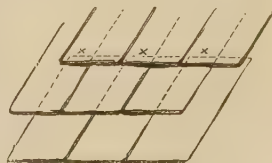
for gin—a device not unknown in ‘Nodnol’ in earlier times. Many traces of it are to be found in the gay novels and memoirs of the thirties and forties. Contemporary with it in origin is rhyming slang—i.e. the employment of a word which loses its own signification, taking that of another with which it rhymes. Thus *Lord John Russell* means *bustle*, a canting term meaning to pick pockets, also money. Romany or Gypsy, Shelta or Tinkers’ Talk, Canting or Kennick, also known at one time as Flash or Thieves’ Latin, form the principal English slangs. All have their dialects or local differences. Thus, the Shelta heard in tramps’ London lodging-houses is a very much corrupted form of that which is spoken in Scotland. Slang may consist of mere intonation or pronunciation: thus, Hotten gives the use of ‘Gawd,’ or ‘Gorde,’ for God, and the like by certain clergymen as pulpit slang. There are in America preachers who carry this to such an extent that they have almost formed a language of their own in this way; and a certain bishop was once declared to be in the habit of saying in the pulpit: ‘He that hath *yaws* to *yaw*, let him *yaw*,’ while in ordinary life he said plainly enough: ‘He that hath *ears* to *hear*, let him *hear*!’ The misuse of certain French terms is also slang, which is, however, returned a hundredfold by the rather recent adoption and abuse of English words by Parisians, who, for example, believing that *five o’clock* means to drink tea, have formed the remarkable slang verb *fiveocloquer*, and even say *Fiveocloquons-nous à quatre heures?* Parliamentary, military, sporting, legal and literary, stage, showmen’s, shopkeepers’, and stock-exchange slang, and that of different callings or trades are all extremely interesting, since there is not one that has not many very old words, often of Norse or Celtic origin, which have not as yet been much investigated. One of the most prolific sources of slang of late years has been the American. This has for a ‘stem’ obsolete English and provincial terms which have been retained chiefly in New England and the West, and which are really not slang, though so called. To these may be added words of German, Dutch, Canadian, French, Red Indian, Negro, and Spanish origin. The Great War caused many Anglo-Indian and other words to pass from soldiers’ slang into current use.

The principal works on this subject are Harman’s *Caveat for Common Corsetors, vulgarly called Vagabones* (1566); the *Life of Bamfylde Moore Carew* (no date), containing a vocabulary of Canting miscalled Gypsy; Grose’s *Dictionary of the Vulgar Tongue* (1785); *Bucchus and Venus* (1737), with a canting vocabulary republished as the *Scoundrels’ Dictionary*. (This dictionary is said to have appeared by itself in 1710 as *A Dictionary of the Canting Crew*.) The first work of any value on this subject in which slang was treated in its true sense was the *Slang Dictionary* of John Camden Hotten (1859). Professor A. Barrère and Charles Godfrey Leland’s *Dictionary of Slang, Jargon, and Cant* contains Americanisms, Gypsy, Shelta, Pidgin English, Anglo-Indian, and other terms, with a history of English slang (2 vols. 1885; new ed. 1897). John S. Farmer and William Ernest Henley’s *Slang and its Analogues* is a monumental work in seven volumes (1890–94), and the same authors’ *Dictionary of Slang* is abridged therefrom (1 vol. 1905). See also M. A. Mücke, *Dictionary of War Words* (1920) and P. L. Jaeger ‘On English War-Slang’ in *Englische Studien* (1926). For American slang, see F. N. Scott, *American Slang* (1926); and AMERICANISMS. Gypsy: see works of George Borrow, *Lavengro*, *Romany Rye*, &c., and *Dialect of the English Gypsies*, by Dr Bath Smart and Crofton (1863–88). See also the articles GYPSIES and SHELTA, with works there cited. Anglo-Indian: Sir Henry Yule and A. Brunell, *Glossary of Anglo-Indian Colloquial Words and Phrases* (1886). Pidgin English: *Pidgin English Ballads*, with vocabulary of the Jargon, by Charles G. Leland (1886). French

Slang: Barrère, *Argot and Slang* (Lond. 1887); and books on slang of the 19th century by Rigaud (1881) and Sainéan (1920), and of the 20th century by Bauche (1920) and Leroy (in Eng. 1922). German Slang: Avé-Lallemant, *Deutsches Gaunerthum* (1862); Genthe, *Deutsches Slang* (1892); a book by Delcourt (in Fr. 1917); Kluge, *Rotwelsch* (1901); Günther, *Die deutsche Gaunersprache* (1919).

Slate, or CLAY-SLATE (Fr. *esclat*, a ‘shiver’ or ‘splinter’), is a highly metamorphosed argillaceous rock, fine-grained and fissile, and of a dull blue, gray, purple, or green colour. A red slate is found at Acton, Quebec. Slate splits into thin laminæ or plates, that are altogether independent of the layers of deposit; though sometimes coinciding with them, they more frequently cross them at different angles (see CLEAVAGE). Some rocks that split into the thin plates of the original stratification are popularly but erroneously named slate, as thin bedded sandstones properly called flagstones or tilestones, sometimes used for roofing. True slate is a very compact rock, little liable to be acted upon by atmospheric agencies. It is chiefly obtained from Palæozoic strata, but it is found also among more recent rocks. It is used for various purposes, being split into thin slabs of small size for ordinary roofs and into larger slabs for dairy fittings, wash-tubs, cisterns, tables, &c., and, when polished, for writing-slates and ‘blackboards.’ School slates are manufactured in very large numbers in Wales. They are split, like roofing-slates, by hand; but the sawing, grinding, and polishing processes are done by machinery: the making of the wood frames for them being also done by machines. In the United States slate is used for grave-vaults and for tombstones. Increasingly large quantities are being quarried for electrical purposes, particularly in Maine and Vermont. There are extensive quarries of roofing-slate in Wales and Scotland, and in the Ardennes in France, some of which have been wrought for a long time. For some years previous to 1891 the average annual quantity of slates quarried or mined in England and Wales amounted to about 450,000 tons (value one million sterling); in 1922 only 222,139 tons were quarried, but the value was nearly two million sterling. Among the great slate-quarries there may be mentioned those of Penrhyn (near Bethesda), Llanberis, and Festiniog. Considerable but much smaller quantities are produced in Argyllshire in Scotland and in some counties in Munster, Ireland. Welsh slates are largely exported to Germany and Australia. Pennsylvania is by far the largest slate-producing state in the United States of America, but Maine and Vermont both outrank it in the production of electrical slate. In recent years there has been a remarkable increase in America in the output of slate ‘granules’ used principally as a surfacing material for manufactured roofing. Pulverised slate or ‘flour’ is used as a filler in roofing mastic, in road asphalt, and also in rubber, oilcloth, and linoleum.

In roofing with slates it is necessary to put them on in two thicknesses, so that the sloping joints may be covered by the overlap of the course above. Besides this, the third course must also cover the first by an inch or two, to prevent rain from penetrating. Slates are generally laid upon boarding, and bedded in lime, and nailed with malleable-iron nails, galvanised, so as to prevent them from rusting. When large strong slates are used



they may be nailed to strong laths in place of boarding. Welsh slates are the smoothest and most generally used; but Argyllshire slates are stronger and better when the roofs are liable to be injured.

Slate-pencils are either cut or turned sticks of soft slate, or they are made by pressing moistened slate powder until it is firm enough to be made into pencils.

Slaughter-houses, or ABATTOIRS.—The public abattoir for slaughtering and preparing animals for food originated in France. On the report of a commission, Napoleon decreed their construction for Paris, and between 1807 and 1818 five were built. So pleased was he with the first completed in 1810 that he further decreed that abattoirs should be established in all large and medium French towns. Since then the idea has been adopted by all the advanced European nations. Edinburgh had a good abattoir in 1851, replaced in 1910 by a larger one on a new site. London's first public abattoir, opened in 1855, was at the Islington market. In later times very many abattoirs have been built or rebuilt in this country, and the newer ones are frequently very fine in design, style, and equipment. The finest abattoirs, however, are to be found in Germany.

The general requirements to be aimed at in a modern slaughter-house are as follows. The site should be open and roomy, and where land is not too expensive. Good drainage and a plentiful supply of pure water are essential. Transport arrangements in the way of roads and railways should be ample. The convenience of the position for dealers, butchers, and other users requires consideration. As far as possible the buildings should be in separate blocks to secure abundance of light and of ventilation, and sound sanitary conditions. Materials should be stone, brick, or reinforced concrete, and iron columns, beams, and roof framing.

The first department of a slaughter-house is that of lairage and pannage, where the animals are placed to await slaughter. The lairs and pens are made of iron or steel bars or tubes fixed in cast-iron columns set in a concrete floor with chequered tiles on top sloped to central passage-ways; a roof over is now generally provided. The position is adjacent to the slaughter-houses for cattle, pigs, and sheep, which, if possible, should be in different buildings.

The equipment for cattle-slaughtering consists of killing rings or pins, to fasten the animals to for stunning by either the pole-axe or the automatic pistol; hand safety wall-hoists and gambrels to hoist the beasts for bleeding, skinning, and dressing; and runways with wheel-travellers 12 feet above the floor to take the split and dressed sides of beef. Sheep and calves are killed on stands, or 'cradles,' and dressed, suspended to hooks on side rails. Pigs are hoisted—stunned or otherwise—to bleeding-bars, from which they are pushed on to a bench and rolled into a scalding-tank, from which they are lifted by a lever-cradle on to a scraping-bench, and then hoisted to overhead tracking for dressing.

From the slaughter-houses the dressed sides generally pass to hanging-halls to be air cooled and dried, and from these either to the delivery-doors or the cold rooms, if not required at once. These departments are connected by overhead runways with wheel-travellers, the hangers being arranged so that the travellers can pass them. The side lines are joined up to the main track by switches, and wheel hooks with their loads can pass to and from any part of the system. Insulated cold rooms, cooled by refrigerating machinery, are a feature of all modern abattoirs, where the meat can be stored or 'matured' until required.

For dealing with diseased or suspected animals a small lairage and slaughter-house is provided away from other buildings, and a dissecting-room should be added for the convenience of the inspectors. The offal department should adjoin, where diseased meat and other waste animal-matter can be sterilised and worked up into tallow and meat meal, the equipment consisting of a steel steam digester, tallow separating and settling tanks, steam drier for digested meat, offal, and blood, and a grinding-mill.

Engine and boiler houses are required to supply power and steam to the refrigerating machinery and offal plant, and hot water to the slaughter-houses. Other subsidiary departments frequently built or rented by private firms or individuals deal with the cleaning of tripe, the melting or rendering of fats, the preparation of skins or hides, the cleaning of the entrails for sausage casings, and the working up of hoofs and horns.

The administrative buildings and offices, staff restaurant where provided, accommodation for inspectors, dealers, and butchers, are usually placed near the main gates, and these buildings give the architect his opportunity. In Germany they are frequently very ornamental, and placed in grounds laid out with flower-beds, shrubs, and trees.

The European abattoir, as a rule, is built in one story, all the principal operations being conducted on the ground floor. Sometimes there is an extensive cellarage for the accommodation of machinery, the salting of hides, &c., and some of the subsidiary departments may have two floors, but the ground-floor idea is adhered to wherever practicable. In the United States, where there are very few public abattoirs, most of the slaughtering business being in the hands of the packing companies, the practice is quite different. The packing-house arose out of American conditions. Cattle were cheaply reared on the great western plains and dressed meat required in the more populous east. The great distances between made it uneconomical to send small consignments of beasts to butchers. The offal, on which packers have always largely relied for their profit, was mostly wasted. Private enterprise evolved the idea of large central slaughteries and manufactories in which every part of the animal would be used to the best advantage, and the experiment was started at the great stockyards of Chicago. Success was not immediate, but the rise of refrigeration solved the chief difficulties. Cold storage and iced and insulated railway trucks enabled the packers to deliver fresh meat all over the Union and, with refrigerated ships, ultimately to England and other places overseas.

Packing-houses vary greatly in design—there has been continuous development—but on one point they nearly all agree. They are tall buildings, four or six stories high, with cellarage in addition, and the beasts to be slaughtered travel on foot up a ramp or inclined way to the top stories where the slaughter-houses are situated. This gives the advantage of gravitation for subsequent handling, hand-friction 'droppers' being used instead of mechanically operated hoists. The offal is shot through shutters to the floors below the slaughtering stories. In the later plants the department blocks are separate, with as many as four to six railway sidings between them. Connection with the cold-storage block is made by bridges or covered ways on the level of the slaughtering floors, and from the offal floor to the tankage-block where blood, bones, hoofs, horns, and other inedible material are worked up into tallow, manure, poultry food, materials for button-making, &c. The refrigerating department is on a very large scale, for it has not only to accommodate great quantities of fresh meat but also to

provide large spaces for the curing of hams and bacon.

The rendering of fats into oleo for margarine-making, 'kettle' rendered lard, and prime steam lard is conducted on the two floors under the offal floor, the ground floor being used for storage of the products, and the cellars underneath for salting and storing skins and hides. The stockyard or lairage is at the rear of the factory, with further lairs on the slaughter-house level. The offices, sausage-making and smoking departments, ice-making plant to supply ice for insulated meat trucks, together with the boiler and power houses, may be at the front of the factory, where there should be a good road.

It would take too much space to describe in detail the great variety of ingenious machinery used in packing-houses. It is constantly being altered and improved. The 'string-gang' is greatly used in the slaughtering departments. The carcasses mechanically propelled on overhead runways pass before a line of men, each of whom does a small part of the dressing, and a very large number of animals are killed and dressed in the most economical way in a relatively small space. The aim of the packing-house is to utilise everything. The great chemical laboratories of the largest packers make rennet and pepsin, and extracts of the thyroid, pituitary, and many other glands, which are used in medicine all over the world.

Slave-coast, a division of the coast of Upper Guinea, Africa, extending eastwards from the Gold Coast through Togoland, Dahomey, Lagos to the river Benin in Nigeria.

Slavery, in the fullest sense of the term, implies that the slave is the property or at the disposal of another, who has a right to employ or treat him as he pleases; but the system has been subjected to innumerable limitations and modifications. Slavery probably arose at an early period of the world's history out of the accident of capture in war. Savages, in place of massacring their captives, found it more profitable to keep them in servitude. All the ancient oriental nations of whom we have any records, including the Jews, had their slaves. The Hebrews were authorised by their law to possess slaves, not only of other races, but of their own nation. The latter were generally insolvent debtors who had sold themselves through poverty or thieves who lacked the means of making restitution; and the law dealt with them far more leniently than with stranger slaves. They might be redeemed, and if not redeemed became free in the space of seven years from the beginning of their servitude; besides which there was every fiftieth year a general emancipation of native slaves.

Greek Slavery.—In the Homeric poems slavery is the ordinary destiny of prisoners of war; and the practice of kidnapping slaves is also recognised—Ulysses himself narrowly escaping a fate of this kind. None of the Greek philosophers considered the condition of slavery objectionable on the score of morals, though they desired it to be humane in practice. Aristotle maintained that some men were born inferior, and were therefore slaves by nature; while Plato only desired that no Greeks should be made slaves. One class of Greek slaves were the descendants of an earlier and conquered race of inhabitants, who cultivated the land which their masters had appropriated, paid rent for it, and attended their masters in war. Such were the Helots in Sparta, the Penestæ in Thessaly, the Bithynians at Byzantium, &c., who were more favourably dealt with than other slaves, their condition somewhat resembling that of the serfs of the middle ages. They could not be sold out of the

country or separated from their families, and were even capable of acquiring property. Slaves obtained by purchase were the unrestricted property of their owners, who could dispose of them at pleasure. In Athens, Corinth, and the other commercial states they were very numerous, and were mostly barbarians. They were employed partly in domestic service (some being *pædagogi*, employed to accompany boys to school, &c.), but more as bakers, cooks, tailors, or in other trades, in mines and manufactories, as labourers on country estates, and as seamen and oarsmen; and their labour was the means by which the owner obtained profit for his outlay in their purchase. These slaves were for the most part purchased; but many were born in their master's family. The Athenian state employed public slaves as police, as soldiers, public criers, gaolers, &c. An extensive traffic in slaves was carried on by the Greek colonists in Asia Minor with the interior of Asia; another source of supply arose from the practice common among Thracians and Scythians of selling their children. In Greece in general, and especially at Athens, slaves were mildly treated, and enjoyed a large share of legal protection. According to Demosthenes, a slave at Athens was better off than a free citizen in many other countries. Manumissions were possible. A master could obtain damages if a slave was maltreated. The slave was not allowed to wear his hair long, was prevented from entering the gymnasia and public assemblies, but had access to temples and festivals. It has been estimated that in the palmy days of the Athenian state there were as many as 400,000 slaves in Attica; about three times the number of freemen.

Roman Slavery differed in some particulars from that of Greece. All men were considered by the Roman jurists to be free by natural law; while slavery was regarded as a state contrary to natural law, but agreeable to the law of nations, when a captive was preserved, instead of being slain (the name was believed on doubtful etymological grounds to be '*servus*, quasi *servatus*'); or agreeable to the civil law, when a free man sold himself. In earlier times there was no restriction on the master's power of punishing or putting to death his slave, which was generally carried out by crucifixion; and even at a later period, when the law on this head was much modified, slaves were used with great rigour. The estimation in which their lives were held is illustrated by the gladiatorial combats. Old and useless slaves were often exposed to starve in an island of the Tiber. Under Spartacus (q.v.) a rebellion of slaves attained alarming dimensions. In the time of the empire the cruelty of masters was in some degree restrained by law. It was enacted that a man who put to death his own slave without cause should be dealt with as if the slave had been the property of another; and that if the cruelty of the master was intolerable he might be compelled to sell the slave. Slaves could contract a kind of marriage called *Contubernium*; and ultimately this relation was regarded as indissoluble. The children of a female slave followed the status of their mother. There were various ways in which a slave might be manumitted, but the power of manumission was restricted by law. The harbouring of a runaway slave was illegal. The number of slaves in Rome, originally small, was increased much by war and commerce; and the cultivation of the soil came in the course of time to be entirely given up to them. During the later republic and empire persons in good circumstances kept an immense number of slaves as personal attendants; and the possession of a numerous retinue of domestic slaves was matter of ostentation—200 being no uncommon number for one person.

A multitude of slaves were also occupied in the mechanical arts and the games of the amphitheatre. Originally a slave was incapable of acquiring property, all his acquisitions belonging to his master; but when slaves came to be employed in trade this condition was mitigated, and it became the practice to allow a slave to consider part of his gains, called his *peculium*, as his own, a stipulation being sometimes made that he should purchase his freedom with his *peculium* when it amounted to a specific sum. Having no legal standing, a slave could not give evidence.

Though the introduction of Christianity did not do away with slavery, it tended to ameliorate the condition of the slave. The fathers taught that the true slavery is not that of the body, but the slavery of sin; and Chrysostom thought the apostle did not insist on the suppression of slavery because it was desirable that men should see how truly the slave could enjoy liberty of soul. Constantine allowed poor parents to sell their children into slavery. Justinian, though his Constitutions (529 A.D.) drew a very sharp line between slaves and freemen, did something to promote the eventual extinction of slavery; the church excommunicated slave-owners who put their slaves to death without warrant from the judge. But it was not till the reign of Basil (867-886) that the slaves' *contubernium* was hallowed by the blessing of the church. The number of slaves again increased; multitudes being brought with them by the barbarian invaders, who were mostly Slavonic captives (whence our word *slave*); and in the countries which had been provinces of the empire slavery continued long after the empire had fallen to pieces. In the Germanic societies there were a few slaves proper, captives in war and the like, but the basis of the Village Communities (q.v.) was the tenants paying rent and holding land under the free. In Britain great numbers of the Celtic natives were enslaved by the Anglo-Saxons; and the Christian Anglo-Saxons had a regular trade with the Continent in Irish slaves, Bristol being a great slaving port. After the Norman Conquest slaves as in a separate class almost ceased to exist, and slavery eventually merged into the mitigated condition known as serfdom, which prevailed all over Europe in the middle ages, and has been gradually abolished in modern times. But though the practice of selling captives taken in war as slaves ceased in the Christian countries of Europe, a large traffic in slaves continued among Mohammedan nations, by whom Christian captives were sold in Asia and Africa; and in the early middle ages the Venetian merchants traded largely in slaves, whom they purchased on the coast of Slavonia, to supply the slave-markets of the Saracens. The history of the achievements of the Barbary corsairs is not to the glory of the Christian nations of Europe. These professional sea-robbers continued for centuries—down to 1812, indeed—to harry the coasts and the commerce of Europe, carrying large numbers of Christians into all but hopeless captivity. When Cervantes was for five years a slave he had about 25,000 fellow-captives in Algiers alone, some treated fairly well, some with great barbarity. Cervantes was ransomed for about £100; £30 or £40 was a more usual price. Another famous slave was St Vincent de Paul. The order of Trinitarians (q.v.) was founded in 1198 for the purpose of redeeming captives (especially French) out of the hands of the infidels, sometimes bringing away several hundreds at a time; and in the 18th century it was not unusual in English and Scottish churches to make collections for a like purpose (see *CORSAIR, GALLEY*). Christians sent to the galleys by their own or foreign authorities were worse off than domestic

slaves. English convicts used to be transported to what was practically slavery in His Majesty's Plantations (see *PRISONS*); and convict labour is still a kind of judicial slavery for life or a term of years.

Serfdom.—A numerous class of the population of Europe known as serfs or villeins were in a state of what was almost tantamount to slavery during the early middle ages. In some cases this serf population consisted of an earlier race, who had been subjugated by the conquerors; but there were also instances of persons from famine or other pressing cause selling themselves into slavery, or even surrendering themselves to churches and monasteries for the sake of the benefits to be derived from the prayers of their masters. Different as was the condition of the serf in different countries and at different periods, his position was on the whole much more favourable than that of the slave under the Roman law. He had certain acknowledged rights—and this was more particularly the case with the classes of serfs who were attached to the soil. In England, prior to the Norman Conquest, a large proportion of the population were in a servile position, either as domestic slaves or as cultivators of the land. The humblest was nearly a slave—the *theow*; the other the *Coerl* (q.v.), an irremovable tiller of the ground. The powers of the master over his serf were very extensive, their principal limitations being that a master who killed his serf was bound to pay a fine to the king, and that a serf deprived of his eye or tooth by his master was entitled to his liberty. And English serfdom was always territorial rather than personal. After the Norman Conquest there were various names used for the serfs, who seem ultimately all to have been confounded in one class, though originally different. The *villein* (*villanus*) was the Anglo-Saxon *coerl*; he could also be an Anglo-Saxon small free landowner, depressed by the Conquest. The villeins were the tenants among whom the ploughlands of the township were chiefly distributed, each villein being supposed to have on an average, a *virgate*, i.e. 30 acres of arable *plus* right of pasture. The *cottier* (*cotarius*) or *bordarius*, also an agricultural labourer, had no share in the arable, and was less favourably situated; he might only have a cottage and garden, and no plough or oxen, and might even work for some of the richer villeins. The distinction between a *villanus* (or *rusticus*) and a *cotarius* (or *nativus*) was, however, always maintained in the rolls, but the 14th-century terms, *villeins regardant* and *villeins in gross*, only referred to different ways of proving villeinage in a law-court. There are *servi* mentioned in Domesday Book, but they are few in number, and have disappeared by the 12th century. In strict legal theory all the villein's chattels were his lord's and could be confiscated if the occasion warranted it; he had to do whatever he was bid; he never knew what the morrow's work would be; he could not leave the manor to which he was attached; he was excluded from bearing arms; he could not sit as recognizer in the shire or hundred court; and there were disabilities against him entering the church. In actual practice, however, much of this breaks down. Every shade and local variation of dependence appears, and the definitions of Bracton and other 13th-century lawyers are often artificial and inconsistent. The manor rolls show that villeinage rested on tenure rather than status, and that villein tenure (as opposed to freehold) implied agricultural service (not rent). A freeholder could occupy a villein tenement, and the distinction lies between *villanus* and *liber tenens*; Magna Carta includes both in most of its general provisions, e.g. 'nulli' (sect. 40), 'homines' (sect. 44). A villein was never a personal slave, but only a villein with reference to some particular manor, and, in fact, did practically

own property (cf. Magna Carta, sect. 20, which protects his plough-team even against the crown itself). Enfranchisement was possible by purchase, taking orders (despite legislation on the subject), or residing in a borough for a year and a day. At times they were definitely entrusted with arms; and the uncertainty of service was probably much exaggerated, while in the manorial court they were self-governed, besides being in frankpledge. The complete independence of the villeins, which fitted into the schemes for parliamentary representation (with the theory that 'taxation requires consent'), and which coincided with the substitution of royal writ for feudal tenure, was hastened on and consummated by economic forces. The development of taxation, the spread of trade, the crusading movement, all helped to make money in demand, while even from the beginning there had been a strong impulse to commute services into money as a matter of convenience. Every alienation of demesne implied diminished need of labour on it, and the increase of population meant there were plenty of men to be hired for money when the bailiff wanted it. Just as the food-payments of Saxon and early Norman times passed into the labour services of the 12th and 13th centuries, so the labour services became commuted into money-rent under the three Edwards. Seven years of bad harvests at the beginning of the 14th century, the Black Death (q.v.), and the Peasants' Revolt of 1381 made commutation universal. The villein became the yeoman or small farmer, while conveyance by feoffments came to be the test of freehold. Serfdom lingered on in places, however, for we find a commission issued in 1574 by Queen Elizabeth, to inquire into the lands and goods of all her bondsmen and bondswomen in the counties of Cornwall, Devon, Somerset, and Gloucester, in order to compound with them for their manumission, that they might enjoy all their lands and goods as freedmen. In a few rare instances liability to servile duties and payments in respect of lands seemed to have continued down to the reign of Charles I. In Scotland serfdom died out earlier than in any other country in Europe, being virtually extinct at the end of the 14th century, but in the 17th century a remarkable form of it was revived. Colliers and salters were bound by the law, independent of paction on entering to a coal-work or salt-mine, to perpetual service there; and in case of sale or alienation of the ground on which the works were situated, the right to their services passed without any express grant to the purchaser. The sons of the collier and salter could follow no occupation but that of their father, and were not at liberty to seek for employment anywhere else than in the mines to which they had been attached by birth. Statutes 15 Geo. III. chap. 28 and 39 Geo. III. chap. 56 restored these classes of workmen to the rights of freemen and citizens, and abolished the last remnant of slavery in the British Islands.

In France, though a general edict of Louis X. in 1315 purported to enfranchise the serfs on the royal domain on payment of a composition, this measure seems never to have been carried into effect, and a limited sort of villeinage continued to exist in some places down to the Revolution. In Italy one great cause of the decline of villeinage was the necessity under which the cities and petty states found themselves of employing the peasant population for their defence, whom it became expedient to reward with enfranchisement. In the 11th and 12th centuries the number of serfs began to decrease, and villeinage seems no longer to have had an existence in Italy in the 15th century. Joseph II. abolished serfdom in Bohemia and Moravia in 1781, and in the German lands in 1782. Over a large portion of Germany the mass of the peasants had acquired

their freedom before the end of the 13th century, but in some parts of the Prussian dominions a modified villeinage (*Leibeigenschaft*) continued to exist until swept away by the reforms of Von Stein in the 19th century. In Russia (q.v.) serfdom remained a part of the social system until 1861.

Negro Slavery existed from the earliest times; the Carthaginians seem to have brought caravans of slaves from various parts of North Africa; but in this the negroes suffered no more than other contemporary barbarians. The negro slavery of modern times was a sequel to the discovery of America. Prior, however, to that event the negroes, like other savage races, enslaved those captives in war whom they did not put to death, and a considerable trade in slaves from the coast of Guinea was carried on by the Arabs. The deportation of the Africans to the plantations and mines of the New World doubtless raised the value of the captive negro, and made slavery rather than death his common fate; while it may also have tempted the petty princes to make war on each other for the purpose of acquiring captives and selling them. The aborigines of America having proved too weak for the work required of them, the Portuguese, who possessed a large part of the African coast, began the importation of negroes, in which they were followed by the other colonisers of the New World. The first part of the New World in which negroes were extensively used was Hayti in St Domingo. The aboriginal population had at first been employed in the mines; but this sort of labour was found so fatal to their constitutions that Las Casas (q.v.), Bishop of Chiapa, the celebrated protector of the Indians, interceded with Charles for the substitution of African slaves as a stronger race. As early as the beginning of the 16th century a good many Africans were already in Hispaniola; the emperor accordingly in 1517 authorised a large importation of negroes from the establishments of the Portuguese on the coast of Guinea. Sir John Hawkins (q.v.) praying for help to the Almighty God (who never suffered his elect to perish), was the first Englishman who engaged in the traffic, in which his countrymen soon largely participated, England having exported no fewer than 300,000 slaves from Africa between the years 1680 and 1700; and between 1700 and 1786 imported 610,000 into Jamaica alone. At first the trade was in the hands of special companies, one of which long enjoyed the special right or *Assiento* (q.v.) from Spain of supplying slaves. Most of the English slaving ships belonged first to Bristol, and from 1730 onwards to Liverpool (q.v.). The slave-trade was attended with extreme inhumanity; the ships which transported the negroes from Africa to America were overcrowded to such an extent that a large proportion died in the passage; and the treatment of the slave after his arrival in the New World depended much on the character of his master. Legal restraints were, however, imposed in the various European settlements to protect the slaves from injury; in the British colonies courts were instituted to hear their complaints; their condition was to a certain extent ameliorated, and the flogging of women was prohibited. But while slavery was thus legalised in the British colonies, it was at the same time the law of England (as decided in 1772 by Lord Mansfield in the case of the negro Somerset, and less emphatically by other judges at earlier dates, without any actual statute on the subject) that as soon as a slave set his foot on English soil he became free; though, if he returned to his master's country, he could be reclaimed. Up till this date the contrary impression was the usual one, though public opinion was strongly setting against the custom of keeping slaves. In 1764 there were believed to be

thousands of negro slaves in London; and advertisements of 'black boys' for sale were frequent, as also rewards offered for runaways. As late as November 1771 the *Birmingham Gazette* advertised the public sale of a negro boy, sound, healthy, and of a mild disposition. Even for the British, however, personal liberty was often an illusion rather than a reality. The press-gang seized men for ships of war, and kidnappers impressed them for service in the East India Company or in the American colonies.

Before the idea of emancipation was contemplated the efforts of the more humane portion of the public were directed towards the abolition of the traffic in slaves, mainly under the influence of a sense of Christian duty. In 1787 a society for the suppression of the slave-trade was formed in London, numbering Thomas Clarkson and Granville Sharp among its original members. The most active parliamentary leader in the cause was William Wilberforce, and Zachary Macaulay was one of its most zealous friends. The Quakers were the only religious body who as such petitioned the House of Commons on the subject. Many people, such as the Rev. Raymond Harris, a Jesuit from Liverpool, defended slavery. W. Penn, though he did much to improve the condition of negro slaves, was himself a slave-owner. Boswell, who on this point opposed his master, speaking of 'so very important and necessary a branch of commercial interest,' says: 'To abolish a status which in all ages God has sanctioned and man has continued would not only be robbery to an innumerable class of our fellow-subjects, but it would be extreme cruelty to the African savages, a portion of whom it saves from massacre and introduces to a much happier life' (*Life of Johnson*, chap. xxxv.). Lord Nelson declared he would always be ready to oppose the 'damnable, cruel doctrine of Wilberforce and his hypocritical allies.' In 1788 an order of the crown directed that an inquiry should be made by a committee of the Privy-council into the state of the slave-trade; and an act was passed to regulate the burden of slave-ships and otherwise diminish the horrors of the middle passage. A bill introduced by Wilberforce for putting an end to the further importation of slaves was lost in 1791, but in 1792 Wilberforce, supported by Pitt, carried a motion to abolish the slave-trade gradually. And it is noteworthy that the anti-Christian French convention, influenced by the teaching of Rousseau, decreed (4th February 1794) that slavery should be abolished throughout the French colonies, and all slaves admitted to the rights of French citizens. Meanwhile, conquest of the Dutch colonies having led to a great increase in the British slave-trade, an order in council in 1805 prohibited that traffic in the conquered colonies; and in the following year an act was passed forbidding British subjects to take part in it, either for the supply of the conquered colonies or of foreign possessions. In the same year a resolution moved by Fox for a total abolition next session was carried in the Commons, and, on Lord Granville's motion, adopted in the Lords; and the following year the general abolition bill, making all slave-trade illegal after 1st January 1808, was introduced by Lord Howick (afterwards Earl Grey) in the House of Commons, was carried in both Houses, and received the royal assent on 25th March 1807. British subjects, however, continued to carry on the trade under cover of the Spanish and Portuguese flags; the slave-ships were more crowded than ever, to reduce the chances of capture, and the negroes were not unfrequently thrown overboard on a pursuit. The pecuniary penalties of the act were discovered to be inadequate to put down a traffic so lucrative as to cover all losses by capture.

Brougham therefore in 1811 introduced a bill, which was carried unanimously, making the slave-trade felony punishable with fourteen years' transportation, or from three to five years' imprisonment with hard labour. An Act of 1824 declared it piracy, and, as such, a capital crime, if committed within the Admiralty jurisdiction; and the statute of 1837, mitigating the criminal code, left it punishable with transportation for life. The Anti-slavery Society practically established the colony of Sierra Leone in 1787 as a home for destitute negroes.

The United States of America abolished the slave-trade immediately after Great Britain (1808), and the same was in the course of time done by the South American republics of Venezuela, Chile, and Buenos Aires, by Sweden, Denmark, Holland, and, during the Hundred Days after Napoleon's return from Elba, by France. Great Britain, at the peace, exerted her influence to induce other foreign powers to adopt a similar policy; and eventually nearly all the states of Europe passed laws or entered into treaties prohibiting the traffic. The accession of Portugal and Spain to the principle of abolition was obtained by treaties of date 1815 and 1817; and by a convention concluded with Brazil in 1826 it was declared piratical for the subjects of that country to be engaged in the slave-trade after 1830. By the conventions with France of 1831 and 1833, to which nearly all the maritime powers of Europe have since acceded, a mutual right of search was stipulated within certain seas, for the purpose of suppressing this traffic. The provisions of these treaties were further extended in 1841 by the Quintuple Treaty between the five great European powers, subsequently ratified by all of them except France. The Ashburton treaty of 1842 with the United States provided for the maintenance by each country of a squadron on the African coast; and in 1845 a joint co-operation of the naval forces of England and France was substituted for the mutual right of search.

The limitation of the supply of negroes naturally led, among other good results, to a greater attention on the part of the masters to the condition of their slaves. But the attention of British philanthropists was next directed towards doing away with slavery altogether in the colonies. Societies were formed with this end, an agitation was set on foot, and attempts were made, for some time without success, to press the subject of emancipation on the House of Commons. At length in 1833 a ministerial proposition for emancipation was introduced by Mr Stanley (Earl of Derby), then Colonial Secretary, and an emancipation bill passed both Houses, and obtained the royal assent 28th August 1833. This act, while it gave freedom to the slaves throughout all the British colonies, at the same time awarded an indemnification to the slave-owners of £20,000,000 under cover of a loan, repayment of which was never demanded. Slavery was to cease on 1st August 1834; but the slaves were for a certain duration of time to be apprenticed labourers to their former owners. Objections being raised to the apprenticeship, its duration was shortened, and the complete enfranchisement took place in 1838. The serious decadence of trade and commerce in the British West Indies has been commonly attributed to emancipation; but though the change in the position of the negroes unquestionably contributed to the result, it is clear that before a slave had been manumitted by law the industry of Jamaica and the other islands had already begun to fall off. It must be remembered that though slavery is abolished in the British empire, that is true only of the empire in a restricted sense. Slavery still exists in British protectorates in Africa and in Indian states. In these, however, emancipation progresses.

The French emancipated their negroes in 1848; as did most of the new republics of South America at the time of their establishment; while the Dutch slaves had freedom conferred on them in 1863. In Hayti slavery ceased as far back as 1791, its abolition having been one of the results of the negro insurrection of that year. In Brazil (q.v.) slavery was not abolished until 1888.

The history of negro slavery in the United States is partly dealt with at Negroes (q.v.); the steps that hindered or prepared the way for its final abolition in 1862-65 are part of the history of the United States (q.v.), and are dealt with in such articles as ABOLITIONISTS, BROWN (JOHN), DRED SCOTT CASE, FUGITIVE SLAVE LAW, GARRISON, LINCOLN, MISSOURI (for the 'Missouri Compromise'), &c. Here it may be noted that in 1800 there were in the United States 893,041 slaves; that Vermont, Pennsylvania, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey emancipated their slaves before 1840, most of them by gradual measures. The average value of slaves was about this period stated at \$600. The 3,953,760 slaves at the census of 1860 were in what were known as the Southern States. Eminent leaders of public opinion from the earliest period of the national existence—such as Washington, Franklin, Jefferson, Madison, Jay, Hamilton—regarded slavery as a great evil, and inconsistent with the principles of the Declaration of Independence. The Society of Friends uniformly opposed slavery, and agitated against it. The Presbyterian Church made six formal declarations against it between 1787 and 1836. The Methodist Episcopal Church always cherished strong anti-slavery views; though when in 1844 one of their bishops was suspended for refusing to emancipate slaves he had inherited through his wife, a secession took place, and the Southern Methodist Episcopal Church was formed. Individuals and groups of persons of almost all churches were found defending slavery. In 1835 the Charleston Baptist Association resolved that the right of masters to dispose of their slaves had been distinctly recognised by the Creator. In 1836 a North Carolina bishop strongly commended for publication a sermon which declared that without a new revelation from heaven no man was authorised to pronounce slavery wrong. In 1838 the New School Presbyterian Church in Petersburg, Virginia, protested against a resolution of the General Assembly declaring slavery a sin against God, pronounced that resolution irreconcilable with American civil institutions, and affirmed that the relation of master and slave had been recognised by the great Head of the Church. Yet, on the whole, anti-slavery views grew steadily; but until the crisis of the civil war very many of those who personally held strong anti-slavery opinions hesitated to join actively in abolitionist agitation, as unwilling to invade what many of their fellow-citizens held to be their indisputable rights. To this halting attitude the war put an end.

Mohammedanism (q.v.) recognises the institution; Mohammed's own precepts insist on the kindly usage of the slave; and Moslem slavery is mainly domestic slavery, household slaves being on the whole well treated. But there is no more awful chapter in the history of human callousness and human misery than the story of the slave-trade as carried on by 'Arab' or Moslem slave-traders, its main tracks from the interior of Africa to the coast being in many places marked by the whitened bones of slaves who during the ages sank in the way, fell out of the caravans in spite of the lash, and died or were slaughtered to save trouble. The main regions from which slaves were procured for the Moslem East were the Sudan

proper, the Egyptian Sudan, or Valley of the Upper Nile, Somali Land, and the borders of the Portuguese East African territory. British and other men-of-war have long been employed in capturing slave-dhows on the east coast. In 1869 the Egyptian Khedive Ismail gave Sir Samuel Baker large powers for the suppression of the slave-trade, a crusade carried on by Gordon Pasha. The sultan of Zanzibar signed a treaty for the suppression of the trade in 1873. By occupying Caucasia, Russia stopped an important supply for the Turkish harems; it also closed the slave-markets of Khiva and Bokhara, and by crushing the Turkomans (Tekkes and others) freed at once 40,000 slaves. Cardinal Lavigerie, who became archbishop of Algiers in 1867, made the suppression of the slave-trade and slavery his life work, and secured the help of many zealous fellow-workers. The Congo Free State under Leopold II. disappointed the hopes of its founders, and many of the atrocities associated with it only came to an end with the accession of King Albert (1909), while forcible recruitment of labourers in Central Africa for the St Thomas cocoa plantations was also stopped in the same year. Slavery, implying native labour procured by force or fraud and applied for private profit, has continued into the 20th century in two forms: first, by slave-raiding and business-trafficking in slaves, raids from Abyssinia into Kenya and the Sudan being especially notorious; second, by transfer, gift, inheritance, adoption, debt-bondage. The demand for tropical products (cotton, rubber, sugar, copra, ivory, palm-oil, &c.) involves a demand for cheap labour, together with the tendency to exploit that labour. The problem in many of the British African colonies or protectorates (especially in those on the east, such as Kenya) of obtaining labour fairly and effectively is already serious, as many colonists sink their capital in the country on the assumption that labour is both cheap and plentiful, and wholesale 'removing' of tribes is not a policy to be commended. The League of Nations (q.v.) has done much useful work towards the abolition of slavery, by various conventions (together with related conventions such as those on the illicit trade in arms), of which the most important was that which, under the guidance of Lord Cecil, passed the assembly of the League in 1926. Just previously, the Maharaja of Nepal had liberated over 50,000 slaves in his kingdom, but it was estimated that there were then in the world still some 3,000,000 slaves, of whom about 2,000,000 were to be found in Abyssinia, while the slave-trade was actively practised in various parts of the Sahara, in Liberia, China, in several Mohammedan states in Asia, and in particular in the Arabian peninsula, especially the Hejaz. While labour conditions in the Congo have enormously improved, it would appear that they are still very unsatisfactory in Portuguese Angola and Mozambique, and in other parts of Africa.

See articles on the different countries where slavery was practised, and the Histories, &c., there cited; also Wallon, *Histoire de l'Esclavage dans l'Antiquité* (2d. ed. 1879); Grote, *History of Greece*; Lightfoot, *Commentary on Colossians*; Hallam, *Middle Ages*; Engelmann, *Die Leibeigenschaft in Russland* (1884); Fustel de Coulanges, *The Origin of Property in Land* (Eng. trans. 1891); Freeman, *Norman Conquest*; Stubbs, *Constitutional History* (1874-78); Thorold Rogers, *Work and Wages* (1885); Seebohm, *English Village Community* (1883); various works by Vinogradoff, including *Villainage in England* (1891); the article FEUDALISM; Pollock and Maitland, *History of English Law*; Buxton's *Slavery and Freedom in the British West Indies*; Clarkson's *History of the Slave-trade*; W. L. Mathieson, *British Slavery and its Abolition, 1823-35* (1926); Sir L. Playfair, *The*

Scourge of Christendom (1884); S. Lane-Poole, *The Barbary Corsairs* (1890); French histories of slavery by Larroque and Villiard; Theodore Parker, *Discourses on Slavery*; W. E. Channing, *Slavery*; Mrs Beecher Stowe's *Key to Uncle Tom's Cabin* (1853); J. E. Cairnes, *The Slave Power* (1862); H. C. Carey, *The Slave-trade* (New York, 1853); O. B. Frothingham, *The Abolition of Slavery* (1878); H. Wilson, *History of the Rise and Fall of the Slave Power in America* (1872); G. W. Williams, *History of the Negro Race in America* (1882); E. W. Blyden, *Christianity, Islam, and the Negro Race* (1887); B. T. Washington, *Story of the Negro* (1909); Klein, *Cardinal Lavigerie* (Paris, 1890); W. Stevens, *The Slave in History* (1904); H. J. Nieboer, *Slavery as an Industrial System* (1910); J. H. Harris, *Dawn in Darkest Africa* (1912), and *Slavery or Sacred Trust?* (1926); Klingberg, *The Anti-slavery Movement in England* (1927); the report of the Slavery Commission of the League of Nations; and the publications of the Anti-Slavery and Protection of Aborigines Society. See also the works of Burton, Baker, Barth, Gordon, Stanley, Thomson, &c.; and for 'blackbirding' in the Pacific, see COOLIES.

Slavonia. See CROATIA, SERBIA.

Slavs, or SLAVONIANS (native name, *Slovane* or *Slovane*, probably connected with *slovo*, 'a word,' thus meaning the people who spoke intelligibly as distinguished from their neighbour, *Niemets*, the German, literally the 'dumb man'; this opinion is held by the majority of scholars, but lacks the support of Miklosich, who considers both to be tribal names), the general appellation of a group of nations belonging to the Indo-Germanic family, whose settlements extended from the Elbe to Kamchatka, from the Frozen Sea to Salonika, the whole of eastern Europe being occupied almost exclusively by them. They were settled in this continent before historical times, as their migrations are never mentioned. It seems probable from the description given in the fourth book of Herodotus that at least one of the Scythian tribes, the Budini, was Slavonic, and to it may perhaps be added that of the Neuri. The original names of the Slavonic tribes seem to have been Winds or Wends (*Venedi*) and Serbs. The former of these names occurs among the Roman writers, and later, in Jordanis, in connection with the commercial peoples of the Baltic; the latter is spoken of by Procopius as the ancient name common to the whole Slavonic stock. The earliest historical notices represent the Slavs as having their chief settlements about the Carpathians, from which they spread northward to the Baltic, westward as far as the Elbe and the Saal, and later, after the overthrow of the kingdom of the Huns, southward beyond the Danube, and over the whole peninsula between the Adriatic and the Black Sea. These migrations ceased in the 7th century; the division of the Slavonic stock into separate branches became now more complete, and gradually they began to form independent states. The sections of the stock may be divided into three groups; the western includes the Poles, Wends, Czechs, and Slovaks (the two latter frequently classed together as Bohemians), estimated at about 29½ million; the southern the Serbo-Croatians, Bulgarians, and Slovenes, estimated at 15½ million; the eastern the Great Russians, Little Russians (Ukrainians), and White Russians, estimated at 103 million. This makes a total of the Slavonic populations of 148,000,000, but in many cases accurate figures are not easily available. Many of the old Slavonic states lost their independence and were till the 20th century in a state of greater or less vassalage. Russia, Serbia, and Montenegro alone were wholly independent. Bulgaria was till 1908 a tributary state of Turkey, but practically independent. Till 1918 Bohemia and Moravia were united to Austria, and outside of Serbia and Montenegro there were southern Slavs (Yugo-slavs) subject to Austria,

to Hungary, or to both jointly. Poland was distributed between Russia, Austria, and Prussia. Some Slavonic tribes had never enjoyed independence—e.g. the Sorbs and Slovenes. The Pan-slavism of the 19th century turned out to be an illusion and a dream.

The Slavs are represented by ancient writers as an industrious race, living by agriculture and the rearing of flocks and herds; as hospitable and peaceful, and making war only in defence. The government had a patriarchal basis, and chiefs were chosen by the assemblies. But in the west contact with the feudal institutions of the German empire, and in the east with Byzantium and the Mongols, greatly altered this primitive constitution; the Slavonic princes aimed at unlimited power, and the chiefs succeeded in binding the free peasants to the soil, as the feudal nobility had done. In the course of the 11th, 12th, and 13th centuries a hereditary nobility was formed in some of the Slavonic states. The people sank into the lowest condition of serfdom. Between them and the nobles there was no third or middle class, as the privileges of the nobility prevented the growth of towns, and such trade as there was was chiefly in the hands of foreigners.

The religion of the ancient Slavs, like that of the Teutonic nations, seems to have been in many of its features a kind of nature-worship—not without, perhaps, a predominating divinity: at least so Procopius tells us. But the whole subject of Slavonic mythology is in a very confused state. For our information about Slavonic deities we are indebted to Nestor and the German chroniclers who wrote about the Baltic Slavs—e.g. Thietmar, Helmold, and others. We thus only know the gods of these peoples and the Russians. About those of the Poles, Czechs, and southern Slavs we know very little. The idols, from the accounts given of them, appear to have been of wood; and this is probably the reason why no genuine remains of them have come down to us. The chief deity, whose worship was probably common to all the western Slavs, was Sviatovit, with whom may be associated Perun and Radegast—and some have thought that these three names denote different personations or manifestations of the same power. Of gods of an inferior order we may name Prowe, perhaps a god of justice, and Chernobog, the black god, together with multitudes of demons and spirits good and bad. Thus, among the Russians there were *rusalki*, water-nymphs, *lieshie*, satyrs; and among the Serbs and Bulgarians, *vilas* and *samo-divas*, a kind of malicious fairy.

Some of these deities were worshipped under monstrous forms: thus, Sviatovit had four heads, Rugewit, the god of war, had seven faces, and so on. The Slavs seem to have had some crude notion of existence and retribution after death. Worship was performed in groves and temples, cattle and fruits being offered by the priests, whose office was originally performed by the head of the family or chieftain; perhaps this may be the reason why there is a common name for priest and prince (*knez*) among the western Slavs: the word, however, is certainly borrowed from the O. H. Ger. *chuning*. The eastern Slavs received Christianity from Byzantium in the 9th century, through the instrumentality of Cyril (q.v.) and Methodius; the western from Rome and Germany. They were christianised with little opposition, for they had no religious caste, and there were no persons politically or socially interested in the cultus of their idols.

SLAVONIC LANGUAGES.—The term Slavonic, is a generic name (like Celtic or Teutonic) for a group of kindred languages and people belonging to the great Indo-European family. The Slavonic

languages are in a highly inflected state: the noun has seven cases, and all the numerals are declined. An article is implied in the termination of the adjective, as is shown by the form which it assumes when used as a predicate. As regards tenses, Russian, Polish, and Czech in their modern forms have lost the imperfect and aorist, but they are preserved in Serbo-Croatian and Bulgarian. The poverty of the tense-system is amply compensated by the so-called *aspects*, which are found in every Slavonic verb—e.g. the frequentative, the momentaneous, and others, which supply tenses that may be wanting to the simple verb and express very delicate distinctions of time and manner. The Slavonic family in preserving these aspects has been truer to the old type of language than Teutonic. Traces of them can be seen in Greek and in Old Irish. The prepositions in and out of composition are used with a delicacy reminding us of ancient Greek. These languages have great power of compounding words, and rich vocabularies. The oldest form known is the Palæo-Slavonic or ecclesiastical Slavonic, so called because used in the Orthodox churches. The original home of this language has been the subject of much dispute, and has divided Slavists into two camps; some finding it in Bulgaria, others in the ancient Pannonia, now corresponding to the territory occupied by the Slovenes; hence it is sometimes called Old Bulgarian and sometimes Old Slovenish. It is, however, only an elder sister and not a mother language. The Slavonic family of languages can be divided into groups. The western—Polish (including Kashubish), Czech, Slovak, and Wendic (or Sorbic, divided into two varying dialects); the southern—Serbo-Croatian, Slovenish, and old and modern Bulgarian, the latter having lost nearly all its cases and the infinitive mood; the eastern—Russian, Ukrainian, and White Russian, the latter treated as a distinct language by Miklosich. Polabish, which died out at the beginning of the 18th century, has been preserved in some vocabularies, &c.: from these fragments Schleicher constructed a grammar. Polish, Czech, Croatian, and Wendic are written in the Latin alphabet, and the remainder in the Cyrillic. See the sections on language and literature in the articles BULGARIA, CZECHOSLOVAKIA, POLAND, RUSSIA, and SERBIA. We may here remark that in literature Russian, Polish, and Czech are richest, the two latter nations having developed a literature much earlier than the former. This remark applies especially to Czech, which can show good prose-writing in the 14th century. Many of the Russian and Polish poets have very great merit. Slovenish and Sorbish are poor. The Serbs developed a respectable literature in the 19th century, and the Bulgarians are already active. But both have only recently shaken off the Turkish yoke, fatal to all progress. Serbian, Russian, and Bulgarian are very rich in old ballads and popular songs. These are scanty in Czech, and almost entirely wanting in Polish. Old Bulgarian literature, as it has come down to us, consists mainly of religious works, original and translated.

See books on the Slavs by Mickiewicz (in Fr., 1849), Léger (in Fr., 1873, 1890-99), Korczak-Branicki (in Fr., 1879), Einfeldt (in Ger., 1907), Balch (in Eng., 1910), Niederle (in Fr., 1911), Radosavljevič (Eng., trans. 1919) and Rivet (in Fr., 1919-20); Bibliography by Kerner (1918); books on Panslavism by Krasinski (1848) and Nötzel (1914), both in Ger.; various books on the Slavonic Churches by Jagić (in Ger., 1913, 1916, 1919-20); histories of Slavonic Literature by Safarik (1869), Pypin and Spasović (1880-84), and Murko (1908); all in Ger.; studies of the Literature by Talvi (Mrs Robinson, 1850), Morfill (1883), and Popović (1917), all in Eng.; Anthologies in Ger. by Berneker (1902), and in Eng. by Selver (1919); various works on Slavonic languages by Miklosich, including his Grammar (1868-79) and his Dictionary

(1886), and books by Jagić (1908), and Block (1911), all in Ger. See also the articles on the various Slav peoples and countries, and the books there cited.

Sleaford, a town of Lincolnshire, on the right bank of the Lea, a branch of the Witham, 17 miles SSE. of Lincoln. It has a fine church (12th to 15th century), a grammar-school (1624), and a monumental cross (1850). Here King John fell sick after crossing the Wash, and whilst spending the night in the old castle (now almost wholly disappeared). Pop. 6680.

Sledges, or SLEIGHS, are travelling vehicles without wheels, which in some form are in use in all countries where snow lies for any considerable part of the year. Usually they are on runners—either one or two pairs—which are connected by a framework and support the body of the vehicle; but the well-known travelling-sledge (*pulkha*) of the Laplanders, built in the form of a canoe, with sharp bow and square stern, of light materials and covered with reindeer skin, has no runners. In the northern United States and in Canada, where sleighs are brought to great perfection, lightness, and beauty, they take the place of carriages in winter; and there, too, sleds of lighter build, and supporting a light platform or seat, are made for coasting—i.e. sliding down hills. Long sleds for this purpose, sometimes capable of carrying forty persons, have two pairs of runners with their framework, on which a platform rests (often like a ladder, covered with a cushion); the front pair of runners is turned on a pivot by a steersman with the aid of ropes and pulleys. In Canada toboggans are in popular use for coasting (here called *bogganing*), and consist of a single length of wood (or two boards joined together), about $\frac{1}{4}$ inch thick, curved backward in front, and the curved portion held back by leather thongs. The toboggan, of course, has no runners, may accommodate two to eight persons, and is guided by the steersman's foot dragging behind, toe downward. In Russia sledges are often drawn by a team of three horses (*troika*).

Sleep is symptomatic of repose in the brain and nervous system; in those who are awake cerebral activity is unceasing. Potential energy is being constantly expended in mental operations, vital processes, muscular movements, &c.; also in the perception of impressions that stream towards the brain incessantly from every part of the economy and of the environment. This is attended by wear and tear of the nervous textures, and by the deposition in them of waste-products proportionate to the work effected. Waking is therefore a positive condition—one in which energy is consumed more quickly than it is restored, and than the waste-products are eliminated. It is a state that entails a full working blood-supply to the brain. After a time, longer or shorter, a sense of fatigue suggestive of repose supervenes that is only relieved by sleep. Sleep, on the contrary, is a negative state—one in which these processes are reversed. The brain is inactive; consciousness and volition are in abeyance; coincidentally the central blood-supply is diminished, the brain is smaller in size, and its temperature is lowered. Expenditure of energy is curtailed to the greatest extent compatible with life. Recuperative processes continue, and predominate over the destructive; the nervous structures are depurated, and potential energy is accumulated. When recuperation is completed awaking occurs, and is accompanied by feelings of invigoration. Waking and sleep, therefore, are indicative of cerebral activity and of cerebral rest; they are both physiological functions of a healthy nervous system. When either is unduly prolonged, curtailed, or

modified it gives evidence of a departure from health.

The brain is a composite organ. It contains innumerable centres which dominate an equally vast variety and number of functions; and these require and obtain sleep in varying degrees according to their functions. The supreme (psychical) centres which are constantly alert during waking need more sleep than some of the subordinate centres. These latter rest partially by day, so that the complete abdication of their functions at night is less urgently required.

The incursion of sleep is gradual. It is synchronous with the subsidence of activity in the brain and nervous system, and it is best studied in this connection. Molecular activity does not cease in the whole brain instantly, but in one portion after another until the whole organ becomes tranquil. It is suspended first in the centres situated highest in the cerebrum, and afterwards in those at lower levels, till the medulla oblongata and spinal cord are included. It consequently affects the motor centres of the brain first. The earliest symptom of sleep is the weakening of the voluntary muscles; relaxation takes place in one set after another until the body assumes the horizontal posture. The sphincter muscles are exceptional; they remain contracted. During deep sleep true slackening occurs in the muscular fibres, even in diseases like tetanus and hydrophobia. A man may fall asleep in motion, as in walking or riding, and maintain his equilibrium; a certain amount of activity being sustained in the motor centres enables him to do so. If he yields to sleep in a stationary attitude, the motor centres being quiescent, he tends to sink into the recumbent posture. Activity next wanes in the psychical centres of the brain. The will ceases to control the working of the intellectual faculties, and the perceptive powers are lessened. The mind, no longer inhibited from within nor corrected from without, revels in absurdities until mental operations cease, or, at least, till they are wrapped in oblivion. The centres of the special senses in the brain are next involved, and usually in the following order; they fail to perceive slight or ordinary impressions, while their special nerves transmit them in a slow and imperfect manner. (a) Vision: The eyelids close; the eyeballs turn upwards and inwards in the orbits. The eyeballs occasionally, if rarely, move independently, and not in unison, during sleep. The pupils contract—the contraction being in ratio to the depth of sleep; they dilate widely in the act of awaking. (b) Hearing: Loud noises interrupt sleep, though an expected noise does so more readily. Monotonous sounds do not prevent or interrupt sleep; their cessation may terminate it. (c) Smell: Slight odours may prevent the onset of sleep; but very pronounced smells are required to disturb it. (d) Taste: It is difficult to determine the condition of this sense during sleep, the sense of touch being apt to vitiate the conclusion. (e) Touch: This is the most sensitive sense during sleep. It is chiefly through it that man is warned of danger, and that his safety is secured. Reflex acts can always be elicited, their vigour depending on the strength of the stimulus, the degree of sensitiveness of the part to which it is applied, and the depth of sleep. The centres in the medulla oblongata then become less active. They chiefly dominate the heart, the lungs, and arterial pressure. The heart beats from ten to twenty times less per minute, and the blood pressure is diminished. The respirations are about four fewer per minute. The inspirations are shallower and chiefly thoracic. The pause between inspiration and expiration is practically absent.

Pettenkofer and Voit stated that of the total carbonic acid eliminated in twenty-four hours 58 per cent. is given off during the twelve hours of day and 42 per cent. during the twelve hours of night; whilst 67 per cent. of the oxygen taken in is absorbed during the twelve hours of night and 33 per cent. during the day. The centres that dominate the various secretions only respond to suitable stimuli, and as these are wanting during sleep the secretory organs are less active. The digestive juices are not formed, and if the gastro-intestinal movements do not cease entirely, they are greatly lessened. The urine is secreted in one-fourth the quantity. The quantity of sodium chloride, sulphates, and urea it contains is smaller; the latter is decreased one-half. The secretion of sweat is increased, and that of milk is continued.

In consequence mainly of the inactivity of the bodily functions the bodily temperature falls as much as from 0°·5 to 2° F., chiefly for some hours after midnight; it being lowest about 4 A.M. It falls similarly by day in those who work by night and sleep by day. According to Helmholtz, a man gives off about three times more heat when he is awake than he does when he is asleep. During sleep the economy is more vulnerable to the influence of deleterious surroundings; it has less resisting power. Hence it is that poisoning by gas and the effects of extreme cold, such as frost-bite, are most readily contracted during sleep; hence also the liability to catch cold from sleeping in a draught. Briefly summarised, during sleep the brain, ganglia, medulla oblongata, and spinal cord are in a state of repose. And the extent to which they are involved may be inferred from the fact that sleeping persons suffer little, if any, from shock in accidents which affect those who are awake most injuriously.

Sleep varies in depth in persons of different ages. It is usually profound in the young, and light in the aged. The depth bears some relation to its duration. Natural sleep varies from time to time during the same night. The observations of Kohlschütter, of Rummo and Ferrannini, and of Mönnighoff and Piesbergen showed that it was deepest an hour after its onset, when its intensity decreases quickly, then more slowly, and again it becomes more profound a second time after four to five hours. This is important in sleep-disturbance, for excitations will act more powerfully when it is lightest. On the other hand, when it is deepest the lowest centres are least inhibited, and the blood is less thoroughly oxygenated. It is then that epileptic, convulsive, spasmodic, and such-like seizures are most apt to occur. Cases of sleep lasting for weeks and months have been recorded (that of Johann Latus in the hospital of Myslowitz in Silesia in 1891-92 lasted 4½ months); in Britain it occurs in neurotic patients, and sometimes is called trance. It is pathological and not natural sleep. In western Africa 'sleeping sickness' is a well-known fatal disease.

Cause of Sleep.—For upwards of two thousand years continuous attempts have been made to elucidate the cause of sleep without success; many theories have been promulgated, but they have fallen short of explaining it.

Of *circulatory theories* the one that prevailed during many centuries attributed sleep to a determination of blood to the head; and much evidence was adduced in its support. Nevertheless, congestion of the brain is incompatible in health with good and refreshing sleep. This hypothesis was replaced by the anæmic theory. From the observations of Donders (1854), Durham (1860), Regnard (1868), Hammond and Weir-Mitchell (1869), and Ehrmann, Salathé, and F. Franck (1877), it would seem to be conclusively demonstrated that

the blood-supply of the brain is lessened during sleep. Whether this is causative, concomitant, or consequent is still open to conjecture. Pathological anaemia is a well-recognised source of wakefulness. It appears certain that a blood-supply sufficient for nutritive purposes, but insufficient for mental activity, is an essential factor in natural sleep. The brain, like all other organs, governs and is not governed by its vascular supply.

Humboldt suggested one of several *chemical theories*—that sleep was due to the want of oxygen; and many have since urged that everything that deprives the brain of oxygen conduces to sleep. An atmosphere deficient in oxygen, or one containing an excess of carbonic acid, induces drowsiness and sleep, but it is poisoned, and not healthy sleep. Pflüger believed that activity of the psychical cells depends on the quantity of intra-molecular oxygen they contain, and that all function is attended (particularly in the gray matter) by explosive movements in the cells, caused by the combination of oxygen with the tissue-elements, in which oxygen is consumed and carbonic acid is formed. He thought that these movements used up the oxygen at a greater speed than the circulation could replace, and that a time arrived when the lack of oxygen and an excess of carbonic acid caused drowsiness and sleep. Again, it has been urged that the waste-products (resulting from mental operations) in the nervous textures occasioned sleep. Preyer believed that the accumulation of these (ponogenes) at first caused fatigue, then sleep, and that waking occurred when they were eliminated in sleep. This doubtless is a factor in the causation of sleep, but it does not explain it.

The absence of external stimuli, such as occurs in the darkness and quietness of night, has been credited with causing sleep. It is a desirable aid to sleep, but, in health, sleep ensues despite all disturbing agencies—even on the torture-rack. Sleep has been ascribed to the law of periodicity that governs all organised things. The study of the bodily functions shows that rest and activity alternate—even the heart gets about ten to twelve hours rest in the pauses between its contractions. Of other numerous theories, it will suffice to say that no one of them can be accepted as fully explaining and finally settling the subtle problem. It may be that the mystery will never be solved until a deeper insight into the working of the mind itself is acquired.

How long should one sleep? is a question that must be answered generally. No hard and fast law can be laid down; every man must be a rule to himself. It is quite clear that nature intends everyone to sleep until the effects of waking are dissipated, and until the bodily energy is renovated. In childhood, when the constructive processes of growth involve large expenditure of energy, sleep is long and profound. In youth much sleep is still needed. In middle age, when decay and repair alone require to be balanced, less sleep is required. In old age, when repair is slowly and imperfectly effected, more sleep is desirable. The duration of sleep is also largely influenced by sex, temperament, occupation, habit of sleep, season, climate, &c. The true guide is the recuperation of the energies; that is indicated by a feeling of well-being on awakening. Some persons awake, after sleeping for an apparently sufficient number of hours, worn, jaded, and exhausted. That is an indication of disease, pointing to an inability on the part of their textures to accomplish their reparation.

Sleeplessness.—The effects of curtailed sleep are very marked. The loss of a single night's sleep is attended by symptoms of enervation; that of several

nights' sleep, by serious consequences. In many diseases the lack of sleep determines a fatal issue; conversely, sleep often determines recovery. Few persons appreciate the fact that the voluntary curtailment of sleep for an hour every night for a year is equivalent to the loss of forty-four nights' sleep of eight hours' duration. That represents an enormous expenditure of energy—e.g. during that time the cardiac pulsations are approximately 210,000 and the respirations about 90,000 more frequent than they would have been during sleep. Undue curtailment of sleep is attended by loss of flesh, the essence of emaciation being the preponderance of decay over repair. The skin becomes dry, and it loses its suppleness and translucency. All the bodily textures are badly nourished, and the organs suffer from lack of innervation. When sleep has been limited unduly, inability to sleep ensues and becomes the bane of existence. Exhaustion of the cerebral structures leads to still graver symptoms, such as insanity. Indeed, insomnia preludes or enters to a greater or less extent into the causation of almost every form of mental alienation. They arise from similar causes. Many of the tragedies of life are due solely to the prolonged want of sleep. Insomnia or continued sleeplessness may cause death from exhaustion. Sleep, on the other hand, is a powerful curative agent—one that alone suffices to determine recovery. It has been well called 'the chiefest thing in physic.'

Sleeplessness is a symptom designed to subserve a highly conservative purpose. It attracts attention in some to ailments that might otherwise elude detection; in others it maintains consciousness requisite for the preservation of life. Sleeplessness is symptomatic of cerebral activity. This may be originated and perpetuated in divers ways. It may arise from mental causes, for the mind is dependent on the brain for its external manifestation. In mental overwork, worry, grief, suspense, &c. the intellectual or emotional centres respectively grow hyperæmic. At night the vaso-motor nerves that dominate the arterial vessels, worn out by continued inhibition, fail to moderate the supply of blood to these centres, and so the man is impelled to work and to worry, and he is prevented from sleeping. In the early stages he is long in falling asleep, and when he does it is to dream of his work and worry. Eventually insomnia becomes pronounced. Sleeplessness may depend on faulty conditions in the brain itself. Cerebral cells primarily or congenitally feeble, or secondarily debilitated by unhealthy conditions, display their enfeeblement in an incompetency to accumulate nervous force. Their molecules are rearranged in a preternaturally unstable manner, and they discharge their latent energy in response to trifling excitations. Such cells are designated 'explosive.' The peripheral cells generally participate in the enfeeblement, and they and their conducting nerves transmit impressions in a rapid and exaggerated manner. The reaction-time is lessened. This is a fruitful source of wakefulness in neurasthenia and its allied conditions. Sleeplessness from this cause usually appears at the epochs of life, and under privations or strains. The patient gets to sleep easily, but awakes in two or three hours, to remain awake till five or six in the morning. The awaking is often attended by distress and misery. It is in this class of cases that insomnia often occurs and recurs mysteriously. All neurotic diseases tend to recur paroxysmally; a bad sleep-habit once acquired is liable to return from time to time from very trivial causes.

Sleeplessness may result from a blood-supply altered either as regards quantity or quality. The cerebral cells are very sensitive to their environ-

ment; they bear excess and deprivation badly. Hyperæmia and anæmia of the brain are consequently productive of cerebral unrest and of wakefulness; and these brain-conditions may arise from diseases of the heart, lungs, and other organs, which secondarily implicate the cerebral circulation. The brain textures are unfavourably affected by alterations of vascular tension; high tension is unfavourable to sleep. They are equally disturbed by overheated blood such as pertains to feverish states. They are similarly perturbed by blood contaminated by peccant matters, such as those of gout, rheumatism, syphilis, malaria, &c.; hence the sleep disturbance in these diseases, and also that which follows the excessive use of tobacco, alcohol, &c. In the latter class the patients get to sleep quickly, to awake at two or three in the morning, to lie awake for some hours; and they are often awakened by slight external excitations.

Sleeplessness may be originated by sensory stimuli, which cause contraction of the peripheral and dilatation of the cerebral blood-vessels, acceleration of the heart's action, and an increase of arterial tension. They also cause dilatation of the pupils, and change the character of the respirations; these become deeper, quicker, and more abdominal. Consciousness of external things can alone be aroused by impressions transmitted to the brain textures (themselves insensitive) becoming converted into sensations and ideas through the agency of the mind. When excitations are of sufficient intensity to cause sensations wakefulness is inevitable. Excitations may be instigated in the most varied ways; they include pain of all kinds, and many impressions arising out of digestive and other derangements. They affect the neurasthenic, gouty, and rheumatic unduly.

It is evident that successful treatment depends on accuracy of diagnosis. In each and every case the sleeping conditions of the sufferer should be attended to. Exercise and food should be proportionate to the body and to the strength of digestion. The *primæ viæ* and the state of the skin must not be neglected. A good habit of sleep should be assiduously cultivated. In sleeplessness due to mental causes change of work should be advised, that new centres may be called into operation, and the overwrought ones correspondingly relieved. It is in these cases alone that devices for getting to sleep, such as the monotonous counting of figures, sheep, &c., are efficacious. In bad cases the judicious use of pure hypnotics is helpful; they force the mind into oblivion. Drugs like barbitone and chloral hydrate, which act chiefly on the brain centres that function thought, and induce sleep that closely resembles natural sleep, are called pure hypnotics, in contradistinction to many substances, as narcotics, analgesics, anodynes, soporifics, &c., that arrest pain, diminish sensibility, and disturb in a pronounced manner the functions of the brain and nervous system.

When wakefulness is due to neurasthenic conditions, tonics, increased nutrition, the abandonment of excesses, change of air and scene are indicated; electricity and suitable baths are useful adjuncts; hypnotics should be sparingly employed. Sleeplessness due to hyperæmic conditions of the brain is to be met by sedative treatment; that which depends on anæmia, by tonics, &c. In both, posture during sleep will repay attention. That which originates from gouty, rheumatic, syphilitic, and like poisons only yields to the alleviation of the constitutional state.

In sleeplessness due to sensory stimuli and pain, care must be taken to ensure the removal or mitigation of these, that the sleep they prevent may supervene. Medicines—analgesics or anodynes—

such as belladonna, should be first selected, for they act as indirect hypnotics by operating chiefly on the nerve-terminals. When such remedies fail, narcotics, as morphine and opium, are called for; they not only lessen perceptivity in the brain and sensitivity in the nerve-endings, but they diminish the conductivity of the nerves. Such wide-reaching drugs have many disadvantages in such cases, but pure hypnotics are useless. Hypnotics, narcotics, and sleep-inducing medicines should never be taken except under medical advice. To drug the brain into quiescence without remedying the cause of the cerebral activity will in many cases only aggravate the evil, for they will be complicated by a drug-taking habit. In most instances drugs are best avoided.

Good bibliographies of this subject are to be found in Copeland's *Dict. of Med.* (vol. iii. pt. 2, Lond. 1858); in *Dict. Encycl. des Sciences Médicales*, art. 'Sommeil' (ser. iii. tom. 10, 1881); also in Neale's *Medical Digest* (Lond. 1891). The following may be consulted in connection with the physiology of sleep: Cappie, *The Intracranial Circulation* (Edin. 1890); Carpenter, *Mental Physiology* (Lond. 1874); Durham, *Physiology of Sleep* (Guy's Hosp. Reports, 1860); Fleming, 'On Sleep,' *Brit. and For. Med. Chir. Rev.* (1865); Hammond, *Wakefulness, &c.* (Phila. 1865); Holland, *Mental Philos.* (Lond. 1858); Lemoine, *Du Sommeil au Point de Vue Phys. et Psychol.* (Paris, 1855); Lyman, *Insomnia* (Chicago, 1885); Marvand, *Le Sommeil et l'Insomnie* (Paris, 1881); Moore, *On Going to Sleep* (Lond. 1868); Mosso, *Sulla Circolaz. del Sangue nel Cervello, &c.* (Rome, 1880); Pflügger, *Theorie des Schlafes* (Pflügger's Archiv, 1875); Serguéyeff, *Physiol. de la Veille et du Sommeil* (Paris, 1890); Vulpian, *Leçons sur l'Appareil vaso-moteur (Physiol. et Pathol.) faites à la Facul. de Méd. de Paris* (tom. ii.). In reference to sleeplessness the following may be referred to: Bride, *Sommeil et l'Insomnie des Vieillards* (Lyons, 1888); Fouquet, *L'Insomnie* (Montp. 1867); Hammond, *Sleep and its Derangements* (Phila. 1869); Macfarlane, *Insomnia and its Therapeutics* (Lond. 1890); De Mussy, *Sur l'Insomnie* (Paris, 1866); Pierrot, *L'Insomnie* (Strasb. 1869); Sawyer, *Causes and Cure of Insomnia* (Lond. 1886), and books by Manacée (trans. 1897) and Michaelis (Leip. 1894). See also ANÆSTHESIA, CATAPLESY, COMA, DREAMS, HYPNOTISM, INSANITY, NARCOTICS, SOMNAMBULISM.

In *Plants*, sleep is one of the phenomena of irritability. Light acts on plants as a powerful stimulus, essential to their active and healthful vegetation. When it is withdrawn the flowers of many plants close, and the greater number show a tendency to it, whilst leaves more or less decidedly incline to fold themselves up. The leaf-stalk also generally hangs down more or less, although in some plants it is more erect during sleep. The sleep of plants, however, is not always nocturnal. The flowers of some open and close at particular hours of the day. Thus, the crocus is a morning flower, and closes soon after mid-day; whilst some flowers expand only in the evening or during the night. It was Linnæus who first observed the sleep of plants in watching the progress of some plants of *lotus*, the seeds of which he had sown. The periodic movements of plants, of which sleep is one, have various uses. The opening of flowers in the morning and the closing in the evening are related to pollination. See PLANTS (*Movements*), and PHYSIOLOGY (VEGETABLE).

Sleeping-sickness, the European name for a malady long endemic on the Congo and the west coast of Africa, has of late years appeared in Uganda, where it has proved very fatal. It has been ascertained to be due to the presence in the blood of a parasite of the genus *Trypanosoma*, which is communicated by the bite of one or more species of Tsetse (q. v.).

Sleepy-sickness is a popular name for Encephalitis lethargica (q. v.).

Sleidanus, JOHANNES, historian, was born at Schleiden, in the neighbourhood of Aachen in 1506, and having been trained to the law he entered the service (1537) of Francis I. of France. But becoming a convert to Protestantism he was dismissed (1541); and for the rest of his life he was ambassador of the Protestant princes of Germany, and represented them at the court of England and at the Council of Trent. He died at Strasburg on 31st October 1556. His name lives as the author of a history of the reign of Charles V.—a well-written, impartial work entitled *De Statu Religionis et Reipublicæ Carolo V. Cæsare Commentarii* (1555; best ed. Frankfurt, 1785–86, 3 vols.). Baumgarten edited the Letters of Sleidanus (1881) and wrote a Life of him (1878).

Sleighs. See SLEDGES.

Sleswick (Ger. *Schleswig*; Dan. *Slesvig*), a region divided in 1920 between Prussia and Denmark. Area of Danish province (South Jutland), including the island of Römö (Röm), 1598 sq. m.; area of Prussian province of Schleswig-Holstein, including the islands of Heligoland, Sylt, &c., and the former duchies of Holstein and Lauenburg, 5802 sq. m. Sleswick is separated from Holstein (q.v.) by the river Eider and the Kiel Canal. The whole region belongs to the alluvial peninsula of Jutland, its eastern half being an undulating plain and its western a series of low-lying but very fertile marsh-lands, protected from the ocean by sea-banks. The eastern coast (230 miles) is deeply indented by several long narrow arms of the sea called fjords, some of which make excellent harbours, and alongside it lie the large islands of Fehmern (in Germany) and Alsens (in Denmark). The western coast is more regular, but very low; and a string of low islands (Römö assigned to Denmark; Sylt, Föhr, Pellworm, Nordstrand, and others remaining German) and sandbanks stretching right in front of it protect it to some extent from the waves of the North Sea. The chief occupations of the people are agriculture, cattle-feeding, ship-building, and navigation. Corn and fat cattle are exported, the latter (of an excellent breed) in large numbers to England. Fishing is carried on in the inlets of the Baltic, and there are profitable oyster-beds amongst the sandbanks of the North Sea. Flensburg is the chief seaport of Sleswick. Pop. of undivided Sleswick-Holstein (1910) 1,621,004; pop. of the Danish province (1921) 163,622 (mostly Danes); of the Prussian province of Schleswig-Holstein (1925) 1,518,164. The capital of the latter is Kiel. Protestantism is the religion of the vast majority.

At the dawn of history Sleswick was inhabited by the Cimbri; they were succeeded by the Angles, Jutes, and Frisians. But the greater part of the Angles crossed over into England, and their place was taken by Danes. When Charlemagne reduced the Saxons to his sway the Danish king built a wall from sea to sea alongside the Eider, the southern frontier of his domains, to protect himself against the emperor's attacks. And from that time (808) for 350 years Sleswick alternated between the Danish and the imperial yoke, its duke paying homage sometimes to the king of the Danes, sometimes to the German emperor. In 1157 the duchy was definitively united with the Danish kingdom. Meanwhile Holstein to the south was conquered and christianised by Charlemagne and his successors, and the countship of Holstein formed in 934 by the German king Henry I. Between 1157 and 1225 this southern part of the peninsula was subject to the rule of Denmark. From the year 1386 the Danish duchy of Sleswick and the German countship of Holstein had one common ruler, the Count of Holstein having fallen heir

to the former dignity in that year. About fifty years earlier a compact had been made, the *Constitutio Waldemariana*, by which it was solemnly agreed that the crown of Denmark and the duchy of Sleswick should not in future be held by the same individual ruler. In spite of this agreement, however, King Christian I. of Denmark possessed himself of both Sleswick and Holstein, and, having in 1474 acquired from the Emperor Frederick III. the suzerainty of Ditmarsh, he converted the countship of Holstein into a duchy. The sons of the next Danish king divided his territories amongst them after his decease, and their immediate successors still further subdivided them; but eventually they were all gathered up again (1581) under the heads of the royal line (Glückstadt) and the ducal line (Gottorp). The latter held Sleswick as a fief of Denmark and Holstein as a fief of the German empire; nevertheless the king of Denmark ruled in several detached portions of both duchies.

Ten years after the conclusion of the Thirty Years' War the Duke of Sleswick (Frederick III.), backed by his son-in-law Charles X. of Sweden, declared himself an independent and sovereign prince. This the Danish kings all along resented, and at length, when Charles XII. of Sweden was routed at Pultowa, Frederick IV. of Denmark grasped (1721) the opportunity, invaded Sleswick, expelled the duke, and seized his territories in that duchy. The heads of the ducal line became, one in 1751 king of Sweden, the other (the nominal duke) in 1762 emperor (Paul III.) of Russia, and soon ceased to take any interest in Sleswick-Holstein, the whole of which (both duchies) was formally given up to the king of Denmark in 1767. On the dissolution of the German empire in 1806 Holstein was united with the Danish crown, but was reincorporated in the German Confederation by the Congress of Vienna in 1815. From 1767 the Danish sovereigns had steadily endeavoured to make the duchies thoroughly Danish and to reduce them to complete dependence upon the Danish crown. At length in 1846 King Christian VIII. proclaimed that the law of succession in Sleswick should be the same as for the Danish crown—in other words, that Sleswick was to be made an integral part of the Danish kingdom. This action, as well as the refusal of the king to summon the common estates of the joint duchies, was warmly and actively resented by the people of Sleswick and by the German party in both Sleswick and Holstein. At length (March 1848) the latter, headed by Count Reventlow and Prince Frederick of Augustenburg, rose in revolt. They found a zealous supporter in Frederick William IV. of Prussia, who made himself the executive agent of the German Confederation. War began in March 1848; several severely contested battles, as at Düppel, were fought before peace was made in the end of 1850. Through the intervention of Austria matters were for a time put on a footing satisfactory to the people of the two duchies—so far at least as fair words and fine promises could go. The Danes, however, still pursued their policy of forcible denationalisation in both Holstein and Sleswick. The death of King Frederick VII. of Denmark in the end of 1863 brought the question of succession to a crisis; for Frederick of Augustenburg proclaimed himself Duke of Sleswick, to which title the new king of Denmark likewise laid claim. Austria and Prussia called upon Duke Frederick to abdicate and leave the duchy, and forbade Denmark to proclaim a constitution for it. Both refused to obey. Thereupon the two powers took up arms against the northern kingdom, and after a short but decisive campaign wrested both Holstein and Sleswick from the Danes. How they divided their conquest between them, and then

quarrelled over the division, and how Austria came out of the conflict thoroughly worsted, has been already told under Germany (q.v.). From the conclusion of that war (1866) to 1920, Sleswick-Holstein constituted a province of Prussia. In the northern part of Sleswick, mainly Danish in population, German measures, such as the compulsory use of the German language in schools, &c., were considered oppressive, but the agitation for incorporation with Denmark more or less died down after the treaty of 1907, which settled the quarrel over the Danish 'optants,' who were refused citizenship by both countries, till it was revived by the Great War and by the creation of many new states on the principle of self-determination. Under the Treaty of Versailles a plebiscite was agreed on, and Sleswick was divided for the purpose into three zones. The northern zone voted as a whole; the middle by communes; and the southern (along with Holstein) was left in undisputed possession of Germany. The northern zone voted for Denmark in the proportion of 3 to 1; the second zone for Germany by 4 to 1 (Flensburg, 3 to 1; the remainder, 6½ to 1). Curiously enough the strongest German vote was in the Frisian communes (over 27 to 1). Germany thus lost the northern zone only.

SLESWICK, the former capital of Sleswick-Holstein, stands on the Schlei inlet of the Baltic, 28 miles NW. of Kiel. It was a great trading town in the 9th century, and has a Gothic cathedral (13th century) with a fine high altar (1514-21), and the Gottorp (q.v.) Castle. There are tanneries and fisheries. Pop. 20,000.

Slevogt, MAX, German artist, was born in 1868 in Bavaria. With a fantastic and whimsical style that is very charming, he has specialised in lithography and wood-cuts, after doing much illustrative work for *Jugend* and *Simplicissimus*. He has been termed the 'Mozart of drawing, with a spark or two of Watteau.'

Slickensides are the smooth, polished, or striated, and generally glazed surfaces of joints and faults in rocks. They are considered to have been produced by the friction of the two surfaces during the movement of the rock. Slickensides are often coated with a deposition of calcite, hæmatite, chalcidony, or other mineral matter, which takes the form of the grooves and striæ and thus often looks as if it had been striated. See FAULT.

Sliding Scale. See CORN LAWS; PROFIT-SHARING; TRADE UNIONS.

Sligo (Irish *sligach*, 'shelly river'), a maritime county of Connaught, with an area of 442,295 acres. Pop. (1841) 180,886; (1861) 124,845; (1881) 111,578; (1901) 84,022; (1911) 79,045; (1926) 71,393, mostly Roman Catholics. The surface rises gradually from the coast as far as the Benbulbin range (2072 feet) and the Slieve Gamph. There are some picturesque lakes, and three of the streams are to some extent navigable. The greater portion of the county is on Carboniferous Limestone. On both sides of Slieve Gamph—a metamorphic ridge—conglomerate and Old Red Sandstone appear, skirting the older formation. Iron, copper, lead, silver, and barytes occur. There is fishing on the coast, but the chief occupation is agriculture; tillage has been superseded by pasturage and cattle-feeding. About half the total area is under grass; a fourth part is uncultivable. The bulk of the holdings range between 5 and 30 acres each. Numerous co-operative creameries have been formed. The county was anciently the seat of the O'Connors. There is a group of rude stone monuments at Carrowmore near Sligo, another at Highwood overlooking

Lough Arrow; the remains of a round tower and a beautiful 10th-century cross at Drumcliffe; ruins of ancient abbeys at Ballysadare, Banada Court, and Ballindoon; numerous cashels, raths, souterrains, and some fine castles in ruins. The island of Inishmurray has the remains of an early Christian establishment planted inside an old pagan cashel or rude stone fort.

SLIGO, chief town of the county, stands on the Garvogue, which is spanned by two bridges, 137 miles NW. of Dublin by rail. Pop. 10,000. The town contains a Roman Catholic cathedral, the church of the Dominican Friars, and other places of worship, a Bishop's Palace (Roman Catholic), college, two convents, prison, hospitals, workhouse, two police barracks, town-hall, county court, and the lunatic asylum for the counties of Sligo and Leitrim. Sligo has the termini of three railways, and its port has been much improved. A shirt and clothing factory gives employment. The corn-mills supply five counties with ground maize, oatmeal, and flour; and there are important salmon-fisheries here and at Ballysadare.

Sligo was the scene of some of St Patrick's first missionary efforts, was plundered by the Danes, and often burnt and pillaged. There are traces of an old castle and fort. The beautiful ruins of a Dominican abbey, founded in the 13th century by the Earl of Kildare, still remain. Sligo, besieged by the parliamentarians in 1641, was captured and lost again by the adherents of William III.; constituted a borough by James I. in 1612, it returned two members to the Irish House of Commons. The Act of Union left it one member, and it was disfranchised in 1870.

Slings, as weapons, differed little from the familiar toy. But slings fastened to the end of a short pole were capable of discharging a bolt with such force that at 500 yards distance it could pierce a helmet or a thin shield. The sling was used in the Persian wars. The Balearic islanders were counted of old the most expert with the sling, which was more recently a favourite weapon of several semi-savage peoples, notably the Tahitians in the Pacific. Slings were used by the besiegers during the defence of Chitral; see Sir G. S. Robertson's *Chitral* (1898).

Slip, in a dockyard, is a smooth inclined plane, sloping down to the water, on which a ship is built. It requires a very solid foundation. For the repair of ships of comparatively moderate size slips consist of a carriage with blocks, as in a graving-dock, working on an inclined railway extending for some distance beyond high-water to a sufficient depth below low-water of spring tides to enable vessels to be floated on the carriage. When the vessel is floated over and grounded on the cradle powerful hauling gear, worked by steam or other power, is set in motion to draw the ship out of the water. Slipways are useful adjuncts to shipping ports, and for vessels up to 2500 tons register they are better than a dry-dock, as better light is afforded for making repairs, and no pumping is needed; but this size is nearly the limit, though there is no good reason, if the slip and gearing be made strong enough, why larger vessels may not use slipways. The term slip is applied also to a jetty or pier sloping down from high-water to low-water, so that boats may land passengers readily at any state of the tide. See DOCK, SHIPBUILDING.

Slivno (Bulg. *Sliven*), or SELIMNIA, a town of Bulgaria, at the southern base of the Balkan Mountains, 70 miles N. by W. of Adrianople, is celebrated for its annual fair. Arms, cloth, and attar of roses are manufactured. Population 28,000.

Sloane, SIR HANS, physician and naturalist, was born at Killyleage, County Down, 16th April 1660, the son of an Ulster Scot. He devoted himself to natural history and medicine, and in spite of an attack of hæmoptysis, which lasted from his sixteenth till his nineteenth year, he arrived in London in 1679 a well-read student. His apprenticeship to Stafforth, a pupil of Stahl, and his friendship with Boyle and Ray did much to encourage and advance him in his favourite studies. In France he attended the lectures of Tournefort and Duverney, and obtained on his return, by the active support of Sydenham, a footing in London as a physician. Already F.R.S., he spent over a year (1685-86) in Jamaica, collecting a herbarium of 800 species; and after his return became physician to Christ's Hospital (1694-1724), President of the College of Physicians (1719-35), Secretary to the Royal Society (1693), Foreign Associate of the French Academy (1708), and Sir Isaac Newton's successor as President of the Royal Society (1727). He had been created a baronet and physician-general to the army in 1716, and in 1727 was appointed royal physician. Though of remarkably delicate constitution, he lived to the great age of ninety-two, dying at Chelsea, 11th January 1753. His museum and library of 50,000 volumes and 3560 MSS., offered at his death to the nation for £20,000, formed the commencement of the British Museum (q.v.). He contributed numerous memoirs to the *Philosophical Transactions*, and published in 1745 a treatise on medicine for the eyes. But his great work was the *Natural History of Jamaica* (fol. 1707-25).

Sloe, or **BLACKTHORN** (*Prunus spinosa*), is generally a shrub of 4 to 10 feet high, but sometimes becomes a small tree of 15 to 20 feet. It is

much branched, and the branches terminate in spines. The youngest shoots are covered with a fine down. The flowers are small, snow-white, and generally appear before the leaves. The fruit is ovate, or almost globose, pale blue with blackish bloom, and generally about the size of the largest peas. The sloe is abundant in thickets and borders of woods and hedgerows everywhere in Britain and almost all parts of Europe. The shoots make beautiful walking-



Sloe (*Prunus spinosa*): a, fruit.

sticks. Being spiny, the sloe is sometimes planted as a fence against cattle; but the roots having a habit of spreading and sending up suckers, hedges of it are troublesome to keep from encroaching on the fields. The bark is bitter, astringent, and tonic. The flowers, with the calyx, are purgative, and were once a favourite domestic medicine. The leaves are used for adulterating tea. The unripe fruit dyes black. The fruit, which is very austere, may be made into a preserve; and from it a kind of brandy may be extracted. An astringent extract of it, called *German Acacia*, was once much employed in cases of diarrhoea. The juice has been used to impart roughness to port wine and in the

fabrication of spurious port. The sloe of the southern United States (*P. umbellata*) has a pleasant black or red fruit.

Slonim, a town of Poland (by conquest from White Russia), 75 miles SE. of Grodno. Pop. 25,000.

Sloop is a one-masted cutter-rigged vessel, differing from a Cutter (q.v.), according to old authorities, in having a fixed bowsprit and somewhat smaller sails in proportion to the hull. The terms 'sloop' and 'cutter' appear, however, to be used nearly indiscriminately. In the British navy of the Victorian era a sloop-of-war was a vessel, of whatever rig, between a corvette and a gun-vessel, and ordinarily constituting the command of a commander. In the days of the sailing navy sloops-of-war carried from ten to eighteen guns; but from the introduction of steam the number of guns ceased to be distinctive. Under the new classification of the navy, the term sloop-of-war has been modified, the modern vessels designated sloops are the smallest type of cruiser, about 1400 tons or less and 15 knots speed, carrying three or four 4-in. guns and two anti-aircraft guns. In peace time they are used for showing the flag and police duties—in war time as mine-sweepers and escorts for merchant ships.

Sloth. These animals, which are referable to two genera (*Cholepus* and *Bradypus*), form a distinct family of the order Edentata. Their nearest allies are the armadillos and ant-eaters of South and Central America, to which countries the sloths also are restricted. They are exclusively arboreal animals and entirely vegetable feeders. In the forests which they inhabit it is quite unnecessary for them to descend to the ground in order to reach another tree, as the interlocking of the branches affords an easy passage. It has been asserted that when a sloth is absolutely compelled to walk upon



Two-toed Sloth (*Cholepus didactylus*).

the ground it acquits itself more creditably than might have been expected from an animal so conspicuously fitted for a purely arboreal life; though some authorities allege that it is quite incapable of progression upon the ground. The form of the animal is bulky and awkward; the fingers and toes are long, and furnished with long curved claws, which enable it to obtain and keep a firm hold upon the branches along which it crawls with the body hanging down. The two genera *Cholepus* and *Bradypus* are known respectively as the 'two-

toed' and 'three-toed' sloths, from the number of toes upon the fore-feet. Neither genus has any incisor teeth; they have canines and molars with flat crowns, suitable for crushing vegetable food. The hair of the sloth is coarse and shaggy, and frequently of a dirty green colour, which is due not to any colouring substance in the hair, but to the presence of minute green Algae on the surface. The damp and warmth of the tropical forests probably favours the growth of these Algae, which disappear when the conditions are altered on the removal of the creature from its native forests. The long green hair combined with the lethargic habits of the sloth must be a protection to it against the attacks of jaguars and large snakes, which are its principal foes. This resemblance to a lichen-covered branch is strangely heightened in one species by an oval mark upon the back which bears the closest resemblance to the broken end of a branch. When the sloth is driven to take extreme measures it can use its teeth and claws to good purpose, and it has been even known to grasp a dog round the neck and strangle it.

Sloth Bear. See BEAR.

Slough. See SKIN, SNAKES.

Slough, a town of Buckinghamshire, 18½ miles W. of London and 2½ NNE. of Windsor. It has grown from a mere village since the railway epoch, and is a well-built place, the seat since 1863 of the British Orphan Asylum. Sir William Herschel lived at Slough from 1786 till his death, and his son, Sir John, thereafter till 1840. A huge depôt for Government motor-cars, lorries, &c., was erected here during the Great War. Stoke Poges (q.v.) and the Burnham Beeches (q.v.) are near. Pop. (1861) 3425; (1901) 11,161; (1921) 16,392.

Slovaks, a branch of the Slavs (q.v.) who dwell in the mountainous districts of east Czechoslovakia (q.v.), and number in all about 2,000,000. They are a race of peasants, and live by cultivating the soil. In religion they are partly Lutherans, partly Roman Catholics. These people formed a constituent part of the ancient kingdom of Moravia, but were incorporated among the subject-lands of the Hungarian crown from the beginning of the 11th century to 1918. Their language is little more than a dialect of Czech, the speech of the Bohemians. Down to the end of the 18th century the Slovaks used Czech as their written or book language, but since that period certain patriotic writers—more notably the poets Holly, Chalupka, Sladkovitch, Hurban-Vajanský, and Hviezdoslav, the philologists Bernolak and Hattala, and the novelist Tomaschik—have tried to create a pure written Slovak literature. Their efforts have been opposed by Hungarians and Czechs.

Slovenians, a branch of the south Slavonic stock to which also the Serbs (Serbians) and Croats belong. The Slovenians are found mainly in Styria, Carinthia, and Carniola, and number in all about 1,250,000. They are sometimes called *Winds* or *Wends*, though distinct from the Wends (q.v.) of Germany. There is not much literature in the native speech apart from the 'Freising Fragments' (forms of confession and a sermon), dating from the 10th century, and 16th-century translations of the Bible, until we come to the end of the 18th century. Since the revival of the language which then took place the principal writers have been the poet-philologist Vodnik (1758–1819), the poets Prešern (1800–49), Vesel-Koseki, Aškerc (1856–1912), and Zupančič (b. 1879), the journalists Bleiweiss and Janežič. See SLAVS, SERBIA.

Slow-match, generally rope steeped in a solution of saltpetre and lime-water, and burning at the rate of one foot per hour. Port-fires are very

similar, but burn an inch a minute. They were used for firing guns before the introduction of friction tubes, and sometimes for firing military mines, &c. They were superseded by *Bickford's fuse*, a train of gunpowder enclosed in two coatings of jute thread waterproofed. See FUSE.

Slow-worm. See BLIND-WORM.

Sloyd (Swed. *slöjd*; cf. Eng. *sleight*), a system of manual instruction developed in the schools of Finland and Sweden, and largely adopted in other countries. The word properly denotes work of an artisan kind practised not as a trade or means of livelihood, but in the intervals of other employment. The fundamental idea of educational sloyd is to utilise this in a disciplinary way as an integral part of general education. To this end the older children are engaged in making articles of common household use varying from simple objects such as a flower-stick or a pen-rest to more complicated articles such as a cabinet or a small table. These objects are made from drawings or from models, but to exact measurements, and the utmost accuracy and finish are insisted upon. The tools employed are the ordinary tools of the carpenter, with certain exceptions, the most important of which is the knife. It is held that work of this kind is valuable, as supplementing and correcting the ordinary school education in the three R's. It fulfils the injunction 'to put the whole boy to school,' it develops faculties that are not otherwise exercised, it trains the eye, and in particular gives a general dexterity of hand. It utilises, as a means of education, the universal delight of children in making things, and it develops in a pre-eminent degree habits of self-reliance, order, accuracy, attention, and industry. It tends like gymnastics to the increase of physical strength, and it has a desirable effect socially, inasmuch as it fosters a liking for bodily labour and a respect for it. Above all it stimulates and exercises the practical intelligence or power of thought in dealing with things. To obtain these results the educational ends of sloyd must be kept prominently in view. The teacher accordingly ought to be a trained teacher who has acquired the requisite manual skill rather than an artisan, and the work ought to be properly graduated. Besides wood-sloyd, sloyd-work in iron and in cardboard (*papp-slöjd*) is also practised. There are also various systems of wood-sloyd differing in practical details. The main principles of sloyd had been advocated by many prominent educationists, and in particular by Herbart and by Froebel, of whose kindergarten system sloyd may be regarded as a continuation. But it was in Finland, on the reorganisation of the national system of education by Uno Cygnaeus, that manual work was first made a part of the regular instruction in the common schools. In Sweden this branch of education has been systematised and its principles expounded, chiefly by Herr Otto Salomon, director of the great slöjd-seminarium at Nääs (instituted 1872).

Salomon's *Teachers' Handbook of Slöjd* was translated and adapted for English teachers in 1891 by Mary R. Walker and W. Nelson, who also translated Alfred Johansson's *Practical Directions* (1892).

Slug, a name used for those land-molluscs of the order Pulmonata (air-breathing) in which the shell is rudimentary or absent. They have the same structure as the Snail (q.v.), but the shell, when present, is usually concealed beneath the mantle, though in some genera (e.g. *Urocyclus*) it is visible through an aperture in the mantle, while in others (e.g. *Helicarion*) it becomes decidedly spiral and more exposed, so that it is impossible to draw any hard and fast line between the true slugs and the shell-bearing pulmonates or snails.

The mantle is usually an oval structure placed anteriorly on the back, with an orifice on its right side leading to the pulmonary cavity. In all slugs slime issues anteriorly from a mucous gland in the foot; in *Arion* and some others there is also a posterior gland. Slugs are divided into six families, each of which seems to have been evolved separately from a group of shell-bearing ancestors. The family Succineidæ, in which the jaw has a quadrate accessory plate, contains both testaceous and shell-less genera, the latter being found in South America, the West Indies, and the Indian and Australian regions. The Vaginulidæ, in which the male and female genital orifices are distinct, occur throughout the tropical regions of the world. The Limacidae, including the genera *Limax* and *Agriolimax*, are a family of almost world-wide distribution, known by the possession of a smooth jaw and aculeate marginal teeth. The Arionidæ, the typical genus of which is *Arion*, have a usually ribbed jaw and quadrate marginal teeth; they are found most abundantly in Europe and North America, more sparingly in South America, Asia, and Africa, and not at all in Australia. The Testacellidæ (including *Testacella*) and the Selenitidæ, both of wide distribution, have all the teeth aculeate; the former are without, the latter with, a jaw. Over 500 species of slugs have been described, of which nineteen inhabit the British islands. Of these three belong to *Testacella*, a genus possessing a small external shell on the posterior part of the body. The *Testacellæ* are carnivorous, and devour earthworms, which they

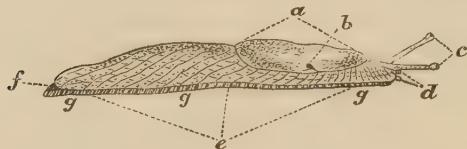


Fig. 1.—Diagram of a Slug:

a, mantle; b, respiratory orifice; c, long horns with eyes; d, short horns; e, sole of the foot; f, posterior mucus pore; g, foot-fringe.

pursue underground. Four species belong to *Limax*—viz. the Great Gray Slug (*L. maximus*) and its ally *L. cinereoniger*, the Yellow or Cellar Slug (*L. flavus*), recognised by its yellowish colour and bluish tentacles, and the Tree Slug (*L. arborum*). Two species belong to *Agriolimax*, the



Fig. 2.—Slugs:

a, *Agriolimax agrestis*; b, *Arion*; c, *Arion empiricorum*, at rest; d, its eggs.

common Gray Slug of our gardens (*A. agrestis*) and the Brown or Marsh Slug (*A. levis*), which is found in damp places. Two are of the genus *Amalia*, which differs from *Limax* in having the back sharply keeled. There are several of the genus *Arion*, differing from *Limax* in the more anterior position of the respiratory orifice, and the

possession of a caudal slime-gland. The Black Slug (*A. ater* or *empiricorum*) is a very large species, varying much in colour, being black, white, black with white sides, black with a red fringe, brown, brown with yellow sides, red, gray, or yellow. The red variety is called the Red Slug, and was considered by Linnaeus a distinct species. The Striped Garden Slug (*A. hortensis*) is a small species common in gardens; it has the under side of the foot yellow or orange. The Irish Slug (*Geomalacus maculosus*) is only found in County Kerry, Ireland, and in Portugal. Slugs do great damage to garden crops, and various methods have been devised for destroying them. They may be sought under stones or boards, or enticed by decaying cabbage-leaves, or collected while on the move at night, or in wet weather. They are readily killed by salt water. They lay their eggs, which often resemble small oval bags of jelly, in clusters in moist places. Slugs frequently climb trees, and some of them, especially the Tree Slug, have the power of descending by means of threads of mucus. The name Slug is often applied by gardeners to the larvæ of saw-flies (Tenthredinidæ).

Slums. See HOUSING AND TOWN-PLANNING.

Sluys, a small town of Holland, province of Zeeland, 6 miles N.E. of Bruges. In the middle ages it was a great seaport, the port of Bruges and Ghent, on an inlet of the North Sea now silted up, so that the town is now two miles from the sea. It is memorable for the naval battle fought off the shore between the English and the French on 24th June 1340, in which Edward III. won a brilliant victory.

Snack, a generic term for small decked or half-decked coasters and fishing-vessels. Most snacks are rigged as cutters, sloops, or yawls.

Smalcald. See SCHMALKALDEN.

Small-arms include all weapons that can be actually carried by a man. They are described under their respective heads, BAYONET, FIREARMS, REVOLVER, SPEAR (or Lance), RIFLE, SWORD. Small-arms are manufactured for the British government at Enfield and Birmingham.

Small Debts is a phrase current in Scotland to denote debts under £20, recoverable in the Sheriff Court (see SHERIFF). In England the same debts are recoverable in the County (q.v.) Court. See DEBT.

Small Holdings. See ALLOTMENTS, CROFTER, PEASANT PROPRIETORSHIP.

Smallpox, or VARIOLA, is one of the most formidable of the class of febrile diseases known as the *Exanthemata* (q.v.). The period of incubation (see under MEASLES) is generally twelve days. All cases of regular smallpox are divisible into three stages—viz. (1) that of the initial or eruptive fever; (2) that of the progress and maturation of the specific eruption; and (3) that of the decline. The course of an ordinary case of discrete smallpox—i.e. one where the pocks remain throughout distinct from each other—will first be described, and afterwards the other forms will be discussed. The first stage begins with rigors, followed by heat and dryness of the skin, a quickened pulse, furred tongue, loss of appetite, pain in the pit of the stomach, with nausea, vomiting, headache, and often pains in the back and limbs. The violence of the pains in the back, and the obstinacy of the vomiting, are frequently very well marked and characteristic symptoms. In children the disease is often ushered in by convulsions; while delirium sometimes attends its onset in adults. On the third day minute red specks begin to come out—first on the face (where they are always most numerous), then on the neck and wrists, and

on the trunk of the body, and lastly, on the lower extremities. These correspond to the incipient *pocks*, which can be felt like small shot under the skin, better, sometimes, than they can be seen. The fever, pain, sickness, &c. usually begin to subside as soon as the eruption appears, and by the beginning of the fifth day, when the eruption is generally fully out, and the *second stage* commences, have entirely disappeared. Upon the second or third day of the eruption a little clear lymph is seen in each pimple, which has increased considerably in size since its first appearance, and which is thus converted into a *vesicle*. The vesicles gradually increase in breadth, and, their contents becoming more and more yellow and opaque, are converted into *pustules*. These are at first depressed in the centre, but at their fullest development often become turgid and hemispherical. The suppuration on the face is complete by about the ninth or tenth day from the commencement of the fever, and the same process rapidly follows in the other parts of the body in the same order of succession as that in which the eruption originally appeared. The progress of the pustules is usually accompanied by swelling of the skin of the face, with a painful sensation of heat and tension; the scalp is often swollen; soreness of the mouth from a modified eruption there is often present; and the patient exhales a peculiar and disagreeable odour. About the eighth or ninth day of the disease a recurrence of the fever, known as the *fever of maturation*, or *secondary fever*, sets in, with a return of headache, restlessness, and sometimes delirium. The *third* or *declining stage* is little more than a period of convalescence. About the eleventh or twelfth day the pustules on the face become brown and dry at the top, or some of them break, and the fluid which oozes out solidifies into a yellowing crust; and from this time the process of *desiccation* goes on, the swelling of the face subsides, and at last only dry scabs remain, which gradually fall off about the fifteenth or sixteenth day. It is not till three or four days after the scabs have formed on the face that the same process is completed over the whole body. The scabs are usually completely gone by the twenty-first day, leaving behind them blotches of a reddish-brown colour, which sometimes continue for some months before they quite disappear; and some of the pustules, in consequence of ulceration of the true skin, may leave pits, especially on the face, which remain permanently. The period of scabbing is accompanied by various symptoms of improvement: the tongue becomes clean, the appetite returns, and by the time that the scabs have fallen off the patient may be regarded as restored to health; so that the entire course of a case of discrete smallpox occupies about three weeks.

Generally speaking, the severity of the disease is proportional to the number of pocks; and when these are so numerous as to run together on any part of the body, the disease is said to be *confluent*. This form differs in many important respects from that already described. The eruption is necessarily modified: the individual pocks are smaller, but by their coalescence they give the skin of the face an appearance 'like a mask of parchment,' and generally lead to much more scarring of the skin. Severe laryngitis and bronchitis, and ulceration of the corneæ, with consequent impairment or destruction of sight, are of frequent occurrence; and salivation is a usual symptom. But most important of all is the difference in the course of the fever. The remission described above in the first stage is slight, if it occurs at all; and the secondary fever, although on this account less conspicuous, is more severe, and much more dangerous to life.

Malignant smallpox is characterised by the severity of the onset, but particularly by the occur-

rence during the first few days of hæmorrhages under the skin, and from the various orifices of the body. Such cases are almost without exception rapidly fatal, sometimes so early that no sign of the characteristic eruption appears at all.

Modified smallpox, sometimes (but not happily) called *varioid*, is the name applied to cases of the disease in which the eruption runs a less severe course than usual. They may be at first discrete or confluent; but the pocks abort either at the papular or the vesicular stage, or if they become pustular are small, and dry up with unusual rapidity. The constitutional symptoms are correspondingly less marked. This form of the disease with rare exceptions occurs only in those who have been vaccinated, or have had a previous attack of smallpox. The form of the disease which followed *Inoculation* (q.v.) had a shorter incubation period (usually ten days), and a shorter and milder course; and the mortality was very much less than when it was contracted by infection.

The *cause* of smallpox is universally allowed to be a specific contagion, of whose nature we are in the most profound ignorance. There is probably no disease so contagious as this. Dr Haygarth stated (in 1793) that, during his long attention to this subject, not a single instance had occurred to prove that persons liable to smallpox could associate in the same chamber with a patient in the distemper without receiving the infection. The contagion acts either through the air, or by contact with the skin, or by inoculation; and the disease may be caused by the dead body, even when it has not been touched. What products of the diseased body are contagious is not exactly known, but the contents of the pustules and the dried scabs certainly are so. Opinions are divided as to the period at which the disease begins and ceases to be contagious. It is safest to maintain that it is capable of self-propagation as soon as the febrile symptoms have exhibited themselves. How soon the patient ceases to be dangerous cannot be decided with accuracy; but the stability of the contagious principle may be inferred from the fact that clothing will retain it for months, and it is said for years, when confined. Like all the contagious exanthemata, smallpox appears in an epidemic form, at irregular and, in our ignorance, it would almost seem capricious intervals. After an extraordinary exemption, perhaps for years, a district is suddenly invaded by it, and continues to suffer for a longer or shorter period, after which the disease spontaneously disappears—dies out, as it were—and does not reappear perhaps for years. Different epidemics vary very much in their severity, and isolated cases are usually milder than those occurring when the disease is epidemic. Race has much to do with the severity of the disease, the constitution of the dark races, especially the Negro, being singularly susceptible of the contagion, and exhibiting very little power of resisting the fatal tendency of the disease.

It is generally admitted that the discovery of *Vaccination* (q.v.), by which smallpox has lost much of its danger, is one of the great achievements of modern medicine. *Inoculation* (q.v.) protected the individual, but was liable to spread the disease, and sometimes caused fatal cases; while vaccination has the advantage of protecting both the individual and the community.

With regard to prognosis, it may be stated generally, it is a very fatal, and was formerly an extremely destructive disease—one death occurring in every four or five cases. Modified smallpox is very seldom fatal, although instances of death are occasionally reported. Smallpox is more fatal at the two extremes of life than in the intervening period, and is especially dangerous in pregnancy.

In olden times it was believed that the eruption was an effort of nature to get rid of the noxious matter, and hence heating and stimulating measures were adopted with the view of promoting the eruption. To Sydenham belongs the credit of first recommending an entirely opposite or cooling mode of treatment; but his suggestions met with the most strenuous opposition, and it was not till long after his death that the cooling treatment was fairly established. In mild cases, and in cases of modified smallpox, the physician has merely to guard the patient against hurtful influences, such as stimulating foods or drinks, too hot a room, or improper exposure to cold, and to prescribe cooling drinks during the fever, and occasional laxatives if they shall be required. In more severe cases the fever may be combated by saline purgatives, prescribed so as to produce two or three liquid stools daily, and by free ventilation of the surface of the body. When the eruption is all out, if the pimples on the face are few and distinct the danger may be regarded as over, and no further treatment is required. If, however, the disease assume a confluent form, wakefulness and restlessness are apt to come on about the eighth day, and soporific drugs may be administered with benefit. If the pustules are abnormally torpid in reaching their maturity, it may be expedient to administer strong broths, or even wine; and when the pustules are livid, and intermixed with Petechiæ (q.v.), cardiac stimulants are necessary in addition, although the patient is then too often beyond the reach of help. During the secondary fever the bowels must be kept gently open, and hypnotic and soothing remedies are often required. A more nourishing diet is now called for, and wine should be given if the pulse is very weak. The external itching is partly relieved by opiates, but local applications are also employed: cold cream, or a mixture of ichthyol 10 per cent. in glycerin, may be thus used with advantage. Numerous special methods have been devised for the purpose of preventing the pitting or scarring of the face, which is often a hideous permanent disfigurement to the patient, e.g. boracic fomentations, but there is not yet sufficient evidence that any of them is uniformly satisfactory in its results.

During the period of desquamation an occasional warm bath may be prescribed with advantage; and the patient should always resort to this measure, as a precaution against carrying the contagion about with him, before again mixing in society.

The history of this remarkable disease is clothed in considerable obscurity. Its original habitat is quite uncertain; but there seems no doubt that it has been prevalent in India from a remote period, and in China since at least 200 years before the Christian era. It has been conjectured that it was one of the pestilences which occurred in Europe during the first and second centuries after that era; but the first accurate description of it is that of Rhazes, an Arabian physician, who flourished early in the 10th century. It appears to have reached England towards the close of the 9th century. After the Crusades it prevailed in most of the temperate countries of Europe, but did not reach the northern countries of Norway, Lapland, &c. for some time later. In 1517 it was carried from Europe to St Domingo; and three years later it reached Mexico, where it committed fearful devastations, and whence it spread with intense virulence throughout the New World. (According to Robertson, three millions and a half of people were destroyed in Mexico alone.) In 1707 it was introduced into Iceland, when more than a fourth part of the whole population fell victims to it; and it reached Greenland still later (1733), when it spread so fatally as almost to depopulate the

country. These cases are striking illustrations of the law that seems universally true, that a contagious disease is always most virulent on its first introduction to a new scene of action. At the present day the interior of Africa, and especially the upper basin of the Nile, seems to be the region where smallpox is most destructive. In Europe it is constantly present in most of the large cities; but during the 19th century—i.e. since the introduction of vaccination—epidemics were much less frequent and severe than before. The most intense and wide-spread was that of 1869-73 (see Report of Medical Officer of the Privy-council, 1874). Smallpox seems first to have been called by that name in the 15th century; *pockes* or *pox* (a contracted plural of *pock*) having come to be loosely used for several eruptive diseases, and especially for 'French pox' or syphilis. Till Sydenham's time measles and scarlet fever were frequently confounded with smallpox.

For smallpox in sheep, see SHEEP-POX.

Smalt. See BLUE, COBALT.

Smaragdite, a peculiar variety of Amphibole (q.v.), light grass-green in colour, with a foliated, lamellar, or fibrous structure. It occurs as a constituent of the rock called Eklogite.

Smart, CHRISTOPHER, a hapless English poet, was born at Sliphbourne in Kent, 11th April 1722, and was educated at Maidstone, Durham, and Pembroke Hall, Cambridge, of which he was elected fellow in 1745. He won the Seatonian prize for an English poem on the attributes of the Supreme Being five times, and left college on his marriage to a step-daughter of John Newbery's in 1752. He now became a bookseller's hack, and made for some years a hard living betwixt improvidence, dissipation, and the expense of wife and children. His mind at last gave way, yet he lived on, with a few brief intervals of sanity, till his death in the rules of the King's Bench, on the 21st May 1771. Smart was assisted by Samuel Johnson in his monthly publication, *The Universal Visitor*, and the moralist preserved a kindly feeling for him in his misfortunes. 'I did not think he ought to be shut up,' he said to Burney. 'His infirmities were not noxious to society. He insisted on people praying with him; and I'd as lief pray with Kit Smart as any one else. Another charge was that he did not love clean linen: and I have no passion for it.'

Smart's works include a number of feeble epigrams, birthday odes, and occasional poems; the *Hilliad*—a heavy satire in answer to a criticism of [Sir] John Hill's; a bald prose translation of Horace (1756), well known to schoolboys; a poor poetical translation of *Phædrus* (1765), and a still poorer metrical version of the *Psalms* (1765), of the *Parables* (1768). His poems were collected in 1791, but the editor was careful to exclude the only thing that now claims a notice, *A Song to David* (printed 1763; ed. Blunden, 1924), some of the stanzas of which are said to have been scratched with a key on the walls of his madhouse. The poem extends to a hundred stanzas, and is marred by repetitions, and grievous defects of rhythm and structure, but it shows a genuine spark of true poetic inspiration not common in its age, and it is not too much to say that the poor poet here for once 'had reached the zenith from his madhouse cell.' Rossetti called it 'the only great accomplished poem of the last century . . . A masterpiece of rich imagery, exhaustive resources, and reverberant sound.'

Smart, HENRY (1813-79), composer, nephew of Sir G. T. Smart (1776-1867, organist to the Chapel Royal), was educated for the law, but early became famous as an organist. His more ambitious compositions (operas, cantatas) have not held their ground, but he is still known for

his organ works, part songs, and church music. See the Life by Sparks (1880).

Smartweed, a name given to some plants of the genus *Polygonum* (q.v.) on account of their acrid properties; especially *Polygonum Hydropiper*, or Water-pepper.

Smeaton, JOHN, an eminent civil engineer, was born at Austhorp near Leeds, 8th June 1724, and early showed a bent towards mechanical pursuits. On leaving school, where he excelled in geometry and arithmetic, he entered his father's office as law clerk; but his heart was not in his work, and about 1750 he removed to London, to commence business as a mathematical instrument maker. In the following year his experiments in mechanical invention were resumed. His improvements on mill-work gained him the Copley Medal of the Royal Society in 1759. In 1753 he was chosen a member of the Royal Society; and in the following year he visited the Netherlands, and inspected the engineering works of that country. In 1755 the second wooden lighthouse on Eddystone (q.v.) rock was destroyed by fire, and the re-erection of the work was entrusted to Smeaton. The new lighthouse was built of stone (1756-59), and this great work, the greatest of its kind hitherto undertaken, remained for 120 years a stable monument of Smeaton's engineering skill, till the erection of the new Eddystone close by (1879-82). Even after his great achievement Smeaton seems to have had little employment, as he applied for and obtained in 1764 the post of 'receiver of the Derwentwater estate;' and this situation he held till 1777, by which time he was in full professional employment. The chief of his other engineering works were Ramsgate harbour (1774); the Forth and Clyde Canal; several important bridges in Scotland (Perth, Banff, Coldstream), together with an immense amount of mill-machinery. He also improved Newcomen's steam-engine. He was in constant attendance in parliament during a large portion of his life. In 1783 his health began to decline, and he retired from active business, dying at Austhorp of paralysis, 28th October 1792. In 1781 Smeaton wrote a *Narrative of the Construction of the Eddystone Lighthouse*. The Society of Civil Engineers published posthumously his numerous professional Reports (3 vols. 1797), which were regarded by his successors 'as a mine of wealth for the sound principles which they unfold, and the able practice they exemplify.'

See a *Short Narrative of John Smeaton* (1793); and *Smiles's Lives of the Engineers* (new ed. 1904-5).

Smectymnuus, a name compounded of the initials of the following five divines: Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstow, joint-authors of *An Answer* (1641) to Bishop Hall's *Humble Remonstrance to the High Court of Parliament* (1641), in defence of the liturgy and episcopal government. Of the five authors, the chief was Thomas Young, Milton's tutor.

Smederevo. See SEMENDRIA.

Smedley, FRANCIS EDWARD, novelist, was born in 1818 at Marlowe. Always deformed, he took early to writing, his half-dozen works including *Frank Fairleigh* (1850), *Lewis Arundel* (1852), and *Harry Coverdale's Courtship* (1855). Bright, cheery books, these appeared originally in *Sharpe's Magazine*, of which Smedley for two years was editor, and they were illustrated by Cruikshank and 'Phiz.' He died in London, 1st May 1864.

Smeinogorsk. See ZMEINOGORSK.

Smell. See NOSE, SENSATION.

Smelling Salts. See SALTS.

Smelt (*Osmerus*), a genus of Salmonidæ, or of

a distinct family, Argentinidæ. The dentition is peculiar—e.g. in the canine-like character of some of the teeth, and in the presence of a row on each side of a groove in the roof of the mouth. The Common Smelt (*O. eperlanus*), called *Spirling* or *Sparling* in Scotland, and *Eperlan* in France, is a fish of 8 or 10 inches (rarely 12 inches) in length. The form is very trout-like, but rather more slender; the tail is larger in proportion, and more forked. The lower jaw is longer than the upper. The back is whitish, tinged with green; the upper part of the sides shows bluish tints, the lower part of the sides and the belly are of a bright silvery colour. The smelt has a peculiar, cucumber-like smell, and a delicious flavour, on account of which it is highly esteemed for the table. From the sea smelts often ascend estuaries and rivers, and they thrive well in lakes and ponds. The same is true of the common American species—*O. mordax*. A third species—*O. thaleichthys*—of smaller size occurs on the Pacific coasts of North America, and another—*O. dentex*—on the corresponding Asiatic coasts. The name smelt is sometimes extended to related genera—e.g. *Argentina*, *Retropinna*, and the Pacific surf-smelts (*Hypomesus*).

Smelting. See COPPER, IRON AND STEEL, &c.

Smeru, or SEMIRU, the highest mountain of Java near the eastern end of the island. It is 12,240 feet high, and is an active volcano.

Smerwick, a peninsula and bay in County Kerry, Ireland, where in July 1579 Sir James Fitzmaurice landed, by authority of the pope, with a number of Italian and Spanish soldiers. They entrenched themselves within a fort, but in November were overpowered and put to the sword, to the number of six hundred, by Lord-deputy Grey and young Walter Raleigh. This gruesome story is introduced into Kingsley's *Westward Ho!*

Smetana, BEDŘICH (1824-84), pianist and composer, was born at Leitomischl in Bohemia, and studied music under Proksch; he taught and directed concerts, mostly in Prague, and was conductor at the National Theatre there from 1866 till 1874, when he lost his hearing. His compositions include the operas *The Bartered Bride* (1866), *Dalibor*, *Libuše*, *Two Widows*, *The Kiss*, *The Secret*, the cycle of six symphonic poems *My Country* (1874-79), and the string quartet *From My Life*. Many of his works, characterised by splendid vigour, spontaneity, and often by a certain refreshing humour, deal with episodes of Czech life and history (though never actually employing folk-tunes), and he is regarded as the founder of the modern Czech school of music. There are studies in French by Ritter (1907), and in German by Rychnovsky (1924).

Smethwick, a municipal (1899), county (1907), and parliamentary borough of Staffordshire, about 3 miles west of Birmingham. There are important iron, glass, chemical, and machine works. Pop. (1891) 36,100; (1901) 54,539; (1921) 75,757.

Smew. See MERGANSER.

Smilax, a genus of Liliaceæ, or according to some (on account of anatomical differences) of a separate family Smilacaceæ. It consists of herbaceous or half-shrubby plants, generally climbing, with net-veined leaves having tendrils at the base, six stamens, a free three-celled ovary, three stigmas, and a roundish berry. The typical genus (*Smilax*) is the most important of the tribe. The Sarsaparilla (q.v.) of commerce is the product of the roots of several species of *Smilax*; and the large fleshy tubers of *S. China*, a native of China and Japan, are nutritious and used for food. *S. Pseudo-china*, an American species, has similar tubers, which are used for making beer and for fattening hogs in some parts of the United States.

Smiles, SAMUEL, author of *Self-Help*, was born at Haddington in 1812. His family owed much to the intelligence, shrewdness, and force of character of their mother, who, when left a widow with a family of eleven, continued successfully to conduct a small business. Samuel Smiles had artistic leanings, but studied medicine in Edinburgh, took his degree when he was twenty, and published at his own expense a work on *Physical Education* (1838). At first he practised in Haddington as a medical man with small success, lectured on chemistry, and wrote articles for an Edinburgh newspaper. He settled as a surgeon in Leeds, but abandoned this for the editorial chair of the *Leeds Times*. He became secretary of the Leeds and Thirsk Railway Company in 1845, and in 1854 secretary of the South-Eastern Railway, retiring in 1866. While at Leeds he came into contact with George Stephenson, and conceived the idea of writing his life, a work which he eventually accomplished (1857). *Self-Help* followed in 1859, and was soon an assured success, 20,000 copies being sold during the first year, and up till 1889 the sales had reached 150,000 copies, while the book had been translated into seventeen languages. Some young men in Leeds who met in the evening for self-education had asked Smiles 'to talk to them a bit,' though really written before, it was only after the success of Stephenson's life that *Self-Help* appeared. Henceforward his career was that of a popular author and compiler, varied by travel to the scenes of the labours of the characters he described. He recovered from an attack of paralysis in 1871; was made LL.D. by Edinburgh in 1878; and lived till the 16th of April 1904, leaving an *Autobiography* to be published in 1905.

To the *Self-Help* series of books he added *Character* (1871), *Thrift* (1875), *Duty* (1880), and *Life and Labour* (1887). Works which teach the same truths by example are *Lives of the Engineers* (1861); *Industrial Biography* (1863); *Lives of Boulton and Watt* (1865); *Thomas Edward* (1876); *George Moore* (1878); *Robert Dick* (1878); *James Nasmyth* (1883); *Men of Invention and Industry* (1884). Besides contributions to the *Quarterly Review*, he also published *The Huguenots in England* (1867), and *The Huguenots in France* (1873); *A Publisher and His Friends: John Murray* (1891); and *Jasmin, the Barber-poet* (1891).

Smillie, ROBERT, miners' leader and Labour member of parliament, was born of Scottish parents in Belfast in 1857. At the age of 14 he worked in a Govan shipyard; at 16 he began his career as a Lanarkshire coalminer. Engaging early and actively in trade union work, he was from 1894 to 1918 president of the Scottish Miners' Federation, from 1912 to 1921 of the Miners' Federation of Great Britain, and again from 1921 of the Scottish Federation. A good fighter and a trusted leader, he was yet unsuccessful as a parliamentary candidate until 1923, when he was elected for Morpeth. See his *My Life for Labour* (1924).

Smirke, SIR ROBERT, architect, was the son of Robert Smirke (1752-1845), a well-known painter and book-illustrator, and was born in London in 1781. He became R.A. in 1811, was architect to the Board of Works, and was knighted in 1831. He died at Cheltenham, 18th April 1867. Smirke's public buildings are usually classical, his domestic dwellings Gothic. London is full of his work. Covent Garden Theatre (1809) was his first great undertaking; the British Museum (1823-47) the greatest. Others of his buildings are the Mint, the Post-office, several of the clubs (including the Carlton), the College of Physicians, King's College, and courts of justice in various parts of the country. He was entrusted with the restoration of York Minster after the fire (1829). Lowther Castle is a specimen of his domestic architecture. His brother Sydney Smirke, R.A. (1799-1877), was associated with him in some of his labours.

Smith, one of the oldest and most wide-spread of English family names, not to be regarded as belonging to one but to very many distinct families. It is, of course, derived from the honourable trade of the smith; the smith being originally a worker in metal or wood, and so nearly equivalent (when not compounded as in goldsmith, locksmith, arrow-smith) to 'craftsman' or 'artificer.' At first the name was not hereditary, but was used as a description of the individual: in the 14th century we have John Smyth, son of Thomas Wright (John being a smith and Thomas a carpenter); John's son might be called William Smythson, and his daughter Mary Smythdoghter. But soon the name became purely hereditary; and it is obvious that there would be many founders of Smith families. Philip le Smethe, William le Smyt, Henry le Smeyt show ancient forms of the name; Smyth, Smythe, and Smijth (derived from a form with a dotted y, Smyth) are also old variants which still survive. Smithson, Smithman, Brownsmith, Redesmith, Nasmyth (= Nail-smith), &c. are derivative forms. Corresponding in meaning are the Latin *Faber*; French, *Le Fevre*, *Lefevre*, or *Lefebvre*; Italian, *Fabroni*; German, *Schmidt*; Dutch, *Smid* and *Smits*. The Celtic *Caird* and *Gow* are nearly equivalent. The English names Ferrier, Ferrers, Ferrars are from the Latin *Ferrarius*, 'farrier' or 'shoesmith.' See NAMES.

In the London directory the Smiths fill seven pages (averaging 200 entries) of the commercial section (as against three and a half pages of Joneses, and three of Browns): in Edinburgh Smiths and Browns are about equal, while Jones is among the rarer names. In English literature they constitute a mighty army: Allibone's *Dictionary of British and American Authors*, with its supplement (1891), enumerates no less than 1069 several and distinct authors of the name of Smith (seventy-five of them William Smith), without counting Smyths, &c. The editor of the *Dictionary of American Biography* has thought no less than 199 persons of the name worthy of notice in that work. To such exhaustiveness the present work cannot pretend; but besides the subjects of the articles below, we add a list of Smiths whose names are more or less familiar in philanthropy, literature, science, or art.

Anker Smith, engraver (1759-1819); Charles Piazzi Smyth, astronomer-royal for Scotland (1819-1900); Charles Roach Smith, antiquary (1807-90); Charlotte Smith, poet and novelist (1749-1806); Eli Smith, American missionary to Syria (1801-57); Sir Francis Pettit Smith, mechanical inventor (1808-74); F. E. Smith, Lord Birkenhead (b. 1872), Lord Chancellor 1919-22, Secretary for India from 1924; George Smith, of Chichester, landscape-painter (1713-76); Rev. Sir George Adam Smith, Principal of Aberdeen University (b. 1856); Gerrit Smith, American philanthropist (1797-1874); Henry Boynton Smith, D.D., American Presbyterian divine (1815-77); James Smith of Deanston, Scottish agriculturist (1789-1850); Sir James Edward Smith, botanist (1759-1828); John Smith, mezzotint engraver (1652-1742); John Raphael Smith, painter and mezzotinter (1750-1812); John Pye Smith, D.D., LL.D., divine and geologist (1774-1851); John Stafford Smith, composer (1750-1836); Robert Angus Smith, Scottish chemist and hygienist, author of *Air and Rain*, &c. (1817-84); Robert Archibald Smith, composer of Scottish songs and psalm-tunes (1780-1829); Sir Thomas Smith, Elizabethan statesman and scholar, author of *De Republica Anglorum* (1514-77); Thomas Smith, of Derby, painter (c. 1709-67); Thomas Southwood Smith, M.D., hygienist, author of *Philosophy of Health and Epidemics* (1788-1861); Sir William Alexander Smith, founder of Boys' Brigades (q.v.; 1854-1914); William Henry Smith, author of the philosophical novels *Thorndale* and *Gravenhurst* (1808-72).

Smith, ADAM, the founder of political economy as a separate branch of human knowledge.

was born in the town of Kirkcaldy, Fife, on 5th June 1723. His family belonged to the respectable middle class; his father was comptroller of the customs at the port of Kirkcaldy, and his mother, Margaret Douglas, was the daughter of a small Fife-shire laird. His father died a short time before his birth, and the boy was the object of the care and solicitude of a widowed mother, to whom he was closely attached, and who lived to be proud of his attainments. When he was no more than three years old the poor woman got a sad fright, from a calamity hardly known at the present day—the child was stolen by tinkers; but he was tracked and recovered by his uncle as they were seeking a hiding-place in the neighbouring wood of Leslie. This was the only adventure in his quiet life. After getting the usual burgh-school education in Kirkcaldy, he was sent, in 1737, to the university of Glasgow, where he seems to have devoted himself mainly to mathematics and natural philosophy, though Hutcheson was the professor of moral philosophy. He secured an exhibition on the Snell foundation, which took him to Balliol College, Oxford, where he studied for seven years, and left traditions as of a man of large acquirements and peculiar independence of thought. It is said that he was intended for the English Church, but if so his own convictions crossed the designs of his friends. He returned to Kirkcaldy, and lived for a while with his mother there in undisturbed seclusion and study. In 1748 he came to Edinburgh, where silently and unostentatiously he became one of the brilliant little circle of men of letters who were then rising to importance, amongst his friends being David Hume, John Home, Dr Hugh Blair, Lord Hailes, and Principal Robertson. In 1751 he got the chair of Logic in the university of Glasgow, and this was changed a year afterwards for that of Moral Philosophy. In 1759 appeared his *Theory of Moral Sentiments*, celebrated for its reference of the mental emotions to the one source of sympathy. The *Dissertation on the Origin of Languages* was published along with the later editions of this book. Both had a great reputation in their day, and, although they are now obscure books in comparison with that other by which the author's name is remembered, the position they held with respectable thinkers gave a hearing to his doctrines on political economy which they would hardly have otherwise obtained. In 1762 the university of Glasgow gave him the degree of Doctor of Laws. In the following year he undertook a task, which might at first seem very uncongenial to a mind like his, given to retired study and independent thought and action—he became 'governor' or travelling tutor to the young Duke of Buccleuch. He was then sedulously collecting materials for his great work, and no doubt the inducement to accept the office was the opportunity it gave him for travelling and seeing for himself. He had the opportunity of being nearly a year in Paris, and of mixing in the circle of renowned wits and philosophers of the reign of Louis XV., including Quesnay, Turgot, and Necker. In 1766 his engagement came to an end, and he returned to Kirkcaldy to live in the old house with his mother.

The year 1776 was an era in the history of the world as well as that of the Kirkcaldy recluse, by reason of the appearance of the *Inquiry into the Nature and Causes of the Wealth of Nations*. If there was any living man to whose works he was indebted for the leading principles of this book it was David Hume, and it was from him, as best understanding the fullness and completeness of the exposition, that it had its first emphatic welcome. He wrote immediately on receiving it: 'Euge! Belle! Dear Mr Smith, I am much pleased with

your performance; and the perusal of it has taken me from a state of great anxiety. It was a work of so much expectation by yourself, by your friends, and by the public that I trembled for its appearance, but am now much relieved. Not but that the reading of it necessarily requires so much attention, and the public is disposed to give so little, that I shall still doubt, for some time, of its being at first very popular. But it has depth, and solidity, and acuteness, and is so much illustrated by curious facts that it must at last take the public attention.' This was not destined to be exactly the literary history of this great work. Its startling doctrines, fine clear style, and abundant illustration from curious facts took at first; but counteracting influences arose when people saw how far the new doctrines went in playing havoc with old prejudices. The French revolution set the mind of the country bigotedly against everything that breathed of innovation. It was known that the younger Pitt participated at first in Smith's free-trade notions, but he had afterwards, whether from permanent conviction or temporary policy, to put himself in the foremost ranks of the enemies of innovation. It was not until long after the terrors of that epoch and the nervous vicissitudes of the war had passed over that Smith's work had an opportunity of revolutionising the public mind on matters of trade and finance. It came up, as it were, the leader of a great literary host, for expounders long crowded in numbers round *The Wealth of Nations* as the text-book of sound economy. It has been made matter of reproach against this work that it is not systematic in its form and that its nomenclature is not exact. But its author was not arranging the results of established knowledge—he was rather pulling down existing structures, compounded of ignorance and prejudice. Nor, indeed, have those who have attempted to make an exact science out of political economy practically vindicated the reproach they have cast on him of being unmethodical. Whatever we may yet come to, very few portions indeed of political economy admit of being treated as exact science; it is too closely connected with human passions and energies, and consequently with special results and changes, to be so treated.

In 1776 he lost his friend David Hume. He watched by him on his death-bed, and wrote an account of his last illness and death in a memorable letter to Mr Strahan in London. Soon afterwards he established himself in London, and became a member of the club to which Reynolds, Garrick, and Johnson belonged, though with the last Smith's relations were not uniformly amicable. In 1778 he was made a Commissioner of Customs. The only effect of this was to bring him to Edinburgh, and increase his means for indulging in his favourite weakness, the collection of a fine library; for he was, as he called himself, a 'beau in his books.' He lost his worthy mother in 1784; in 1787 he was chosen Lord Rector of Glasgow University; and he died 17th July 1790.

Smith's position in the history of political economy, his relation to his predecessors, and his influence on later economists have been considered in the articles *POLITICAL ECONOMY*, *FREE TRADE*. It is a mistake to hold that the barren principle of *laissez-faire* was the teaching of Adam Smith. Smith held it to be the duty of the state to protect its citizens from infectious diseases, to endow by charter joint-stock companies with exclusive trading privileges, to enforce military training on all males, and to establish compulsory and cheap education; state intervention being, however, justified only where the work cannot be done by individuals, or not so well as by the state. Smith's works were edited in 5 vols. by Dugald Stewart in 1811-12, and contain, besides the *Theory of the Moral Sentiments* and the *Wealth of Nations*, essays on the first formation of languages, on the history of

astronomy, ancient physics, and ancient logic, and on the imitative arts. There have been numerous editions of the *Wealth of Nations*, by M'Culloch (1850), Thorold Rogers (1880), Nicholson (1884), and Cannan (1904). His system has been dealt with by all subsequent economists, and in all civilised languages. His Glasgow lectures on *Justice, Police, Revenue and Arms* were published in 1897. See Lives by Dugald Stewart (1811), Farrer (1881), Haldane (1887), John Rae (1895), Macpherson (1899), and Hirst ('Men of Letters,' 1904).

Smith, ALBERT, was born at Chertsey, Surrey, on 24th May 1816, and educated at Merchant Taylors' School. He entered the Middlesex Hospital, and, after in 1838 becoming an M.R.C.S., proceeded to Paris to complete his studies. He then commenced practice with his father, but soon relinquished it for lecturing and light literature, and published upwards of a score of books, some of which were illustrated by Leech. His novels include *The Adventures of Mr Ledbury* (1844), *Scattergood Family* (1845), *Marchioness of Brinvilliers* (1846), *Christopher Tadpole* (1848), and *The Pottleton Legacy* (1849); of his entertainments the most successful was 'The Ascent of Mont Blanc' (1852). He appeared in this at the Egyptian Hall only two days before his death, which took place at Fulham on 23d May 1860.

Smith, ALEXANDER, poet, was born 31st December 1830 at Kilmarnock, but brought up at Paisley and Glasgow, became a pattern-designer in a Glasgow warehouse, sending occasional verses to the *Glasgow Citizen*. Through George Gilfillan his *Life Drama* appeared in several issues of the *London Critic* (1851), and was reprinted the next year in a volume of which 10,000 copies sold in a very few months. But the author had scarcely found himself famous when he began to be fiercely assailed. The poem was certainly immature and extravagant, while an immoderate admiration of Keats and Tennyson coloured his expression, giving rise to the charge of plagiarism. Still, a richness and originality of imagery more than atone for defects of taste and knowledge. In 1854 he was appointed secretary to the university of Edinburgh, and next year produced *Sonnets on the War* in conjunction with Sydney Dobell (q.v.), his brother-poet in the 'Spasmodic' school. He afterwards wrote *City Poems* (1857); the Northumberland epic, *Edwin of Deira* (1861); and, in semi-poetic prose, *Dreamthorp: a Book of Essays* (1863); *A Summer in Skye* (1865); and *Alfred Hagart's Household* (1866), a simple and touching story of Scottish middle-class life. In 1857 he married Miss Flora Macdonald from Skye; and he died at Wardie, near Edinburgh, 8th January 1867.

See the Rev. T. Brisbane's *Early Years of Alexander Smith* (1869), and the Memoir by P. P. Alexander prefixed to his *Last Leaves* (1869).

Smith, GEORGE, Assyriologist, was born of humble parentage in London on 26th March 1840. Whilst pursuing his trade of bank-note engraver he found means to study the cuneiform inscriptions in the British Museum, and through the kindly notice and assistance of Sir Henry Rawlinson and Dr Birch was in 1867 appointed an assistant in the department of antiquities in that museum. He helped the former to prepare the third volume of *Cuneiform Inscriptions* (1870), and through his skill as an interpreter of the Assyrian monumental writing not only was able to fix the dates of important events in the history of the East, but discovered the *Chaldean Account of the Deluge* (1872). He likewise furnished (1871) the key to the interpretation of the Cypriot character and script. In 1872 he was sent by the proprietors of the *Daily Telegraph* to

Nineveh in quest of discoveries; the collections he brought home were presented to the nation. The British Museum commissioned him (1873) to return and complete the excavations he had begun amongst the ruin-mounds of ancient Assyria, an account of which expedition, entitled *Assyrian Discoveries*, was published in 1875. Whilst on a third visit to the same regions he suddenly died at Aleppo, in Syria, on 19th August 1876. Besides the books quoted, he wrote *Annals of Assurbanipal* (1871), perhaps his most important publication; *History of Assyria* (1875); *Eponym Canon* (1875), a work on oriental chronology; *History of Babylonia* (ed. Professor Sayce, 1877); *History of Sennacherib* (ed. Professor Sayce, 1878); and papers contributed to *Translations of Biblical Archaeology* and the first series of *Records of the Past*.

Smith, GOLDWIN, son of a Berkshire physician, was born at Reading, 13th August 1823. He received his education at Eton and Oxford, where he had a brilliant career, completed by a first-class in classics in 1845. In 1847 he was elected Fellow of University College, and in the same year he was called to the bar at Lincoln's Inn. He was nominated assistant-secretary to the first, and secretary to the second Oxford University Commission, and served on the Popular Education Commission in 1858. He was regius professor of History at Oxford from 1858 till 1866. During the American civil war he was a strenuous upholder of the North, writing several pamphlets in support of the Federal cause, and in 1864 lectured in the United States. In 1868 he was elected to the chair of English and Constitutional History in the Cornell University at Ithaca, New York. In 1871 he settled in Canada, where he became a conspicuous publicist. He edited the *Canadian Monthly*, 1872-74, and founded and for a time edited *The Week* and *The Bystander*, strongly advocating commercial union or complete reciprocity between Canada and the United States. He wrote much for periodicals, and contributed to this Encyclopædia. He died 8th June 1910. Among his works are *Irish History and Irish Character* (1861); *Lectures on the Study of History* (1861); *Rational Religion* (1861); *Empire* (1863); *The Civil War in America* (1866); *Three English Statesmen* (Pym, Hampden, and Cromwell, 1867; new ed. 1882); *A Short History of England* (1869); *The Political Destiny of Canada* (1879); *Cowper* (1880); *Lectures and Essays* (1881); *Jane Austen* (1890); *The United States* (1893); *Questions of the Day* (1894); &c. His *Reminiscences* (1910) and *Correspondence* (1913) were edited by A. Haultain, who also wrote a monograph (1913).

Smith, GRAFTON ELLIOT, anatomist and ethnologist, was born at Grafton, New South Wales, 15th August 1871, and educated at Sydney High School and University, and St John's College, Cambridge. He made a study of the mammalian brain, and after his appointment as professor of Anatomy at Cairo (1894) his attention was given to mummies and to the transmission of early civilisation. In 1909 he moved to the chair of anatomy in Manchester University, in 1919 to that in University College, London. In his *Migrations of Early Culture* (1915), *The Evolution of the Dragon* (1919), *Elephants and Ethnologists* (1924), and other works by him and by the school of which he is leader, a very elaborate structure of theory has been erected, world-wide customs hitherto ascribed to independent invention are traced to special originating conditions in Egypt and radiation from that centre.

Smith, HENRY JOHN STEPHEN, mathematician, was born in Dublin, November 2, 1826, and was educated at Rugby and Balliol College, Oxford,

taking a double-first in 1849. In 1861 he became Savilian professor of Geometry. He died February 3, 1883. He was the greatest authority of his day on the theory of numbers (see his *British Association Reports* from 1859 to 1865), and also wrote on elliptic functions and modern geometry. In 1881 the French Academy offered their 'Grand Prix' for a demonstration of certain theorems, ignorant of the fact that they had already been demonstrated fourteen years before by Smith, to whom accordingly the prize of 3000 francs was awarded, but not till a month after his death. He was a man of great versatility, geniality, soundness of judgment, and delicacy of humour.

Smith, JAMES and HORACE, authors of *The Rejected Addresses*, were the sons of an eminent London solicitor, and were born, the former on 10th February 1775, the latter on 31st December 1779. Both were educated at Chigwell in Essex. James succeeded his father as solicitor to the Board of Ordnance; Horace adopted the profession of a stockbroker, and realised a handsome fortune, on which he retired with his family to Brighton. Both were popular and accomplished men—James remarkable for his gaiety and conversational powers, and Horace—the wealthier of the two—distinguished for true liberality and benevolence. Both had written for the *Pic-nic* (1802), the *Monthly Mirror* (1807-10), &c., when the committee of management advertised for an address to be spoken at the opening of the new Drury Lane Theatre in 1812, and the brothers adopted a suggestion made to them, that they should write a series of supposed 'Rejected Addresses.' They accomplished the task in six weeks—James furnishing imitations of Wordsworth, Southey, Coleridge, Crabbe, Cobbett, &c., and Horace those of Scott, Byron (all but the first stanza), 'Monk' Lewis, Moore, W. T. Fitzgerald, and others. In point of talent the authors were about equally matched; for though James had the greatest number of successful imitations, the most felicitous of the whole is Horace's 'Tale of Drury Lane, by W.S.' ('I must have done this myself,' said Walter Scott, 'although I forget on what occasion.') It is a curious fact in literary history that the *Rejected Addresses* should themselves have suffered rejection, and that the copyright, offered originally to Murray for £20 and refused, was purchased by him for £131 in 1819, after the book had run through sixteen editions, and had brought its authors over £1000. James was afterwards an occasional contributor to the periodical literature of the day, and received £1000 for writing Charles Mathews' 'entertainments.' Horace between 1807 and 1845 produced more than a score of three-volume novels—*Brambletye House*, *Tor Hill*, &c. These are forgotten, but a new edition of his *Tin Trumpet* (1836) appeared in 1869, in which year also an *édition de luxe* of the *Rejected Addresses* was published at New York. Of Horace's *Poems* (2 vols. 1846) the best known is the 'Ode to an Egyptian Mummy.' James died in London on 24th December 1839, and Horace at Tunbridge Wells on 12th July 1849.

See PARODY; also vol. i. of Hayward's *Biographical Essays* (1858), Timbs's *Lives of the Wits and Humourists* (1862), and Beavan's *James and Horace Smith* (1899).

Smith, JOHN, one of the Cambridge Platonists, was born early in 1616, the son of a small farmer at Achurch, near Oundle, in Northamptonshire. At eighteen he entered Emmanuel College, Cambridge, as a sizar, had Whichcote for his tutor, graduated B.A. in 1640, but missed a fellowship in his own college, as another Northamptonshire man already held one. However, the Earl of Manchester's clearances at Queen's College opened up for him a fellowship there in June 1644. Here he

laboured with diligence as Hebrew lecturer, Censor Philosophicus, Greek Prælector, and became in 1650 Dean of the college and Catechist. But his feeble health gave way, and he died, after a long illness borne with saintly patience, 7th August 1652, and was buried in the college chapel. His funeral sermon was preached by Simon Patrick, who wrote long after in his *Autobiography*, 'Blessed be God for the good I got by him while he lived.' His *Select Discourses* was published in 1660, again in 1673, in 1821, and at the Cambridge press in 1859. A selection was edited by Lord Hailes in 1756.

Smith, CAPTAIN JOHN, adventurer and explorer, was born at Willoughby, Lincolnshire, in 1580, and was educated at the schools of Alford and Louth. On his father's death in 1596 he made up his mind to go to sea, but instead his guardian bound him apprentice to a merchant of Lynn. Business not being to his mind, he accompanied the second son of Lord Willoughby to France, and at Havre saw some soldiering under Henry IV. Next we find him in the Low Countries, whence he crossed to Scotland, returned to Willoughby, lived in a wood and studied Machiavelli and Marcus Aurelius, and exercised himself on a good horse with lance and ring. As the Turks were at that time ravaging Hungary he made up his mind to join the Christian army, and was robbed by four adventurers in France on his way thither. He joined a half-merchant, half-pirate, and in coasting round Italy and the north of Africa they were enriched by the capture of a Venetian argosy. Next at Graz, in Styria, he entered the service of Ferdinand, Duke of Austria, under whom he greatly distinguished himself, and had some astonishing adventures. He was sold as a slave and marched to Adrianople, but escaped and travelled through Germany, France, Spain, and Morocco. After a sea-fight with two Spanish men-of-war he returned to England in 1604 enriched with 1000 ducats. In 1605 he joined the expedition of a London company to colonise Virginia. In April 1607 Jamestown was founded on the James River. On the way out Smith had been accused of conspiracy and narrowly escaped hanging, but in June 1607 he had his full liberty, and was admitted to the governing council. There was a desperate scarcity of food, and in endeavouring to find supplies, he fell into the hands of Powhatan, an Indian chief, and was only saved from being clubbed to death by the intervention of the Princess Pocahontas (q.v.). Smith was elected President of the colony in 1608, but returned to England disabled by an accident with gunpowder towards the end of 1609. During 1610-17 he was again in North Virginia; and he died in London, 21st June 1631. His works include *A True Relation of Occurrences in Virginia* (1608), *A Description of New England* (1616), *New England's Trials* (1620), *General History of Virginia* (1624), and *True Travels of Captain John Smith* (1630). Charles Deane in 1866 first raised doubts as to the veracity of the Pocahontas story. Arber, who carefully edited Smith in 1884, believed in him implicitly; but doubts were again raised by Henry Adams (1892). There are Lives by Scheibler (1782), Sparks (1834), Simms, Warner, Ashton, Bradley (1905), and Johnson (1915). See an edition of the *Works* with Arber's notes, Bradley's introduction, and Seccombe's bibliography (1910).

Smith, JOSEPH. See MORMONS.

Smith, ROBERT, whose name lives in the Smith's Prizes at Cambridge, was born in 1689, and was cousin to the mathematician Roger Cotes, whom he succeeded as Plumian professor of Astronomy at Cambridge in 1716. He succeeded Bentley

as master of Trinity College in 1742, published *Harmonia Mensurarum* (1722), *A Complete System of Optics* (1738), and *Harmonics, or the Philosophy of Musical Sounds* (1748), edited the *Lectures on Hydrostatics and Pneumatics* of Cotes in 1737, and died at Cambridge in 1768.—The two Smith Prizes, now amounting to about £23 each, are, by a Grace of October 1883, awarded annually for the essays of greatest merit on any subject in mathematics or natural philosophy by recent B.A.'s. Holders have been Henry Martyn, J. Herschel, Whewell, Airy, Colenso, Stokes, Cayley, J. C. Adams, Lord Kelvin, Tait, and Clerk-Maxwell.

Smith, Sir Sidney. See SMITH (SIR WILLIAM SIDNEY).

Smith, Sydney, wit and reformer, was born at Woodford, Essex, on 3d June 1771, the second in a family of four sons and one daughter. His father, Robert Smith (1739–1827), was a clever eccentric, who 'bought, altered, spoilt, and then sold about nineteen different places in England;' from his mother, Maria Olier (died 1802), the daughter of a French Huguenot, he derived all his finest qualities. After five years at Southampton, in 1782 he was sent to Winchester, where he rose to be captain of the school, and whence, having first spent six months at Mont Villiers in Normandy, in 1789 he proceeded to New College, Oxford. He duly obtained a fellowship, but of only £100 a year, and in 1794 was ordained to the Wiltshire curacy of Netheravon, near Amesbury. 'Mr Hicks-Beach,' he tells us, 'the squire, took a fancy to me, and requested me to go with his son to reside at Weimar; but Germany became the seat of war, and in stress of politics we put into Edinburgh, where I remained five years' (1798–1803). During this time he officiated in an Episcopal chapel there, and published *Six Sermons* (1800); married in 1800 a Miss Pybus of Cheam in Surrey; and in 1802, with Jeffrey, Horner, and Brougham, started the *Edinburgh Review* (q.v.), writing eighteen of the articles in the first four numbers. He next lived six years in London, and soon made his mark as a preacher, a lecturer at the Royal Institution on moral philosophy (1804–6), and a brilliant talker; but in 1809 'was suddenly caught up by the Archbishop of York, and transported to the living of Foston in Yorkshire, where there had not been a resident clergyman for 150 years,' but where he continued for twenty as 'village parson, village doctor, village comforter, village magistrate, and *Edinburgh* reviewer.' He farmed his glebe and built a parsonage, but was pinched in his means till in 1820 he came into £400 a year. In 1828 Lord Lyndhurst, the Tory chancellor, presented him to a prebend of Bristol, and next year enabled him to exchange Foston for the more desirable rectory of Combe-Florey in Somerset. In 1831 Earl Grey appointed him a canon residentiary of St Paul's, and this completed his round of ecclesiastical preferment. Visions of a mitre had sometimes crossed his waking dreams, but those dreams were never to be realised. However, he managed to 'grow old merrily' at Combe-Florey, which, in his own phrase, 'bound up well with London.' In London he died at his house, 56 Green Street, Grosvenor Square, on 22d February 1845. He is buried at Kensal Green.

Sydney Smith's writings include sixty-five articles, collected in 1839 from the *Edinburgh Review*, where they had appeared during 1802–27; *Peter Plymley's Letters* (1807–8), in favour of Catholic emancipation; *Three Letters to Archdeacon Singleton on the Ecclesiastical Commission* (1837–39); and various pamphlets on contemporary abuses and forgotten controversies, all consigned now to oblivion. So that their author is chiefly remem-

bered as the creator of 'Mrs Partington,' the kindly sensible humorist who stands immeasurably above Theodore Hook, if a good way below Charles Lamb.

His Life (1855) was written by his daughter Saba (1802–66), who in 1834 married Dr (Sir) Henry Holland (q.v.). See also Hayward's *Essays* (1858), Stuart J. Reid's Life of him (1884; new ed. 1896), Briscoe's *Wit and Wisdom of Sydney Smith* (1900), and G. W. E. Russell's *Sydney Smith* ('Men of Letters,' 1904).

Smith, Walter Chalmers, Scottish poet, was born in Aberdeen in 1824, studied at Old Aberdeen and Edinburgh, and, after holding a Presbyterian charge in London for some years, laboured as a Free Church minister at Orwell (Kinross-shire), in Edinburgh, in Glasgow, and again till 1894 in Edinburgh in the Free High Church. He died 19th September 1908. Widely popular as an admirable preacher, he won the favour of a yet larger public by a series of volumes of poetry marked by richness of thought, creative imagination, and lyrical charm, although unequal and not seldom careless in construction. These are *The Bishop's Walk*, by 'Orwell' (1861); *Olrig Grange*, by 'Hermann Kunst' (1872); *Hilda among the Broken Gods* (1878); *Raban, or Life Splinters* (1880); *North-Country Folk* (1883); *Kildrostan, a Dramatic Poem* (1884); *Thoughts and Fancies for Sunday Evenings* (1887); *A Heretic* (1890).

Smith, William, called the Father of English Geology, was born at Churchill in Oxfordshire, 23d March 1769. He became a land-surveyor and engineer, and so was naturally drawn to geology; and in 1794, after his appointment as engineer to the Somerset Coal Canal, he began his study of the strata of England. His epoch-making Geological Map of England was published in 1815, and from 1819 to 1824 he published, with self-denying zeal, no fewer than twenty-one geologically coloured maps of English counties, assisted in the latter task by his nephew and pupil, John Phillips, afterwards professor at Oxford. Smith received the LL.D. degree from Trinity College, Dublin, in 1835, and a pension of £100 from the crown in 1831. He died at Northampton, 28th August 1839. He was buried here, and thus had his wish to be buried in the Oolite as he had been born on it. See his *Memoirs* by Professor Phillips (1844), and T. Shepherd, *William Smith: his Maps and Memoirs* (1920).

Smith, Sir William, compiler and editor, born in London in 1813, distinguished himself highly in Greek and Latin in the examinations of the university of London, and went through the course of law at Gray's Inn. But he began the real work of his life in 1840 with the publication of editions of the *Apology*, *Phædo*, and *Crito*, of Plato, and the *Agricola*, *Germania*, and part of the *Annals* of Tacitus. His great *Dictionary of Greek and Roman Antiquities* appeared in 1840–42, and was only superseded by its own third edition in 1891 (2 vols.). The *Dictionary of Greek and Roman Biography and Mythology* (3 vols. 1843–49) followed, and this magnificent series of classical handbooks was concluded by the *Dictionary of Greek and Roman Geography* (2 vols. 1853–57). Their learned editor next turned, and with still more striking success, to the task of preparing a series of smaller classical dictionaries for schools; and some years later still achieved further successes with his well-known series, *Principia Latina* and *Initia Græca*, on a method extended also to German and Italian. Students' manuals of history formed the next series of books he put forth, including *Greece*, *Rome*, *France*, *Hume*, and *Hallam*. His complete edition of Gibbon's *Decline and Fall* appeared in 1854 (8 vols.); his serviceable *Latin-English Dictionary*

in 1855; the *Student's Latin Grammar* in 1863; the *Manual of English Literature* in 1864; and the *English-Latin Dictionary* in 1870.

Another monumental group of works is his series of theological dictionaries: the famous *Dictionary of the Bible* (3 vols. 1860-63; new ed. 1893); *A Dictionary of Christian Antiquities*, in conjunction with Archdeacon Cheetham (2 vols. 1875-80); and *A Dictionary of Christian Biography, Literature, Sects, and Doctrines during the first eight Centuries*, in conjunction with Dr Wace (4 vols. 1877-87). He became editor of the *Quarterly Review* in 1867, held the D.C.L. of Oxford (1870) and other honorary degrees, and was knighted in 1892. He died on the 7th October 1893.

Smith, WILLIAM HENRY, newsagent, book-seller, and Cabinet Minister, was born in London, June 24, 1825. He was educated at the grammar-school, Tavistock, and while a youth entered his father's business, and rose step by step to be head of the firm. This, the largest wholesale newspaper business of the kind in Britain, was founded by his father (born 1792), who saw that the London newspapers, sent off by the evening coaches only, were not delivered in Manchester and Liverpool until forty-eight hours after publication. He conceived the idea of forwarding the papers by express parcel, with private coaches leaving London in the morning, so that the night coaches were overtaken, and the delivery of news secured twenty-four hours in advance. As the business expanded, to this was added the right of selling books and newspapers at railway stations (Birmingham Railway, 1849). W. H. Smith was as strong in organising faculty as his father had been, and business was extended. He represented Westminster, 1868-85; was returned for the Strand in 1885 and again in 1886. He held the posts of Financial Secretary of the Treasury (1874-77), First Lord of the Admiralty (1877-80), Secretary of State for War (1885); in Lord Salisbury's ministry he was First Lord of the Treasury and leader of the House of Commons till his death, 6th October 1891. He left a large fortune, and his widow was raised to the peerage as Viscountess Hambleden. See his *Life* by Sir Herbert Maxwell (2 vols. 1893).

Smith, WILLIAM ROBERTSON, theologian and orientalist, was born at Keig, Aberdeenshire, on 8th November 1846. He received all his early training from his father, the Rev. William Pirie Smith, D.D., minister of the Free Church at Keig. He entered the university of Aberdeen in 1861, and graduated after an exceptionally brilliant career in 1865. He afterwards studied theology at the Free Church College, Edinburgh, at Bonn, and at Göttingen; while in Edinburgh he was also assistant to the professor of Physics (Professor P. G. Tait) in the university there. Immediately on the conclusion of his theological studies he was elected by the Free Church Assembly of 1870 to the vacant chair of Hebrew and Old Testament Exegesis in the Free Church College, Aberdeen; his suggestive inaugural address being *What History teaches us to seek in the Bible* (1870). At an early stage in the preparation of the ninth edition of the *Encyclopædia Britannica* he was invited to contribute articles upon Biblical subjects. The first of these ('Angel') appeared in 1875. That on 'Bible' (1875), a brief objective account of the now well-known historical and scientific facts of the subject, was almost immediately assailed on the ground of its heterodoxy—especially for its acceptance of the non-Mosaic authorship of Deuteronomy. In consequence of the excitement that had been aroused, the Assembly of 1876 referred all Smith's articles then published to a committee, which reported in 1877 that there was no ground

for a heresy prosecution, but added that a majority of the members of the committee had found cause for 'alarm' and 'anxiety' in the article 'Bible' on account of its 'dangerous and unsettling tendency.' In these circumstances a prosecution for heresy was instituted before the Free Presbytery of Aberdeen. A long process ensued, in the course of which Smith displayed remarkable debating talents, and in the end, after many vicissitudes in the various courts of the church, the trial resulted in the acquittal of the accused at the Assembly of 1880 by a majority of 7 in a house of nearly 600 members. In consequence, however, of the article on 'Hebrew Language and Literature,' which appeared in the *Ency. Brit.* in June 1880, he was not allowed to resume his teaching duties during the following winter; and although no new heresy was alleged to have been brought in that article, he was removed from his chair without a trial by a considerable majority at the Assembly of 1881. Smith, who, besides contributing largely to successive volumes of the *Encyclopædia Britannica*, had written several important pamphlets in connection with his trial, delivered at the request of a number of laymen in Edinburgh and Glasgow in 1880-81-82 two series of lectures substantially published in *The Old Testament in the Jewish Church* (1881) and *The Prophets of Israel* (1882). In 1881 Smith removed to Edinburgh, and became actively associated with Professor Baynes in the editorship of the *Ency. Brit.*; on the death of his colleague he had the undivided responsibility of editor-in-chief. In the beginning of 1883 he was appointed Lord Almoner's professor of Arabic in the university of Cambridge, where shortly afterwards he was elected to a fellowship at Christ's College. His work on *Kinship and Marriage in Early Arabia* was published in 1885. In 1886 he was elected by the Cambridge senate to the university librarianship, which office he exchanged for the Adams professorship of Arabic in 1889. As Burnett lecturer he delivered at Aberdeen in 1889-91 three courses on the religion of the Semites; the first series was published as the *Religion of the Semites* (1889). After several years of greatly impaired health, he died 31st March 1894. See *Life* by Black and Chrystal (1912).

Smith, SIR WILLIAM SIDNEY, the hero of Acre, was born at Westminster, 21st July 1764, entered the navy at eleven, and received a lieutenancy for his courage at Cape St Vincent in 1780. After further service under Graves and Rodney, he rose to the rank of captain in 1782; gave advice to the king of Sweden in the war with Russia (1790-92), being knighted as a reward; was next sent on a mission to Constantinople, and aided Hood in burning the ships and the arsenal at Toulon in December 1793. He next watched the Channel for French privateers, but was taken prisoner in Havre-de-Grâce harbour in April 1796. He succeeded in making his escape in 1798, and in October was sent as plenipotentiary to Constantinople, whence he hastened to St Jean d'Acre on hearing that Bonaparte was about to attack. On the 16th March 1799 he captured the enemy's vessels, and he held the town heroically until Napoleon raised the siege, leaving his artillery behind, on the 20th May. For this he received the thanks of parliament and a pension of £1000. Sir Sidney Smith next aided Abercromby in Egypt, became rear-admiral of the blue in 1805, and successively guarded Sicily and Naples, destroyed the Turkish fleet in Abydos (1807), blockaded the Tagus, became vice-admiral of the blue in 1810, K.C.B. in 1815, and admiral in 1821. He died at Paris, 26th May 1840. See the *Life* by Barrow (1848).

Smithfield, or **SMOOTHFIELD**, is an open space of 5½ acres in London, used for centuries as a

market for sheep, horses, cattle, and hay. Being a little north of Newgate and west of Aldersgate, it was outside the city walls, and available for jousts, tournaments, executions, and burnings. It was also a place of recreation for the people, and the celebrated Bartholomew Fair (q.v.) was held in Smithfield. Here the patriot Wallace was executed by Edward I.; here in the great agrarian revolt Wat Tyler, at the head of 30,000 peasants, encountered Richard II., and was stabbed by Walworth, the Mayor of London; and it was here that many of the long line of martyrs from 1401 to 1612 suffered in the flames or on the scaffold. With the growth of the city the cattle-market became an intolerable nuisance (described in *Oliver Twist*), and was finally closed in 1855. The Smithfield Club (1798) holds its annual cattle shows in the Agricultural Hall. Smithfield has still its hay market and a great meat market.

Smithfield, a village of Virginia, on a navigable creek 24 miles WNW. of Norfolk, contains in St Luke's Episcopal Church (1632; built of imported brick) the oldest Protestant building in America, and after the adobe cathedral at Santa Fé the oldest surviving Christian edifice in the United States.

Smithsonian Institution, at Washington, D.C., was organised by act of congress in 1846 in accordance with the will of James Macie Smithson (1765-1829), who, in a fit of pique at the Royal Society's rejection of a paper which he had submitted in 1826, bequeathed the reversion of an estate of £105,000 to the United States of America to found 'at Washington an establishment for the increase and diffusion of knowledge among men.' He was an Englishman, a natural son of Sir Hugh Smithson, first Duke of Northumberland, and Mrs Elizabeth Macie, a niece of Charles, Duke of Somerset. He devoted his life to scientific pursuits, especially to chemistry and mineralogy, was a Fellow of the Royal Society from 1787, and for long a member of the French Institute, and died in Genoa. The institution is a body of which the presiding officer *ex officio* is the president of the United States, and the Chief-justice of the United States customarily the chancellor. It is governed by a board of regents appointed by the Federal government, its direction under them being confided to a chief officer styled the Secretary. It has a spacious and beautiful building, forming one of the chief architectural adornments of the capital, which is occupied by offices and workrooms, but mainly by the collections of the government, which also fill separate adjoining buildings. In these buildings under its ownership or direction are the results of the exploring, surveying, geological, ethnological, and other expeditions of the Smithsonian and the government, known as the United States National Museum. The work of the institution is to promote original research; to publish the results of investigations, and distribute them freely to libraries in every land; to facilitate the interchange of scientific thought and labour, by sending and receiving free of cost the publications of all learned societies. It has a working library, but its main collections of books are in the Library of Congress (see LIBRARY). Its publications consist of a quarto series, *Smithsonian Contributions to Knowledge*, an octavo series, *Miscellaneous Collections*, both published at the expense of the fund, and an annual Report printed by congress. Under its direction are certain government bureaux: (1) the National Museum, (2) the National Gallery of Art (including the Freer Gallery), (3) the Bureau of Ethnology, (4) the Bureau of International Exchanges, (5) the National Zoological Park, (6) the Astro-physical Observatory, as well as the Regional

Bureau for the United States for the International Catalogue of Scientific Literature.

Smith's Sound. See BAFFIN BAY; also POLAR EXPLORATION, and map there.

Smock-frock, an outer garment of coarse white linen worn by agricultural labourers over their other clothes, especially in the south of England. It is like the French blouse, but longer; and the shoulders are often somewhat elaborately ornamented with neatly sewn folds and puckers.

Smoke, a common term to signify the volatile products of the imperfect combustion of such organic substances as wood or coal. The smoke from burning wood is almost colourless, consisting principally of carbonic acid and water, whilst that produced by burning coal is generally laden with oily and tarry vapour and finely divided carbon (or soot). The different effects resulting from the use of these varieties of fuel is exemplified in the brightness of Paris as compared with the (too generally) gloomy atmosphere of London. In London the smoke nuisance is an old grievance; Evelyn the diarist wrote his *Fumifugium* in 1661; and in his diary explains the unpleasantness of the great fog of the winter of 1684 (when a fair was held on the Thames), and justly ascribes it to the 'fuliginous steam of the sea-coale.'

The smoke nuisance may justly claim pre-eminence for itself in Great Britain, where coal is generally cheap, and where its users either from ignorance or prejudice refuse to adopt means for its proper combustion. In bright warm windy weather the smoke so produced is carried away from towns and factories, and becomes lost to view by mixing with the air; but in cold calm weather with an atmosphere saturated with moisture (or what is a true white fog) the smoke is arrested, and mixing with it gradually accumulates, and forming as it were a vast aerial emulsion of water vapour, tarry matter, and soot, gives rise to the black or brown fogs now so common in the large city. This dirt and soot suspended in the air not only causes disease by entering the lungs, but also acts as a screen obstructing the sunlight. But apparently what is most deleterious to plant life in towns and to human lungs is the sulphur in the coal, which so long as coal is consumed must be liberated by burning, and is ultimately oxidised into sulphurous and sulphuric acids. That the general death-rate in a town is enormously increased in foggy weather is indubitable; though, on the other hand, there is probably some disinfecting influence from the carbon and sulphurous acid present in a foggy atmosphere.

In this article there fall to be explained, first, the causation of such dark-coloured fogs; secondly, what has been done and what may yet be done in the direction of their prevention. (1) When a microscope slide is passed quickly over a smoky flame, a thin, semi-transparent film is left on the glass, which when examined under a powerful microscope presents the appearance of numerous particles of amorphous carbon in a finely divided condition, each particle being surrounded by an areola or coating of oily or tarry matter. This explains why a black fog may be and will remain persistent, even while rain is falling, each particle of carbon being, so to speak, surrounded by a waterproof coating which repels moisture. Aitken conclusively proved that the separation of liquid water from a moisture-laden atmosphere or white fog is due to particles of fine dust present in the air (see FOG). We should therefore expect that the introduction of solid particles of carbon into such an atmosphere would have the same effect, which doubtless would be the case did not each particle repel the vaporous particles of water in its

immediate neighbourhood; at the same time their density is insufficient to cause them to fall through the turbid atmosphere as smuts.

In a smoky town when a breeze prevails the smoke in its horizontal passage through the air gradually parts with its greasy-coated carbon to anything which impedes its progress, such as buildings, trees, &c.; so much so that only a few miles away it loses its dolorous aspect and assumes the soft, dreamy haze so dear to the painter, which after all is only an air emulsion of finely attenuated particles of grease.

The densest fog of this kind on being agitated will deposit all its carbon as smuts, and become changed into a white fog or mist; therefore changes of temperature causing convection currents, or electrical discharges, will disperse the densest fog with extraordinary rapidity. In like manner such a fog finding its way into a dwelling-house is exposed to currents of dry heated air, in which the condensed moisture reassumes its gaseous or invisible condition, while the other constituents are deposited as a grimy coating upon its walls, furniture, &c. Likewise in breathing such a fog-laden atmosphere the carbon and oily products are arrested by the air-passages, and become apparent in the expectorated secretion from the bronchial tubes. A comparatively small amount of solid carbon and oily vapour may thus bring about atmospheric conditions wholly at variance with all ideas of beauty, comfort, and cleanliness. Of course with perfect combustion only carbonic acid and water vapour are the products; both being colourless vapours. There are numerous mechanical stokers by which the green fuel is gradually carried from the furnace doors to the fire bridge, by which means the smoke and tarry vapours given off during the distillation stage are forced over the mass of incandescent fuel occupying the posterior position in the furnace. In some cases the fuel is also by mechanical means fed from the bottom of the grate bars, by which means the same end is gained. The only objection to the general use of such stokers is the expense of erection, and the cost of upkeep.

(2) *Smoke Abatement.*—It has been pointed out that wherever smoke is agitated—e.g. by atmospheric or electric currents—its carbon is quickly deposited by its particles agglomerating into masses too heavy to remain in suspension. This may be simply shown, as, when smoke is agitated by fanners or air-currents in a closed space, in a short time it loses its characteristic black colour, the carbon being deposited as smuts.

Other plans by which smoke from furnaces is passed through water and washed have been tried with more or less success, and may come to be compulsorily adopted in factories, as is now the case with iron blast-furnaces, where the products—viz. carbon, hydrocarbons, ammonia, and even the carbonic and sulphurous acids present in all coal-smoke—are profitably utilised. By means of such appliances there is now no difficulty in preventing the emission of coloured smoke from any factory-chimney. But the real difficulty which meets all attempts at smoke abatement lies in the sentimental desire for the cheerful though smoky blaze of English house-fires. This causes, it has been estimated, in London alone the production of thousands of tons of black smuts per annum, which descend either on the city itself or in its immediate vicinity.

Long ago it was pointed out that to obtain the full advantage of the use of coal it should be carbonised—i.e. heated in closed retorts, when the whole of the volatile products, consisting of oil, tar, and gas, would be properly utilised, leaving a coke which would not only burn with a smokeless flame, but give out, weight for weight, a much

larger amount of available heat than the uncarbonised coal. At the same time the inflammable gas (one of the products of this process) would either alone or mixed with the coke yield, when properly burned, a smokeless fuel for use in kitchens or fireplaces, thus doing away with this serious evil, as well as effecting an annual saving of many millions of tons of coal.

Many attempts have been made to effect this by constructing house-grates and cooking-ranges so that the raw coal is introduced from the bottom—i.e. at the fire-bars or grids, so that all gaseous products have to pass through an incandescent mass of carbon before reaching the chimney. The mechanical difficulties to be overcome would necessitate the entire reconstruction of the present house-heating arrangements. But a good deal has been done to abate the smoke nuisance from domestic chimneys by the growing use of smokeless fuel, by gas-cookers, and similar heating apparatus. For the *Method of Zones*, see HOUSING AND TOWN-PLANNING. The Public Health Act of 1875 condemns 'any chimney (not being the chimney of a private dwelling-house) sending forth black smoke in such a quantity as to be a nuisance,' while the Act of 1926 is more comprehensive, at the same time increasing the penalties.

See books on Smoke Abatement by Booth and Kershaw (1904), Nicholson (1906), Cohen and Ruston (1925); a Bibliography by McClelland (1913); and Fitzgerald, *The Smokeless City* (1922); also the publications of the London Coal Smoke Abatement Society, and Smoke Abatement League of Great Britain; the latter holds frequent conferences on the subject. In Germany corresponding societies and the government educate stokers in the scientific management of firing, and stimulate and test the ingenuity of inventors of smoke averting appliances. See also FUEL.—For a special use of smoke, see HAM, PRESERVED PROVISIONS. For Smoker's Sore Throat, see TOBACCO. For Opium-smoking, see OPIUM. For Smokeless Powder, see GUN-COTTON, GUN-POWDER, RIFLES.

Smoky Mountain. See APPALACHIANS.

Smolensk, a city of Russia, stands on steep declivities overlooking the river Dnieper, 244 miles W. by S. of Moscow. It was a place of note in the 9th century, has a cathedral of the 17th and 18th centuries, a university (1919), some fine buildings, and was from the 14th century a powerful fortress, and as such an object of contention between the princes of Lithuania and Poland on the one side and of Moscow on the other. Here the Russians were repulsed by Napoleon, 17th August 1812. Pop. 60,000.

Smollett, TOBIAS GEORGE, physician, poet, novelist, journalist, historian, was a Dumbartonshire gentleman, belonging to that upper class of Scottish society—the lawyers and landed gentry—to which Sir Walter Scott also belonged. He was educated for the medical profession, but failed to make a living by it. He drifted into literature, and by it he made a precarious living and a lasting name. For the failure of his life in material success he was himself largely to blame. Handsome, upright, generous, of genuine humour, a pleasant companion on occasions, he yielded from his youth to (among other mischievous propensities) the evil habit of epigrammatic sarcasm on one or other of the company he was in. Proud, vindictive, of hot temper and haughty manner, as sensitive as he was satirical, he was a foredoomed failure as a doctor, and foredoomed to quarrels, lawsuits, fine and imprisonment, and money difficulties in general as a journalist. The little poetry he wrote was not of great merit. His history was, as David Hume estimated it, a clever superficial review of the subject. It was the novels that made his name, and three of them maintain it.

Smollett was grandson of Sir James Smollett of Bonhill, advocate, member of the Scottish parliament, commissioner of the treaty of Union, and judge in the consistorial court. The fourth son of Sir James and his first wife, daughter of Aulay Macaulay of Ardencaple, was Archibald, who, without his father's sanction and without means to support a wife, married Barbara, daughter of Robert Cunningham of Gilbertfield, a young lady of good family but portionless. Sir James assigned to the imprudent couple Dalquhurn, the second house on the estate, and the few fields around it, on which stand now the towns of Alexandria and Renton. The third child of Archibald and Barbara was Tobias George, born at Dalquhurn, birthday not recorded, baptised on Sunday, March 19, 1721. His father died shortly after, and his grandfather in 1731. Sir James and his successor would seem to have behaved with reasonable kindness to the widow, a clever managing woman, and her three orphan children. Smollett went to Dumbarton grammar-school, was taught Latin well by John Love, and distinguished himself by the luxuriance of his boyish satire. He went to Glasgow College, attended arts and medical classes, and while attending them served an apprenticeship to John Gordon, doctor, apothecary, and very worthy man. It was thus he qualified for medical practice. Subsequently, in June 1750, he obtained the degree of M.D. from Marischal College, Aberdeen. In 1739 he went to London and tried to get *The Regicide, a Tragedy*, put on the stage. He failed, quarrelled with everybody about it, and published it ten years later with a very foolish preface. He romances about the ill-usage he and it underwent in the story of Melopoy in *Roderick Random*. Smollett was appointed surgeon's mate on board the *Cumberland*, which sailed in 1740 to join Admiral Vernon's fleet, and took part in the unfortunate expedition to Carthage in 1741. He describes that expedition in *Roderick Random*, and also in a *Compendium of Voyages and Travels* he published in 1756. His temper could not brook the service; he quitted it in the West Indies and tarried a while in Jamaica, where he met Anne Lascelles, the expectant heiress of 'a comfortable, though moderate, estate in the island.' Mr Buek sees good reason to believe that he married her before he left the island. Others date his marriage 1747. He seems to have returned to London in 1742 or 1743. In 1744 he set up house in Downing Street, afterwards in Mayfair, to look for medical practice. He wrote *The Tears of Scotland* in a coffee-house in 1746. The same year appeared *Advice, a Satire*—his first publication. Next year he published *Reproof, a Satire*. The *Adventures of Roderick Random*, written autobiographically, appeared anonymously in 1748, and was at once a great success; Lady Mary Wortley Montagu thought the novel was Fielding's. *The Regicide* was published in 1749. In 1750 Smollett visited Paris along with Mr Moore—afterwards Dr Moore, novelist, father of Sir John Moore—and met Mark Akenside there. In 1751 was published, written biographically, *The Adventures of Peregrine Pickle*. It too had an instant success. The doctor, who gives an entertainment after the manner of the ancients, is a misrepresentation of Dr Akenside, and the laughable account of the feast is a satire on his pedantic affectation of Athenian manners. Smollett was paid for inserting 'The Memoirs of a Lady of Quality, Frances Hawes, Lady Vane,' which are a blot on the novel. He now tried to set up in Bath as a medical man, publishing *An Essay on the External Use of Water*; it was his last attempt of the kind, and it failed. Returning to London to live by his pen, he fixed his abode in Chelsea, and published *The Adventures of Ferdinand, Count Fathom* in 1753.

The robber scene in the Black Forest, from that story of a gambler and swindler, has been the prototype of many such, and is a literary masterpiece. About this time an action was raised in the Court of King's Bench against Smollett for caning a person named Gordon. The verdict was in his favour, but the law-costs embarrassed him. In 1755 his translation of *Don Quixote*, which is still read, was favourably received. He became in 1756 editor of *The Critical Review*, a High Church and Tory monthly. Countless troubles to the editor culminated in 1759, when Admiral Knowles brought an action against the *Review*, and Smollett was fined £100 and sent for three months to the King's Bench Prison. In 1756 he also began a *Complete History of England* from the time of Julius Cæsar's invasion down to 1748. He wrote the four quarto volumes in fourteen months, finishing the work in December 1757. This effort brought on chest disease and a scorbutic affection; he never enjoyed good health again. After coming out of prison he wrote a continuation of his History, which he eventually brought down to 1765. From all this labour on history he is 'said to have cleared £2000.' In 1757 his farce, *Reprisals, or the Tars of Old England*, was put on the stage by Garrick. Smollett toiled at compiling a universal history and translating Voltaire. The *Adventures of Sir Launcelot Greaves*, an English *Don Quixote*, appeared as a serial, 1760-61, in the *British Magazine*, a sixpenny monthly, and was published separately in 1762. Like all the novels Smollett wrote, it is weak in construction, but lacks neither vivacity nor wit. He edited *The Briton*, 1762-63, a weekly paper in support of Lord Bute's administration, received no reward, and was routed from the newspaper field by the *North Briton*, the organ of his former friend, John Wilkes. In April 1763 Elizabeth, his only child, died of consumption. He left England in June, sojourned on the Continent more than two years, and published in 1766 the still readable *Travels through France and Italy*. The same year he, broken in health, visited Scotland—his second visit since he left as a lad—and while in Edinburgh stayed with his mother and widowed sister. His health benefited by this journey, but on his return south it broke down again. He left England in 1768 to seek recovery in a warmer climate. He had the year before solicited a consulship at Nice or Leghorn—the only favour he ever asked from government—was refused it, and went to live in Italy, relying on his wife's small and always uncertain income and on his pen. He wrote the *Ode to Independence* about this time. The *History of the Adventures of an Atom*, a prose satire, in which political leaders are broadly caricatured under fictitious names, was published in 1769. In a village, called Monte Novo, near Leghorn, Smollett wrote, in weakness and much pain, the last and best of his novels, *The Expedition of Humphry Clinker*, written in epistolary form. The 'Ode to Leven Water' occurs in it. It was published in 1771; and Smollett just lived to hear the first rumours of its success. He died, 17th September 1771, aged fifty-one, and was buried in the English cemetery, Leghorn. If he had lived four years longer he would have inherited the family estates; as it happened, he left his widow quite unprovided for. Her small income from the West Indies by and by failed entirely, and there was a benefit performance in the Theatre Royal of Edinburgh in her behalf when she was destitute twelve years after his death. The novels which have become classics are the three in which Smollett himself is adumbrated as, respectively, the Scottish Roderick Random, the English Peregrine Pickle, and the Welsh Matthew Bramble (*Humphry Clinker*).

Plays and Poems, with Memoir (1 vol. 12mo. 1784). *Miscellaneous Works*, first collected by David Ramsay of the *Edinburgh Evening Courant*; humorous frontispieces by Rowlandson; meagre life (6 vols. 8vo. Edin. 1790; does not contain *Adventures of an Atom*). *Miscellaneous Works, with Memoir*, by Robert Anderson, M.D., carefully edited (6 vols. 8vo. Glasgow, 1796); *Excursion to Carthagera* added to 2d edition (6th ed. 1820). *Works, with Memoir*, by John Moore, M.D. (8 vols. 8vo. Lond. 1797), carelessly edited; memoir valuable owing to personal intimacy. *Miscellaneous Works, with Memoir*, by Thos. Roscoe (1 vol. large 8vo. Lond. 1840). Sir W. Scott's Biographical Prefaces, published separately (2 vols. 12mo. Paris, 1825). *Life and Selections*, by Robert Chambers, (1867). *Works*, carefully selected—the three classical novels, the plays, the poems—with *Life and Notes* by David Herbert; *Notes* fill up blanks left by Smollett (1877). *Works*, ed. Henley and Seccombe (12 vols. 1899–1901). *Novels* (Shakespeare Head edition, 11 vols. 1925 *et seq.*). *Works*, ed. Saintsbury (12 vols. 1925). *Letters*, ed. E. S. Noyes (1926). See also Hazlitt's *Comic Writers*; Thackeray's *Humourists*; Seccombe in the *D.N.B.* (1898); Lives by Hannay (1887), Smeaton (1897), Melville (1926); and (especially for *Peregrine Pickle* and Smollett's quarrels) *A Study in Smollett* by H. S. Buck (1925).

Smolt, a name given to young river salmon when they are bluish along the upper half of the body and silvery along the sides.

Smuggling, a violation of customs laws, to be distinguished from illicit distillation, which violates excise laws (see CUSTOMS DUTIES, EXCISE), no longer deserves the name of a trade in the United Kingdom. From about the close of the 17th century to near the middle of the 19th the suppression of that kind of free trade by vigorous methods engaged the close attention of the inland revenue department. Free trade as a national policy put down the smuggling trade. Only a very small number of persons comparatively deal in contraband goods now. But when the duties on spirits were higher in England than in Scotland, Northumberland and Cumberland were haunted with smugglers. Haddington and Berwick and the Scottish counties on the Solway were long demoralised by unwise tariffs on articles of import from abroad. Readers of Scott's novels know the effective use he makes of smuggling for the purposes of his art in *Guy Mannering* and *Redgauntlet*. Robert Burns was an exciseman, and it was also one of his duties to prevent the smuggling of contraband goods. It is well known how in 1792 he placed himself on one occasion at the head of the revenue officers and a guard of dragoons, waded the Solway sword in hand, was the first to board a smuggling brig, captured the crew, and had the brig sold at Dumfries. It was on that occasion that Burns wrote 'The Deil's awa' wi' the Exciseman.' The exploits of smugglers and coastguardsmen in the frequent and bloody encounters that took place constitute the main interest of many an exciting tale.

The contrabandista used to be one of the most popular characters in Spain. The exports from England to Gibraltar, to refer only to one of his lines of activity, used to be large, and were introduced by smugglers to the interior of Spain. The injudicious tariffs imposed by both England and France encouraged smuggling to an enormous extent on both sides of the English Channel: spirits, especially brandy, tea, tobacco, silk goods from France; from England the most important article of illicit trade was cotton-twist. English goods were introduced into France chiefly by the Belgian frontier, and dogs were trained to convey them; a dog would convey goods worth from £20 to £50. There used to be cruel slaughter of these dogs, a reward of three francs being given by the customs authorities for every one seized.

A great historical outburst of smuggling was the answer which commercial enterprise gave to Napoleon's Berlin and Milan decrees. Silk from Italy reached England by Smyrna after being a year on passage, by Archangel after being two years. Cotton-twist, coffee, sugar, tobacco were shipped from England to Salonika, conveyed thence by mules and horses through Serbia and Hungary to Vienna, and distributed over the Continent from that capital. Coffee from London would reach Calais by Vienna. The risks and expense raised the price of sugar on the Continent to 6s. a pound.

In 1831 an official report estimated the loss by smuggling to the British revenue as exceeding £800,000 a year (in French brandy to the extent of £500,000). Three-fourths of the tobacco consumed in Ireland was smuggled; the total annual cost of protecting the revenue was then from £700,000 to £800,000. In 1840 it was believed that 48 per cent. of French silks paid no duty. The south coast of England, especially Kent and Sussex, was largely addicted to the smuggling trade with France, by which it was stated that goods to the value of £2,000,000 were conveyed into France from England by the Belgian frontier alone.

So long as the Isle of Man had an independent system of customs (till 1765) it proved a veritable focus of 'smuggling' with adjoining British coasts, especially the north shore of the Solway Firth, where the whole population became demoralised by the 'free trade.' The smaller lairds connived at it, or shared in it; the Rev. Robert Carson, parish minister of Anwoth (successor of the sainted Samuel Rutherford), was deposed because he not only smuggled himself, but encouraged others to smuggle. 'Brandy-holes' were found in the most unlikely places. One subterranean chamber might be discovered and ransacked, with small result, by the revenue officers, while a rich store was concealed in a chamber directly beneath the other, but so hermetically sealed as to escape the observation of lynx-eyed 'gaugers.' Sets of underground chambers connected by various tortuous passages were not unusual; and the entrance to such vaults was sometimes under the hearthstone of a humble (and pious) cottager, or might be cunningly concealed beneath the fireplace of a mill-kiln, and inaccessible so long as the fire was burning. Alan Fairford's adventures in *Redgauntlet* are wonderfully true to fact.

Among the principal articles liable to duty in the United Kingdom are cocoa, coffee, currants, raisins, beer, spirits, wine, tea, tobacco; and the sugar duty encourages some smuggling of saccharine. The law is mainly regulated by Customs Acts of 1876, 1879, 1881, and the Merchant Shipping Act of 1894. The number of seizures of smuggled goods averages at present some 8000 per annum, tobacco being the principal article. A curious source of evading customs duties was at one time found to be common in the navy, tobacco-stalks being landed contrary to law. Tobacco being issued to the crews of H.M. ships of the navy in the form of unmanufactured leaf, the men could, in preparing it for use, remove the mid-rib of the leaf, which they are enjoined by regulations to destroy; the landing of the stalk, formed by the mid-rib when separated from the leaf, is, of course, prohibited by law. But the stalks being serviceable for making snuff, a considerable trade existed in certain localities, with the intervention of the receivers, between seamen and others employed on board H.M. ships and persons who purchased stalks for the purpose of obtaining drawback upon the snuff produced from them.

Smuggled goods are liable to forfeiture, and are sold for revenue purposes. Vessels engaging in

smuggling are liable to forfeiture, and their masters and owners to a penalty up to £500. Fraudulent evasion of customs duties, or attempted evasion, renders the offender subject to forfeit treble the value of the goods, or a money penalty of £100. Heavy penalties are incurred by resistance to customs officers, or aiding and abetting smuggling. In the United States the penalties are similar, but in some cases severer; a sailor guilty of smuggling is liable to a penalty, as in England, and to imprisonment for twelve months in addition.

See W. D. Chester, *Chronicles of the Customs Department* (1885); Lieut. H. N. Shore, *Smuggling Days and Smuggling Ways* (1892); also the article **TAX**.

Smut, or **BUNT** (sometimes also called **Dust-brand**), is the popular name of certain small fungi which infest flowering land-plants, especially the grasses. This name is derived from the appearance of the spores, which are nearly black and very numerous. At the present time the group is called the *Ustilagineæ*. Some of them live in the intercellular spaces only, others penetrate the walls of the cells, especially of the parenchyma (simple) cells, and live within the living matter of the plant. Some species attack a part only of their host—e.g. *Entyloma* forms pustules on the leaves of certain species of *Ranunculus*; others spread throughout the tissues, forming spores in special places. Thus the mycelium of *Pilletia tritici*, which causes the disease specially known as **Bunt** in wheat, may spread through the whole of a wheat-plant, but the spores are found only in the ovary. Various species of *Ustilago* fructify in the inflorescences of various grasses, and cause the disease known as **Smut**. The part of the plant where the fructification is being formed is generally enlarged, and becomes filled with the black resting spores. This swelling is especially noticeable in maize-plants attacked by *U. zeæ*. The mycelial hyphæ are not very densely spread within the tissues of a host, but the hyphæ that will bear spores branch repeatedly, and thus form a mass of compact tissue within that part of the host selected for the fructification, this compact mass taking the form of that part of the host, or covering with a flat layer a part of the surface, or eating a cavity out of the tissues of the plant and taking the form of that cavity. Generally the spore-bearing hyphæ become transformed into spores, so that nothing but spores remains, but some species form definite envelopes for the spores—e.g. *Doassansia*. The germination of the spores occurs when they have been well saturated with water. Typically, a germ tube is emitted which is called the promycelium. This, in most cases, gives forth from the far end a number (4 to 10) of smaller tubes, called sporidia. From these sporidia there may arise a tube which takes all the protoplasm; this tube, called an incipient mycelium, may enter into the tissues of a host and develop a true mycelium. Sometimes in a species which usually develops in this way any or all of these steps may be omitted—e.g. the spore may give rise to an incipient mycelium direct. Important economic diseases of this type in Britain are the smuts of oats and barley and smut and bunt in wheat. The last, also known as stinking smut from the characteristic fishy odour of the spores, is best dealt with by pickling the seed in dilute formaldehyde or by treating it with finely powdered copper carbonate. See **WHEAT**. The other diseases are combated by soaking the seed in hot water.

See **FUNGI**; also Bennett, *Outlines of Fungi and Plant Diseases* (1924), &c.

Smuts, **JAN CHRISTIAN**, statesman and general, was born at Pretoria in 1870, was student at Christ's College, Cambridge, and practised at the Cape Town Bar. He was given supreme command

of the Boer troops in the Cape Colony (1901), but in 1916–17 commanded the British forces in East Africa. He had held many political posts, and had represented South Africa in the Imperial War Cabinet (1917–18) and at the Peace Conference (1919), before becoming premier of the Union (1919–24), succeeding Botha, whose right-hand man he had always been. He was an ardent supporter of the League of Nations. His philosophical studies bore fruit in a volume on *Holism* (1926), tracing in the universe a progressive organisation in greater and greater wholes.

Smyrna, the most important seaport of Asia Minor, stands on the west coast, at the head of the Gulf of Smyrna, which penetrates 46 miles inland from the Aegean Sea; it climbs up the slopes and nestles at the foot of Mount Pagus (460 feet, on the south-east), which is crowned by the ruins of the ancient Greek Acropolis. Viewed from the waters of the Gulf it presents a fine appearance, but the great fire of 1922, beginning in the Armenian quarter and spreading to the Greek and then to the Frankish or European (which included the banks, consulates, hotels, &c. on the quays), left untouched only the miserable Turkish quarter on the higher slopes. About three-fifths of the town was destroyed, with great loss of human life. Previously there were a great number of modern mosques, churches, bazaars, &c., but few buildings with any architectural pretensions, and the city was the seat of archbishops of the Roman Catholic, Greek, and Armenian churches, and of the Turkish governor-general of the province (*vilayet*) of Aidin. Traces of the ancient walls, the stadium, theatre, and some temples can still be discerned. Rebuilding has progressed but slowly, owing to the uncertain political situation, the flight and deportation of so many of the former inhabitants, the new scheme of planning which involves much greater space for streets, public squares, gardens, &c., the consequent difficulties of expropriation and compensation, and the lack of sound financial backing. *Bariakli* and *Cordelio* are two modern suburbs on the north shore of the Gulf. The climate is uncertain, but intensely hot in summer, and earthquakes are by no means unknown, those of 178 A.D., 1688, 1768, and 1880 having been particularly severe. Smyrna is well served with three main lines (with branches) of railway, ensuring direct communication with *Panderna* on the Sea of Marmora, *Angora*, and *Damascus*. But it is as a commercial seaport that the place is specially celebrated. It still remains the great entrepôt for Asia Minor that it was seven hundred years before Christ. The harbour is large, safe, and easily accessible. It is the centre for all the important trade of the interior, in corn, raisins, figs, valonia, tobacco, wool, skins, oil, and silk, all of which are exported, and the surrounding country is rich in minerals—chrome ore, lignite, salt, mercury, iron, zinc, and antimony. The industries, however, were badly affected by the looting and massacres which accompanied the fighting after the Great War and the fire of 1922. Carpets, cotton, silk, and soap factories, tanneries, iron, saw and flour mills were formerly largely in the hands of Armenians or Greeks, who were deported in enormous numbers after the Treaty of Lausanne (1923), when a compulsory exchange was arranged between Greeks of Turkey (excluding Constantinople) and Mohammedans of Greece (excluding Western Thrace). Pop. estimates (1900) 250,000; (1914) 350,000, of whom one-half were Greeks; (1924) 100,000.

Smyrna was originally a city of the Greek *Æolic* immigrants into Asia Minor, and was one of the seven cities associated with Homer; it became *Ionian*, and during the 7th century B.C. enjoyed wonderful prosperity as the principal intermediary

in trade between Europe (Greece) and Lydia; but at the end of the century it was captured and destroyed by Alyattes, king of Lydia. For more than three hundred years it maintained merely a struggling existence; but it was at length rebuilt on a different site by Antigonos, and further enlarged and fortified by Lysimachus, both inheritors of the conquests of Alexander the Great. Under the Romans its commercial fame was revived, though it had rivals in Ephesus and Pergamum, and at a later date a still more formidable rival in Byzantium, to whose emperors it belonged. It became famous, too, as an ecclesiastical centre, and was one of the Seven Churches of the Apocalypse; St Polycarp, its second bishop, suffered martyrdom there in 155 A.D., and an archbishopric was created in the 6th century. Smyrna was frequently sacked by the Turks, was partly occupied by the Knights of Rhodes (1344), destroyed by Tamerlane (1402), and finally captured by the Turks under Murad II. in 1424. The 17th and 19th centuries also witnessed a great commercial prosperity, nearly ruined, however, by the Balkan Wars (1912-13), the Great War, and succeeding events. In May 1919 the Greeks occupied Smyrna and the surrounding *vilayet* in virtue of the Treaty of Sevres. To counteract Italian designs in South Anatolia they began next year their advance into the interior, at first successful. The Turks, however, by a supreme effort under Kemal Pasha (q.v.) drove the Greeks from the country, and entered Smyrna, 9th September 1922. Four days later the great fire occurred. War between Turkey (q.v.) and the Allied Powers was only narrowly averted.

Smyth, DAME ETHEL, was born at London in 1858, and studied music at Leipzig Conservatorium. Her chief compositions include two symphonies, a Mass (1893), and the operas *Der Wald* (1901), *The Wreckers* (1906), *The Boatswain's Mate* (1916), *Fête Galante* (1923), and *Entente Cordiale* (1925). At times influences of classical composers, especially Brahms, are apparent, but as a whole her works are full of sincere, vigorous writing. Recognition of her worth came first from Germany. She was a militant suffragist, published excellent volumes of reminiscences in 1919 and 1921, and in 1922 was created a D.B.E.

Snail, a term employed to designate the species of terrestrial Gasteropoda (q.v.) which have well-formed spiral shells. The more typical snails

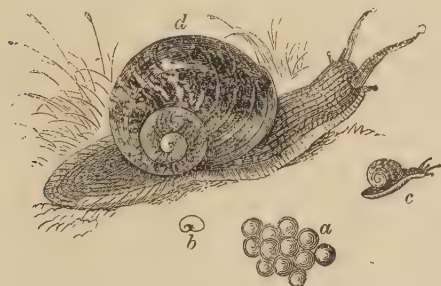


Fig. 1.—Common Snail (*Helix aspersa*):

a, eggs; b, appearance when newly hatched; c, slightly advanced stage; d, mature snail.

belong to the genus *Helix*, of the family Helicidae, and have the shell of many whorls, globose, depressed, or conical. The aperture or mouth of the shell is more or less encroached upon by the last whorl but one, it is often strengthened by an internal thickened rib, its edges are usually more or less reflexed, and there are sometimes calcareous

tooth-like prominences known as the denticles or apertural lamellæ. The animal progresses upon a foot or sole, which is flattened beneath, and fringed at the edge. There are four retractile tentacles, the two upper ones the largest, and bearing the eyes. There is a crescent-shaped jaw, which is usually strongly ribbed. The tongue or lingual membrane bears very many teeth arranged in transverse rows. Thus, the Common Garden Snail has 135 rows of 105 teeth=14,175 in all. Snails are hermaphrodite, but mutual insemination takes place. They are provided with calcareous styles or darts, which are secreted within a sac, the dart-



Fig. 2.
'Darts' of
Snails:

a, *Helix aspersa*;
b, *Helix arbus-*
torum.

sac, from which they are protruded during copulation. The forms of these darts are very various, and sometimes offer excellent characters for the separation of allied species. The eggs of snails are round or oval, and are deposited in damp places or in the earth. Those of the Edible Snail are nearly as large as a pea. At the approach of winter, or in very dry weather, snails close the mouth of the shell with a membrane (*epiphragm*) formed by the drying of the mucous substance which they secrete, and become inactive and torpid. Some, as the Edible Snail, make a succession of such membranes, the outer one of which is also strengthened by a quantity of calcareous matter, the secretion being at first a white

viscid fluid, but quickly hardening like plaster of Paris. When this is to be removed a fresh secretion of fluid mucus softens it at the edges. The Common Garden Snail is to some extent gregarious when in the torpid state: many individuals may frequently be found closely packed together in cracks in walls, under logs or stones, and in other sheltered places. Snails delight in warm moist weather, and are active chiefly at night and during or after rain. They are also more abundant on limestone soils than elsewhere; the kinds found in districts where there is little or no lime have frequently very thin shells, owing to the deficiency of calcareous matter to strengthen them. Snails feed chiefly on vegetable substances, although they are very indiscriminate in their appetite, and even devour the dead of their own kind. The mischief which they do to garden crops is too well known; and gardeners are constantly on the alert to destroy them. Thrushes and blackbirds devour great quantities of snails; they select a suitable stone against which they break the shells. These 'breaking-stones' may often be found in fields and by roadsides surrounded by fragments of shells. Snails possess in a very high degree the power of repairing injuries, and specimens may not rarely be found in which part of the shell has been broken and repaired again. Snails are found in nearly every part of the globe, some thousands of species having been described by authors. Seventy species are found in the British Islands, of which twenty-two belong to the genus *Helix*. The Edible or Roman Snail (*H. pomatia*), much esteemed as an article of food on the Continent, is regularly bred on large and prosperous snail-farms in canton Zürich, Bavaria, and elsewhere, being fed on salad, greens, kitchen-waste, meal, &c. It is a large tawny species, not rare in parts of the south of England (especially Kent and Surrey), and is sold for food in London. The Common Garden Snail (*H. aspersa*), the most destructive species in Britain, is too abundant in most places, but rare in parts of Scotland and north-west England. It is also used for culinary purposes, notably in the Newcastle, Bristol, and Swindon districts. The Striped Snail (*H. nemoralis*) is smaller than the Garden Snail,

and of various colours, usually red or yellow, ornamented with one to five spiral dark-brown bands. The rim or lip of the aperture in this species is dark brown, but in a closely allied species, *H. hortensis*, it is white. Both these species are very common, and it is a favourite custom for collectors to obtain large series showing the variation, their beauty and interest being very great. Taking variations in the banding alone, already eighty-nine of *H. nemoralis* and fifty of *H. hortensis* have been found within the British Islands, while very many others are known from abroad. *H. nemoralis*, when introduced into Virginia, produced many band-variations which are not known in Europe. *H. arbustorum* is a species about the same size as *H. nemoralis*, but brown, mottled with pale yellowish, and usually encircled by a single dark band. The Kentish Snail (*H. cantiana*) is smaller, whitish, more or less tinged with rufous. The Hairy Snail (*H. hispida*) is a small horn-coloured or brown species found in hedges, among moss, &c.; its shell is clothed with minute hairs or bristles. *H. virgata* is a species rather over $\frac{1}{2}$ -inch in diameter, found very abundantly in chalky places, on downs, and by the sea. It is usually white with one or more dark-brown bands, though some of the varieties are blackish or yellowish. On the South Downs this and an allied but smaller species (*H. caperata*) are so abundant that the sheep, when feeding upon the short grass, can scarcely avoid devouring them; and the excellency of the South Down and Dartmoor mutton has in part been attributed to the nutritive qualities of the snails. *H. ericetorum* is another species allied to *H. virgata*, and found in similar places, but it is larger and has the shell much flattened above. *H. pulchella* is a minute but very beautiful species, found abundantly both in Europe and North America. Hyalinia (often called Zonites) is a genus of small snails in which the jaw is without ribs, and the shell smooth and shiny. There are eleven British species. Some of them emit a garlic odour, especially *H. alliaria*. *H. crystallina* is a small species of a clear white colour. The genus Pupa consists of brown cylindrical shells, resembling small seeds. Some of them, which are placed in the sub-genus Vertigo, are exceedingly minute. *P. antivertigo* has the aperture of the shell so barred by long calcareous processes (denticles) that it is a wonder how the animal can emerge from it. Clausilia is somewhat similar to Pupa, but longer both actually and in proportion to the width; the aperture is turned to the left (*sinistral*) instead of to the right (as is the case with the majority of snails), and is provided with a very curious spiral, shelly plate (*clausium*). A south European snail (*Stenogyra decollata*) is of a cylindrical shape, and sheds its upper whorls when it becomes adult, the aperture so formed being covered by a shelly plate. Adult specimens thus appear truncate, presenting a very singular appearance.

Snake Bird. See DARTER, WRY-NECK.

Snake Cult, Snake Dance. See SERPENT-WORSHIP.

Snake River, the largest affluent of the Columbia River, rises among the Rocky Mountains near the western border of Wyoming, sweeps in a rough semicircle through southern Idaho, forming here the famous Shoshone Falls (q.v.), and, turning north, divides Idaho from Oregon and partly from Washington. At Lewiston it turns westward, and in southern Washington, under the name of the Lewis River or Fork, joins the Columbia, after a course of some 1050 miles. It traverses a very mountainous country, flowing through deep, lava-walled cañons, and is navigable for steamboats

only to Lewiston (160 miles). Its chief affluents are the Boisé, Owyhee, Malheur, Salmon, Clear-water, and Palouse.

Snake-root. See BISTORT, MILKWORT, ARISTOLOCHIA, and SENECA.

Snakes (*Ophidia*) form one of the classes of reptiles, and are readily known by their shape, being limbless and much elongated. To some extent the shape may be an adaptation to the habit of creeping through crevices and among dense herbage; for, apart from snakes, it is seen in other animals which crawl through obstacles or underground, in limbless lizards (e.g. *Amphisbæna* and *Anguis*), in the amphibian *Cæcilians*, in various eel-like fishes, and in worms.

General Habit and Structure.—As regards habitat we distinguish tree-snakes, usually green in colour, of slender body, and of active habits; the water-snakes, including the non-poisonous freshwater forms, such as the British Grass Snake and the tropical Anaconda, and the very venomous sea-snakes (*Hydrophidæ*), whose flattened tail, apical nostrils, &c. are adaptations to their mode of life; the burrowing snakes (*Typhlopidae*), with rigid cylindrical bodies, narrow mouths, and no specialised ventral shields; and the majority, which may be called ground-snakes.

The scales covering the body are formed from folds of skin. In each species of snake they have a definite arrangement, which is greatly relied on in the more detailed classification. This is especially true of the shields on the head, which are usually named after the underlying bones—parietals, frontals, nasals, &c.; thus between the nasal scale (on which the nostril opens) and the pre-orbital (in front of the eye) there is in harmless snakes a loreal scale, which is one of their characteristics. Most important in the life of the animal are the strong ventral scales or shields, for each of these is attached to a pair of ribs and helps to grip the ground. As they correspond in number to the vertebræ, they are also diagnostic of species. The number of vertebræ in snakes is often great, in some pythons amounting to more than four hundred. They form a uniform series, distinguishable only into pre-caudals and caudals, and all the pre-caudals except the first bear ribs. The bodies of the vertebræ are concave in front and have well-developed articular processes.

The skull is highly specialised. The bones which form the brain-case proper are firmly united, but most of the others are movable. Thus, 'when the snake opens its mouth for the purpose of striking its prey, the digastric muscle, pulling up the angle of the mandible, at the same time thrusts the distal end of the quadrate bone forward. This necessitates the pushing forward of the pterygoid, the result of which is twofold: firstly, the bending of the pterygo-palatine joint; secondly, the partial rotation of the maxillary upon its lachrymal joint, the hinder end of the maxillary being thrust downward and forward. In virtue of this rotation of the maxillary, through about a quarter of a circle, the dentigerous face of the maxilla looks downward, and even a little forward, instead of backward, and the fangs are erected in a vertical position' (Huxley). The halves of the lower jaw are connected in front by an elastic ligament, and this, combined with the mobility of the quadrates and squamosals, makes it possible for the snake to swallow its relatively large prey.

The teeth of snakes are short, conical, and sharp, and are fused to the bones which bear them. The upper teeth may occur on the maxillæ, palatines, pterygoids, and rarely on the pre-maxillæ; the lower teeth are borne as usual by the dentaries.

In the most venomous snakes, such as vipers and rattlesnakes, the maxillary teeth are few, and each is folded so as to form a tubular or grooved fang. The specialised fang is connected by a gradual series of forms with the ordinary teeth.

As to the appendicular skeleton, no snake has any trace of anterior limbs or girdle, and only a few—the pythons, boas, Typhlopidae, and Tortrices—have any rudiment of a pelvis. The pythons and Tortrices have short rudiments of hind-limbs terminated by claws.

While the nervous system of snakes differs from that of other reptiles only in small details, such as the absence of a differentiated spinal accessory or eleventh cranial nerve, the sense-organs are in many respects peculiar. The upper and lower eyelid, vestigial in the embryo, remain undeveloped, but a transparent screen, probably due to the 'third eyelid' or nictitating membrane, is fixed across the eye and covered by a single transparent scale. The eyes are often small and the sight is often dim. As the common simile 'as deaf as an adder' suggests, the sense of hearing is also dull; there is no external ear and no tympanic cavity. The nostrils lie at the apex of the snout; the sense of smell seems sufficiently acute to guide the snakes to their prey and to their mates. In finding the latter they are aided by the peculiar, sometimes musk-like odour characteristic of snakes. Of a sense of taste they have little need, for they swallow their prey whole, nor are the usual gustatory organs present. It is not too much to say that the most developed sense-organ is the tactile tongue, with which snakes feel their way and test everything which they touch.

The internal structure of snakes presents several peculiarities in adaptation to the elongated shape of the body. Thus, the stomach is long but not broad, the lobes of the liver are also elongated, there is in most cases only one lung, the kidneys are not opposite one another, and so on. The elasticity of the food-canal is an adaptation to the swallowing of relatively large booty, and during this often slow process the larynx is shunted forward into the mouth so that respiration is not seriously impeded. Although boas, rattlesnakes, and some others have paired lungs, most snakes have only one, usually with a rudiment of the other. There are often auxiliary air-sacs on the windpipe, and the posterior part of the lung is rather a reservoir for air than an actual breathing organ. Apart from the characteristic hiss, produced by the forcible expulsion of air, most snakes are dumb, but some boas are said to whine, and a few others make peculiar sounds, of which the rattling of the rattlesnakes is best known. In having a three-chambered heart and a circulation of mixed blood in the greater part of the body snakes resemble lizards and tortoises. No urinary bladder is developed.

The Poison-apparatus.—The poison-gland characteristic of the venomous snakes is not a new structure, but merely a specialised salivary gland, and it is interesting to notice that a similar modification occurs in the poisonous Mexican lizard *Heloderma*. From the gland, which lies on each side behind the eye, and is about the size of an almond in the cobra, a duct extends to the base of the fang, down which the venomous juice flows when the snake bites its victim. The fangs are folded teeth, each an open groove, as in the sea-snakes, or a closed tube, as in the vipers. It is of course clearly to be understood that the 'sting of the serpent' is a poisonous bite. Stretching over the poison-gland is the membranous origin of the masseter muscle which works the lower jaw, and by means of this and other somewhat complex arrangements the poison-gland is automatically compressed when the snake opens its mouth to

strike. But the opening of the mouth also brings about the erection of the fangs, which are



Fig. 1.

Open mouth of a venomous snake, showing the fangs half-hidden in their sheaths. (After Nuhn.)

recumbent and ensheathed when not in use. Behind each functional fang is a series of reserve fangs, and if a fang be broken the foremost of the reserves is shunted forward, and becoming fixed to the maxilla replaces the one which has been lost.

The juice formed in the specialised glands and forced out along the fangs is a clear viscid fluid with an acid reaction, and with poisonous properties which vary according to the species

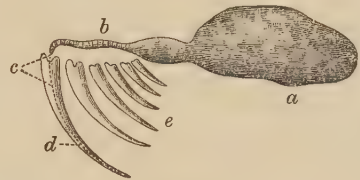


Fig. 2.

Dissection showing the poison-gland, *a*; its duct, *b*; the tubular fang, *c*, *d*; the reserve fangs, *e*. (After Nuhn.)

and also with the vigour of the snake. It may be kept for months or even years without losing its virulence. Injected through the fangs into the blood of a victim, it tends to paralyse the nerve-centres. It has most effect on birds and mammals, less on cold-blooded animals, such as fishes. An injection of the blood of a venomous snake may also prove fatal. Several venomous snakes are unaffected by their own venom, and Fayrer states that Cobras and Daboias may bite one another with impunity. He also notices that the 'sweepers and Dhomes', who attended his elaborate experiments in India were wont to eat the animals which had been fatally bitten. In 1843 Lucien Bonaparte discovered in the poison of the adder (*Pelias berus*) a substance which he called 'vipérine,' but this seems practically identical with the ptyaline of ordinary saliva, and we are still far from understanding why the juice of the poison-gland should have its peculiar properties.

Food.—Snakes are almost always carnivorous; and, as is suggested by the nature of their teeth, which are not adapted for mastication, they swallow their booty intact. Mammals, birds, reptiles, amphibians, fishes, molluscs, and insects are all eaten by snakes, and there are many forms with strange preferences—e.g. for milk and eggs. In the egg-eating African snake—*Rachiodon*—the teeth are rudimentary, but the inferior spines of the anterior vertebrae project on the dorsal wall of the gullet and break the egg-shells. In many cases the prey is relatively large—larger indeed than the normal size of the mouth and gullet—and the process of swallowing is tedious. In the python, for instance, there is a slow continuous action of jaws and teeth; the victim is firmly held by one side of the mouth while the other side is protruded and its teeth implanted further forward, and so on alternately on each side. Meanwhile the mobile bones of the skull are being stretched to the utmost, and the

victim is covered with saliva which makes the passage down the elastic gullet somewhat easier. After a heavy meal the snake often lies dormant for a time, after which it may cast its slough.

Movements.—Owen has said of snakes that they can 'outclimb the monkey, outswim the fish, outleap the zebra, outwrestle the athlete, and crush the tiger;' yet all without limbs. The muscular system is very strongly developed, and the long ribs associated with most of the vertebræ serve instead of legs. The serpent 'literally rows on the earth, with every scale for an oar; it bites the dust with the ridges of its body.' On a very smooth surface—on glass, for instance—it can make no headway, but in normal conditions the edges of the anterior ventral scales are fixed against the roughnesses of the ground, the ribs are drawn together first on one side then on the other, the body is thus wriggled forward to the place of attachment, the hind part fixes itself, the front part shoots out, an anterior attachment is again effected, and thus the snake glides onwards. But this scarcely suggests the swiftness or the beauty of what Ruskin calls 'one soundless, causeless march of sequent rings, and spectral procession of spotted dust, with dissolution in its fangs, dislocation in its coils. Startle it; the winding stream will become a twisted arrow; the wave of poisoned life will lash through the grass like a cast lance.' Were it not for many fanciful pictures it would scarcely be necessary to say that without any support snakes are not able to raise the anterior part of their body more than a short distance from the ground.

Sloughing.—It is well known that a snake periodically 'casts its skin,' leaving behind it a continuous 'slough.' The same process occurs in lizards, and to a less extent in some other animals. What is cast is the external layer of the epidermis, and its continuity depends on the fact that the scales are simply folds of skin. As to the physiology of the process, although a complete explanation has not yet been given, it is evident that the outer layer of the skin tends to die away, and that the continued growth of the animal makes sloughing necessary. The number of sloughings in a year varies with the species of snake and also with the age and health of the individual. Cobras have been observed to slough as often as once a month, but this seems to be unusually often. Before sloughing snakes are often almost blinded by the change in the skin over the eyes, and at this time they are said to be very irritable. In getting rid of its slough the snake gets its head free first, and the outer layer is turned inside out from before backwards.

Reproduction.—The sexes are almost always quite like one another externally, save that the females are always larger. The internal organs of reproduction are paired, but those of the right side are often the larger and lie in front of those on the left. The male has a double copulatory organ, sometimes covered with spines or hooks. The eggs, fertilised within the oviducts, are more or less oblong in shape, and are surrounded by a leathery envelope, 'for the rupture of which the embryos are provided with an egg-tooth, a special development like that of the chick.' Most snakes are oviparous, but, as among lizards, viviparous forms occur, such as the British Adder (*Pelias* or *Vipera berus*). It is said that Geoffroy Saint-Hilaire and Florent Prévost 'succeeded in making the (normally oviparous) Common Grass Snake viviparous by depriving it of water and maintaining a suitable surrounding temperature;' and it may be that some viperine snakes and the *Boa Constrictor*, which have borne their young alive in captivity, are oviparous in natural conditions of life. Of the python it is recorded that the mother coils herself around the laid eggs

and broods over them, the temperature within the coils rising as high as 96° F.

Classification.—Snakes may be thus classified:

SUB-ORDER I.—Ophiorodontia (=Typhlopidae): the simplest and smallest snakes, sometimes smaller than earthworms, occurring in most warm countries as burrowers in the soil. The mouth is narrow and not distensible; the eyes are small and half-hidden; and the skull, besides being much less mobile in its parts than is usual in snakes, is unique in having transverse palatine bones which meet or nearly meet in the base, in the absence of a 'transverse bone,' and in the freedom of the pterygoids from the quadrate; only one jaw, either the upper or the lower, bears teeth. They are not venomous. Most of the forms belong to the genus *Typhlops*—represented in America, Africa, India, Australia, and by one species in south-eastern Europe.

SUB-ORDER II.—Colubrifornia: mostly harmless snakes without any fangs (*Aglyphodontia*), or with some of the posterior maxillary teeth grooved and fang-like (*Opisthoglypha*). Examples: the Pythons (*Pythoniæ*), the Boas (*Boidæ*), the Grass or Ringed Snake (*Tropidonotus natrix*), the Smooth Snake (*Coronella lævis*), the Tree-snakes (*Dendrophidæ* and *Dryophidæ*).

SUB-ORDER III.—Colubrifornia venenosi: poisonous snakes with permanently erect fangs, succeeded by solid teeth (*Proteroglypha*). Examples: Cobras (*Naja*), Hamadryas (*Ophiophagus*), Coral-snakes (*Elaps*), Sea-snakes (*Hydrophidæ*).

SUB-ORDER IV.—Viveriformes: poisonous snakes with a few erectile maxillary teeth specialised as fangs (*Solenoglypha*). Examples: Vipers (*Viperidæ*) and Rattlesnakes (*Crotalidæ*).

Distribution.—The number of species is certainly above 1000 and is sometimes estimated at about 1800. They are represented in most parts of the world, abundantly in the tropics, commonly in temperate countries, dwindling towards the poles. They are absent from New Zealand and most Oceanic islands, and it is a proverbial saying that 'there are no snakes in Iceland.' In Ireland also they are unrepresented, except by casual importations.

The Grass or Ringed Snake (*Tropidonotus natrix*) and the poisonous Viper or Adder (*Pelias* or *Vipera berus*) are the two common kinds of snake found in Britain. There is indeed only one other species, the Smooth Snake (*Coronella lævis*), and this is of rare occurrence. The smooth snake and the ringed snake are non-poisonous Colubrine snakes; the viper is a small representative of a very venomous family. As the viper is discussed in a separate article, and as the smooth snake is restricted to a few parts of the south of England, we need only describe the ringed snake. It sometimes attains a length of 3 or 4 feet, is very fond of water, and feeds chiefly on frogs, small fish, young birds, mice, and other small animals. Its colours are beautiful—usually brownish gray with a green tinge above, dull pale bluish beneath. In summer it is fond of basking among the long grass; in winter it hibernates in some sheltered nook in company with several of its fellows. Unlike the adder, the ringed snake is oviparous, laying 16–20 eggs in some well-sunned spot. It is common in some parts of Britain. These three species also form the Ophidian fauna of Scandinavia, Denmark, Holland, and Belgium; but there are over a dozen other European species, of which one of the commonest is the Asp (*Vipera aspis*).

The North American Ophidia include a large number of Colubrine snakes and about a score of pit-vipers or rattlesnakes. Among the Colubrine forms are the water-snakes (*Tropidonotus*), the black snakes and coachwhip snakes of the genus *Coluber*, the pine-snakes (*Pityophis*), species of *Elaphis*, the king-snakes (*Ophibolus*), the ring-necked snakes (*Diadophis*), and so on. Besides the rattlesnakes proper (*Crotalus*) there are related genera, such as *Ancistrodon*, the copperheads and moccasins. And outside the two families of Colubridæ and Crotalidæ there are representatives of the burrowing Typhlopidae, of the boa-like Erycidae, and of the venomous coral-snakes (*Elapidae*)—the harlequin snake (*Elaps fulvus*) being a well-known representative of the last.

The Colubridæ form the largest and most cosmopolitan of Ophidian families, being abundantly represented in all the great regions except Australia, where the venomous Elapidæ predominate. 'The tree-snakes proper (Dendrophidæ) are found in all the tropical regions; the nocturnal tree-snakes (Dipsadidæ) and the arboreal whip-snakes (Dryophidæ) are also essentially tropical, but they are either wholly, or almost wholly, wanting in Australia' (Heilprin).

The Pythons and Boas are distinctively tropical snakes: the Pythons in Africa, India, Malaya, Australia; the Boas in tropical America. Among the most important venomous snakes of India are the following: the Cobra (*Naja tripudians*), the Hamadryas or Sunkerkhor (*Ophiophagus elaps*), the Krait (*Bungarus caeruleus*), and the Sankni (*B. fasciatus*), various species of Callophis, the Chain Viper or 'Bora Siah Chunder' (*Daboia russellii*), *Echis carinata*, various species of *Trimeresurus*, and the sea-snakes (*Hydrophis*, &c.).

Zoological Position.—It may be granted that snakes are more nearly allied to lizards than to other living reptiles, but the affinities are not close, nor does palæontology help us much, for fossil remains of Ophidia are scarce. 'Only one species, the *Simoliophis rochebruni*, from the Upper Cretaceous deposits of the Charente, France, is known to antedate the Tertiary period.' 'Whether or not the snakes are in part the modified descendants of the extinct lacertilian Pythonomorphs, to which they seem to approximate in certain points of structure, still remains to be determined.'

Superstitions about Snakes.—As snakes fill most men with fear, which is the prolific mother of fiction, hundreds of strange superstitions surround these animals. Born from the soil, they lick the dust for their food; powerful indeed, they are killed by spiders, and cannot stand before crabs; venomous many of them, they are poisoned by human saliva, and flee from the shadow of the ash or the odour of rosemary; their maximum size has been stated at a mile. It is not surprising that many peoples should have found in the serpent 'a divine hieroglyph of the demoniac power of the earth—of the entire earthly nature,' or even a symbol of the principle of evil. 'As the bird,' Ruskin says, 'is the clothed power of the air, so this is the clothed power of the dust; as the bird is the symbol of the spirit of life, so this of the grasp and sting of death.' For serpent worship, see SERPENTS.

We cannot wonder that the ingenuity of despair should have sought out many strange antidotes to the poison of serpents. Various kinds of herbs, portions of the snake's own body, a diet of 'antipathetic' animals, spells, charms, and amulets have been often resorted to, often of course with successful results, for the bite is not always fatal, and confidence is the best of tonics; often of course uselessly when the Fates were cruel. Among the most famous, and for the most part quite useless, 'cures' for snake-bite is the application of a 'snake-stone.' Although the nature of this so-called 'stone' is sometimes kept secret by the native quacks who prepare it, the substance is often a piece of charred bone, and its only possible efficacy lies in its power of absorbing the poisoned blood from the wound to which it is applied. But the results of actual experiments with snake-stones are entirely against any belief in their virtue. Some of the Ammonites (q.v.) have been used as snake-stones, the idea being that they were petrified snakes. Another kind of snake-stone or adder-stone, also called *ovum anguinum*, adder-gem, and *druidical bead*, was carried about as a miscellaneous charm in Britain, and was believed to have been produced by a number of adders laying their heads together

and hissing till the foam produced was turned into stone. Such charms when examined have often been found to be simply ancient—possibly prehistoric—spindle-whorls. See also BEZOAR.

As a superstition we must also regard the widespread belief that snakes 'fascinate' their prey. Although many observers are convinced of this, the use of the word 'fascinate' has not been justified. No doubt snakes, having no movable eyelids, have an unusual power of steady staring; no doubt birds whose nestlings are threatened will flit anxiously about regardless of danger. In countries where venomous snakes are common, it is possible that the animals on which they prey have an inherited dread of them. It is certain that both men and animals when brought suddenly face to face with something terrible are often panic-stricken and incapable of motion; but there is no evidence that snakes have a power of fascination.

Scarcely a superstition, but rather an insufficiently confirmed opinion, is expressed in the common belief that snakes swallow their young ones when danger threatens. Were not errors of observation exceedingly common, we should be inclined to accept this strange fact, for the shelter afforded by the mouth is a convenient if somewhat hazardous one, and the young snakes might live there for some time. It is known that a few fishes and amphibians carry their young in their mouths. But the possibilities of mistake are many: thus, some snakes eat other snakes, and their bodies have often been found in the food-canals of their larger neighbours. Moreover, some snakes are viviparous, and unpractised observers might mistake the oviducts for the alimentary canal.

Serpent-charming.—This art has been practised from very ancient times in Africa and the East, and often remains from generation to generation the profession of a family. Pliny and older writers frequently describe it, and there are several allusions to it in the Old Testament Scriptures; see Exod. vii. 11, 12; Psalm lviii. 4, 5; Eccles. x. 11; Jer. viii. 17. It is sometimes practised for alleged useful purposes, since the 'charmners' are often employed to clear a house of its unwelcome snake visitors, though common report says that they are yet more successful in removing inanimate objects. For the most part, however, it is, like conjuring, a form of popular amusement. In India it is practised by several distinct classes of men, who vary in the methods and success of their art. The subject has not as yet been studied with adequate scientific precision, so that it is difficult to separate what is due to trickery and to dexterity from any residual facts which cannot be thus explained. There is no reason to believe that the charmners possess the constitutional immunity from snake-bite which they often claim, for a tragic end to their exhibitions sometimes belies their pretensions, and they usually take good care to play with snakes whose fangs or even poison-glands have been carefully removed, or even to use those which are not venomous at all. Nor can we, without further evidence, believe that the professional snake-finders have, beyond the cleverness of long experience (including an educated sense of smell), any peculiar power of discovering concealed snakes, especially since it is well known that they often use simple sleight of hand, producing snakes from within the folds of their robes, or merely discover what they themselves have previously hidden. The frequent use of a musical pipe, and the way in which the snakes seem to respond to the sounds, are facts interesting to naturalists, who believe that at least many snakes are very deaf. Experiments should be made to determine how far the rhythmical motions which often accompany the

music may have any influence on the snakes. That the charmers govern their snakes by their eye is another of the vague assertions of common report; but more interesting is the ancient habit of spitting down the snake's throat, closing its mouth, laying it flat on the ground, and sending it into a cataleptic—perhaps hypnotic—state, or 'turning it into a stick.' The charmers sometimes manifest a fearlessly confident dexterity in handling intact venomous snakes, and they sometimes suffer for it.

Snake-bites.—The effect of a snake-bite depends, on the one hand, on the species of snake, on its vigour at the time, on the extent to which the teeth closed on the flesh of the victim, and so on; on the other hand, on the species and vigour of the organism bitten. In connection with the effects of different snake-poisons Dr A. H. Hilson divides venomous snakes into two classes: in the first, including the Cobra, Krait, Daboia, and other Indian snakes, the poisoning causes paralysis of the lower extremities and the muscles of articulation, is associated with a regular or intermitting action of the heart, with paralysis of the respiratory muscles, with persistent consciousness, with little effect on the sensory ganglia, and is unaffected by injection of ammonia into the veins; in the second class, including the common Australian poisonous snakes, the Rattlesnake, and the Indian genus *Trimeresurus*, the poisoning causes no paralysis or only as an adventitious symptom, is associated with failure of the heart's action, but with no impeding of respiration, with rapid obliteration of consciousness, with disordered sensory functions, and is curable by injection of ammonia into the veins and by the use of stimulants. Snake-poison is usually regarded as (a) a neurotic paralysing the nerve-centres, (b) an irritant producing inflammation, and (c) to some extent a septic. It acts through the circulation on the nerve-centres, and also affects the blood itself.

Fayrer summarises the treatment of snake-bite as follows: 'Apply at once a ligature, or ligatures at intervals of a few inches, as tight as you can possibly tie them; and tighten the one nearest to the wound by twisting it with a stick or other such agent. Scarify the wound, and let it bleed freely. Apply either a hot iron or live coal, or explode some gunpowder on the part; or apply either carbolic or some mineral acid, or caustic. Let the patient suck the wound whilst you are getting the cautery ready; or if any one else will run the risk, let him do so.'

* If the bite be on a toe or finger, especially if the snake has been recognised as a deadly one, either completely excise, or immediately amputate at the next joint. If the bite be on another part, where a ligature cannot be applied, or, indeed, if it be on the limbs above the toes or fingers, cut the part out at once completely.

'Let the patient be quiet. Do not fatigue him by exertion. When, or even before, symptoms of poisoning make their appearance, give the ammoniacal preparation called eau-de-luce, or liquor ammoniac, or carbonate of ammonia, or even better than these, hot spirits and water. There is no occasion to intoxicate the person, but give it freely, and at frequent intervals. If he become low apply sinapisms and hot bottles, galvanism or electro-magnetism over the heart and diaphragm. Cold douches may also be useful. If the respiration be failing, artificial Respiration [q.v.] . . . may be employed.'

'The antidotes, in addition, may be used by those who have faith in them; but, as I have said, I fear there is no reason to believe that they are of any use. Encourage and cheer the patient as much as possible. As to local effects, if there be great pain, anodynes may be applied or administered, and antiseptic poultices to remove sloughs; collections of matter must be opened. Other symptoms

are to be treated on general surgical principles. This, I believe, is the sum and substance of what we can do in snake-bite. If the person be not thoroughly poisoned we may help him to recover. If he be badly bitten by one of the more deadly snakes we can do no more.'

By many reliance has been placed as antidotes on ammonia, permanganate of potash, arsenic, iodine, bromine, the poison and bile of other snakes, the guaco plant, ipecacuanha, aristolochia, senega. Fitzsimons (1912) recommends rubbing permanganate of potash into the well-opened wound. Most antidotes, he says, are worthless; ammonia and nicotine are actually dangerous. The ligaturing to be effective should be applied at once; and the permanganate of potash treatment should be followed by the injection of one of the generalised anti-venomous serums.

Uses of Snakes.—Some snakes—e.g. *Ophiophagus*—eat one another; many help to keep down the numbers of small animals, such as rats and mice, whose increase is disadvantageous. Several are used for food; the poison is sometimes used by native physicians as a medicine—'a promoter of the virtue of other drugs, an anti-spasmodic, a digestive, a stimulant,' &c.; it is also used to increase the deadliness of weapons. The oil extracted from the abundant fat of many snakes is said to be very useful for external application, and there is hardly a part of the body from which it has not been employed in superstitious therapeutics.

See ANACONDA, BOA, COBRA, PYTHON, RATTLESNAKE, VIPER, &c.; Hoffmann's 'Reptilia' in Bronn's *Thierreich* (Leip. and Heidelberg, 1859 *et seq.*); Duméril and Bibron, *Erpétologie Générale* (9 vols. Paris, 1834-54); Günther, *Reptiles of British India* (Lond. 1861); Blanford, *Fauna of British India* (1891); Fayrer, *Thanatophidia of India* (1874); Bell, *British Reptiles* (1839); Boulenger and others, *Catalogue of the Snakes in the British Museum* (3 vols. 1882-96); Jan and Sordello, *Iconographie des Ophidiens* (Paris, 1860-80); Krefft, *The Snakes of Australia* (Sydney, 1869); books on North American reptiles by Halbrook (1842), Baird and Girard (1853), Cope (1900), and Gadow (1906), and Hopley's *Snakes* (a popular work, 1882); and Leighton's *Life-History of British Serpents* (1901).

Snakewood. See BREAD-NUT.

Snapdragon (*Antirrhinum*), a genus of Scrophulariaceæ, consisting of annual and perennial herbaceous plants, chiefly natives of the temperate parts of the northern hemisphere. They have the calyx five-parted; the corolla swollen at the base, but without a spur, and *personate* (Lat. *persona*, 'a mask')—i.e. its mouth closed by the pressure of the lower against the upper lip; and the fruit is a two-celled oblique capsule, opening by three pores at the apex. The English name refers to a peculiarity of the corolla, the lower lip of which, if forcibly parted from the upper so as to open the mouth, shuts with an elastic spring or snap. Some of the species have very pretty flowers. *A. majus* has long been a favourite in British gardens, in which there are many fine varieties of it. The whole plant is bitter. An oil is extracted in Persia from the very abundant seeds,



Snapdragon (*Antirrhinum majus*).

by heating and then submitting them to pressure. —Snapdragon is also the name for a Christmas pastime in which raisins are snatched out of a dish in which brandy is burning, in a room otherwise dark.

Snaphaunce, a term originally applied to the spring-lock of a gun or pistol, but afterwards applied to the gun itself, a Dutch firelock of the 17th century. See FIREARMS.

Sneek, a town in the Netherlands, province Friesland, 13 miles SW. of Leeuwarden, with an active trade in agricultural produce, especially in butter and cheese. Pop. 13,000.

Sneeze-wood (*Ptaeroxylon utile*; family Sapindaceæ), one of the largest and most valuable trees in South Africa, sometimes yielding logs 80 feet long by 4 feet in diameter. The wood is of a yellowish colour, and has a handsome appearance somewhat resembling satinwood in the grain. It is difficult to work owing to its great hardness, but is believed to be very durable. It is employed for cabinet-making, for carpentry work, for fencing, and for engineering purposes. Neither the white ant nor the teredo, it is said, will penetrate it. Its native name is *Umtati*, and it derives its English name (a translation of the Dutch *Nies-hout*) from the irritating nature of the dust which results from sawing or otherwise working it.

Sneezing consists in a sudden violent expiration, preceded by one or more inspirations. During the expiration the fauces are generally closed so as to direct the current of air through the nose. Sneezing is most frequently produced by the presence of irritating substances in the nose, and indeed its purpose seems to be mainly to expel these from the nasal cavities. Irritants stimulate the terminal branches of the fifth nerve which are distributed over the nasal mucous membrane, and the stimulus conveyed to the 'respiratory centre' in the medulla leads to the respiratory efforts described. Sneezing is therefore a 'reflex act,' and as such is beyond the control of the will. It may, however, sometimes be prevented by the application of a strong stimulus to the nasal nerve, such as by compressing it at its exit from the nose, and it may also be prevented sometimes if a bet be made that it will take place. Sneezing may also be induced by irritation of other nerves than the nasal: thus, by gazing at a very bright light the strong stimulation of the optic nerves will sometimes bring on a sneeze. Sneezing not only rids the nasal cavity of foreign substances, but acts in a special way upon the general and especially the cerebral circulation. For the respiratory centre in the medulla is in close proximity to the vaso-motor centre, and the stimulus which leads to the sneeze produces at the same time increased activity of the vaso-motor centre, whereby the pulse is quickened, the blood-pressure rises, and the blood-vessels of the brain are dilated. Hence sneezing exerts a stimulant effect on the brain. Substances employed to induce sneezing are termed 'sternutatories' or 'errhines,' the principal ones being snuff, ipecacuanha, and euphorbium.

Paroxysmal sneezing is an expression of a special idiosyncrasy, and occurs most frequently, if not always, in persons of nervous habit. The attacks are often periodic, recurring like 'morning sneezing' with great regularity at certain times or under certain conditions. In others the attacks are provoked by the inhalation of dust or by particular odours. All these forms of morbid sneezing are due either to an increased irritability of the nerves in, or to chronic congestion of, the nasal mucous membrane, or to an increased excitability of the central nervous system, or to both, and they are largely maintained by *habit*. The disease is not

infrequent in persons of gouty or asthmatical tendencies. The treatment consists in the choice of a climate most suitable to the individual, but no rule can be laid down for any one case; in some cases change of air appears to exert little influence, in others a change even to the opposite side of a street will effect a cure. Diversion of the attention will often prevent the appearance of a paroxysm at its wonted time. The drugs employed most successfully in combating the affection are opium, morphine, the combined bromides or iodides of sodium, potassium, and ammonium, *Lobelia inflata*, and nerve tonics. Locally, sprays of adrenalin or ichthyol solution are useful. See HAY-FEVER. —The custom of formally invoking a divine blessing on one who has just sneezed is of venerable antiquity, and is very widely spread, but its real significance is by no means so easy to determine. Rabbinical legends connect it with Jacob, but it is not possible to give any fuller answer to Pliny's question, 'Cur sternumentis salutamus?' than to say that it expresses respect to a divine intimation or to a natural sign of mortality. The most famous historical sneeze is that which was hailed as a good omen by Xenophon's ten thousand at a moment of despair.

Snehatten, a mountain of the Dovrefjeld (q.v.) in Norway, 7566 feet high.

Snell Exhibitions. See GLASGOW (UNIVERSITY).

Sniatyn, a town in the extreme south-east of Eastern Galicia, on the Pruth, 25 miles NW. of Czernowitz. Pop. 12,000.

Snider, JACOB, the inventor of a method for converting Enfield muzzle-loading rifles into breechloaders (see BREECH-LOADING, and RIFLES). Originally a Philadelphia wine-merchant, he busied himself in inventions connected with dyeing, brewing, coach-wheels, the sheathing of ships, &c., and crossed to England in 1859 to induce the British government to adopt his system of breech-loading or converting. In this he succeeded, but for one reason or another found himself unable to obtain the expected remuneration. He died 25th October 1866, worn out by delays, lawsuits, poverty, and debts.

Snipe, the name of a genus (*Gallinago*) and of a family (Scolopaciæ) of birds, order Grallæ. The birds of this genus have a very long, straight, flexible bill, slightly elevated towards the tip of the upper half, which expands a little, is decurved at the point, and projects over the lower. The whole bill is smooth, soft, and extremely sensitive. The head is compressed; the eyes are large and are placed far back. The wings are moderate in size; the legs are rather long; the three toes in front are long, slender, and divided to the base; the hind-toe is slender. The Common Snipe (*G. gallinago*) is about 11 inches in entire length, the bill almost 3 inches. The sexes are alike in plumage, but the female is rather larger than the male. The general colour of the upper parts is blackish brown, finely mixed with pale brown and with a rich buff colour; three pale brown streaks along the head; the neck and breast pale rust colour mottled with black; the belly white. The tail consists of fourteen feathers. The snipe when flushed changes its course several times in a zigzag manner in the air, and then darts off very swiftly, so that young sportsmen find it a very difficult bird to shoot. The snipe makes a rough and ready nest of a little dry herbage in a depression of the ground, or sometimes in a tuft of grass or rushes. The eggs are four in number, large for the size of the bird, pale yellowish or greenish white, the larger end spotted with brown. This species of snipe is

plentiful in all the moory and marshy parts of Britain, and generally throughout Europe and as far as Iceland, also extensively in Asia, and it is found in the north of Africa, its representative in South Africa being a distinct species (*G. aquatorialis*). It breeds in Britain, even in the south of England, and migrates in autumn, to return in the following spring, while the winter birds are migrants from Scandinavia, arriving in the end of summer and departing in spring. The note of the



Common Snipe (*Gallinago gallinago*).

snipe is a *scape, scape*; but especially at the breeding season the bird produces a peculiar drumming or bleating sound (hence the name 'heather-bleater' given to the snipe in Scotland) when executing its extraordinary aerial evolutions. The sound is due to the vibration of the two outer tail feathers as the bird shoots down through the air. Perhaps the stiff primaries of the wings help the sound, which is believed by some ornithologists to be produced by the female as well as by the male. The snipe is capable of being tamed, and becomes very familiar. A tame snipe has been known to eat nearly twice its own weight of worms in twelve hours. The snipe is in high esteem for the table, and is included amongst game in Britain. The habits of all the other species of snipe correspond very nearly with those of the common snipe. The Great Snipe, or Solitary Snipe (*G. media*), an annual visitor in small numbers to eastern and southern parts of England, very rare in Scotland and Ireland, but abounding in the extensive marshes of continental Europe, is found also in Asia and in many parts of Africa. Its entire length is about 12½ inches, the bill not quite so long in proportion as that of the common snipe. There are sixteen feathers in the tail. The Jack Snipe, or Judcock, usually referred to a separate genus, *Limnocryptes gallinula*, is the smallest of the group, and like the common snipe in plumage. It is common in Britain, but mostly as a winter visitant, and is found also during summer and winter in most parts of Europe and of the north of Asia and in North Africa. North America has a number of species. The Common American Snipe (*G. wilsoni*) is about equal in size to the common snipe of Europe, and much resembles it also in plumage, but has sixteen feathers in its tail. The name snipe is extended in popular usage to include the genus *Macrorhamphus*, in which the outer toes are connected at the base by a membrane. In other characters, as well as in plumage and habits, the similarity to the true snipes is very great. The Red-breasted Snipe, or Brown Snipe (*M. griseus*), of North America has been occasionally seen in Britain and in Picardy and Normandy. In size it is nearly equal to the common snipe.

Snipe-fish. See TRUMPET-FISH.

Snizort, LOCH, a large and picturesque inlet of the sea in the north-west of Skye, between Trotternish and Vaternish Points. It narrows from 9 to 3¼ miles, and is 8½ miles long.

Snoring, an abnormal and noisy mode of respiration produced by deep inspirations and expirations through the nose and open mouth, the noise being caused by the vibrations of the soft palate and uvula. Sometimes the noise arises in the glottis, the vocal chords vibrating loosely. Keeping the mouth shut will usually make snoring impracticable.

Snorri Sturlason, an Icelandic historian and politician, was the son of a chief of the western fjords, and was born in 1179. The grandson of Sæmund Sigfusson, the compiler of the Elder or Poetic Edda, instructed him in the history, mythology, and poetry of the North, as well as in classical literature. By a wealthy marriage Snorri early sprang into a position of influence, and was elected (1215) supreme judge as well as president of the legislative assembly of the island. But his ambition, avarice, and love of intrigue led him to take part not only in private quarrels, but in the intestine troubles of Norway, and thus drew upon him the ill will of the Norwegian king, Hakon, who sent secret instructions to Iceland for his arrest, or, if need be, his assassination. The king's commands were carried out by one of Snorri's bitter enemies, who attacked him in his own house, and murdered him in the year 1241. Snorri was a poet of no mean order; and besides numerous laudatory poems on contemporary kings and jarls, he composed the Younger or Prose Edda (q.v.) and the *Heimskringla*; this last is a series of sagas or biographies of the Norwegian kings down to 1177, based on trustworthy sources and critically sifted evidence, and is written in a lively and interesting style. It has been translated by S. Laing (1844; new ed. by Rasmus B. Anderson in 4 vols. 1889).

Snow is the crystalline form into which the excess of vapour in the atmosphere is condensed when the temperature is below freezing. It is not, like hail or sleet, frozen rain, but is formed directly by the invisible aqueous vapour condensing in minute spicules of ice round the dust-particles that float in the air. More than 1000 different forms of crystals have been observed, and many of the chief or typical forms sketched or photographed by Scoresby, Glaisher, Bentley, and others; but in all of them the filaments of ice are arranged at angles of 60° or 120°, and they may be grouped into five classes. (1) Thin plates or stars of six rays (figs. 1 to 5), the forms getting more complex the lower the temperature. (2) A solid nucleus or a flat plate, with needle-like crystals projecting in all directions; fig. 7 is a section through one of these.

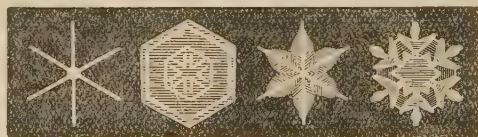


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

(3) Fine hexagonal or three-sided prisms about 1/16th of an inch long. (4) Prisms having thin plates perpendicular to their length: this form is rare (fig. 6). (5) Pyramids with six faces (fig. 8): this form also is rare, and is often associated with electrical disturbances. Each shower generally consists of flakes of one class only. Their form is best seen in calm weather; if there is much wind the crystals are broken and irregular, and during

gales tend to agglomerate in spherical masses. Perfect snow crystals are seen only when snow is formed at a temperature considerably below the freezing-point of water. When the temperature is near the freezing-point, snow falls in agglomerations of snow crystals which are known as *snow-flakes*. Each flake consists of a matted network of snow-crystals, in which the form of crystallisation is usually obscured owing to partial thawing. The size of flakes varies from about an inch down to



Fig. 5.

$\frac{1}{16}$ th of an inch in diameter, the size being smaller the lower the temperature. The snow-fall of the British Isles is rarely so great as to cause serious inconvenience, except when accompanied by wind and consequent drifting: it then accumulates in railway cuttings and other sheltered places very rapidly, and to an extent limited only by the depth of the sheltered place. In the New England states the average annual fall ranges from 4 to 7 feet.



Fig. 6.

Fig. 7

Fig. 8.

In the Arctic regions and Siberia, though the fall is not greater than this, the snow lies unmelted much longer. To the south of lat. 40° snow is rare, except on hills; but it has been known to fall and lie for several days in Algeria and Morocco, and at Canton, within the torrid zone, it has fallen to a depth of 4 inches. Fresh-fallen snow is very light, owing to its looseness of structure—a foot of such snow gives only about an inch of water when melted; but it increases in density when lying, partly by compression due to its own weight, partly by the filling of the interstices with condensed and frozen moisture from the air, and greatly by partial thawing and refreezing. In this way the snow on mountains that rise to a height sufficient to have a temperature mostly below freezing gets hardened into *névé*, and ultimately into the ice of the glacier, by which it is transferred to lower regions; but if the depth on a steep slope gets too great before it has time to harden it is liable to sweep down suddenly as an avalanche of dry snow. On the other hand, the sudden melting of snow may cause dangerous floods, such as occur when the warm wind, called the *Föhn*, blows over the Alps; but the more gradual melting of the snow-mantle of hills feeds the deep-seated springs of

rivers. The snow of the Arctic regions, where solar radiation is weak, does not compact together, but remains dry and powdery; in eastern Siberia the prevalent wind is north-west, and all winter there is a continual drift of dry snow along the surface towards the south-east. The white colour of snow is due to reflection of the light from the innumerable surfaces of the crystals, each of which is composed of clear ice, just as glass loses its transparency when pulverised. Snow is feebly phosphorescent, absorbing light during the day and giving it out at night. The loose texture of freshly fallen snow makes it an admirable non-conductor of heat, and in the temperate zone it often preserves the ground from the chilling action of short spells of intense cold. The latent heat set free when vapour condenses into snow also sometimes mitigates the severity of a frost.

In polar and alpine regions, where it lies unmelted from year to year, and the annual fall is small, snow is sometimes coloured red by the presence of innumerable small red plants. In its native state the plant consists of brilliant red globules seated on a gelatinous mass. It is an *Alga*, *Protococcus nivalis*; it is probably near akin to the not uncommon *Hematococcus pluvialis*. Red snow seems to have been observed by the ancients, as a passage in Aristotle apparently refers to it; but it attracted no attention in modern times till 1760, when Saussure observed it in the Alps, and from chemical experiments concluded that the red colour was owing to the presence of some vegetable substance, which he supposed might be the pollen of a plant. The next observations on red snow were made in the Arctic expedition under Captain Ross, when it was found extending over a range of cliffs on the shore of Baffin Bay for 8 miles, the red colour penetrating the snow in some places to a depth of 12 feet. Less frequent is a green growth on snow. See also BACTERIA, BLIZZARD, ICE.

SNOW-LINE.—This is the usual term employed to signify the height below which all the snow that falls during the year is melted in the course of the summer, or, in other words, the limit above which snow perpetually lies. It is no hard and fast line, but varies greatly in different localities, and in most localities varies more or less from year to year. Hence it would be more appropriate to speak of a zone, having upper and lower limits, within which the snow-line moves up and down. The altitude at which this line (or zone) is found depends upon several conditions—the volume of snow precipitated during the winter, the amount of the rainfall and the position of the mountain-slope with reference to the principal rain-bringing winds, the latitude or distance from the equator, the degree of exposure to the sun's rays, the angle of the slope or the relative steepness of the mountain-side, and the general humidity or dryness of the atmosphere. Other things being equal, the following rules hold good: the snow-line is higher in north latitudes on the south than on the north side of mountains; higher on the east than on the west, owing to the greater prevalence of westerly winds in regions where snow accumulates; and higher in the interior of continents than near the sea, because in the former situations the precipitation is less and the heat of summer greater. In each separate locality the snow-line must be determined by a proper series of observations. To the general rules quoted above must be superadded those that depend upon the latitude: between 20° N. and 20° S. of the equator the altitude is pretty uniform; from 20° to 70° on both sides of the same central girdle it falls as the latitude increases in a pretty regular manner; but beyond 70° N. and S. and up to 78° in both directions it sinks very rapidly.

To these general rules there are of course in actual fact some important exceptions. In the Himalaya the snow-line runs 4000 feet higher on the north than it does on the south side; this is caused by the greater depth of snow that falls on the south side, by the greater dryness of the climate of Tibet, which increases the evaporation, and by the comparatively treeless rocks and barren soil on the northern side absorbing more heat than the well-wooded southern slopes. In the Andes the snow-line rises very rapidly between the equator and 18° S. lat., and more rapidly in proportion on the west than on the east side, owing to the comparatively small quantity of snow that falls on the Pacific side of the mountains. The subjoined table gives the snow-line on some of the most important mountain-ranges and peaks on the globe.

Mountains.	Latitude.	Snow-line in feet.
Greenland.....	75° N.	2,250
Norway (interior).....	62½°	5,100
" (coast).....	61½°	3,100
Kamchatka.....	59°	5,250
Altai.....	50°	7,000
Alps.....	45°-47°	8,860
Pyrenees.....	43°	8,950
Caucasus.....	43°	11,000
Rocky Mountains.....	43°	12,500
Atlas Mountains.....	32°	14,000
Himalaya (north side).....	30°	19,500
" (south side).....	27°	15,500
Kilimanjaro (East Africa).....	3° S.	16,000
Andes of Bolivia (east side).....	16°	16,000
" " (west side).....	16°	18,400
" Chile.....	33°	14,700
Australian Alps.....	37°	6,600
Andes of Patagonia.....	42°	6,000

Snowball Tree. See GUELDER ROSE.

Snowberry (*Symphoricarpos racemosus*), a bushy shrub of the Caprifoliaceæ, a native of the northern parts of North America, and now very common in British shrubberies. It has simple leaves, small flowers, and white uneatable berries (pollinated by wasps), remaining on the bush after the leaves. The genus is North American, with one species in south-west China. The name Snowberry is also given to *Gaultheria serpyllifolia*, a native of North American bogs.

Snow-bird (*Fringilla hyemalis* or *hudsonia*), a North American bird of the Finch family (Fringillidæ), common from the Gulf of Mexico to the Arctic Circle, in all the eastern parts of North America. The wings are rather short, the tail slightly notched. The whole length is about six inches; the upper parts are lead-colour, the lower parts white, the two outer tail-feathers white, the next white margined with black. This bird migrates northwards early in spring, and southwards late in autumn. They are first found in small flocks; their favourite haunts are roadsides, but they always take to trees when disturbed. In cold weather they visit farmhouses and villages; and before a snowstorm they assemble in large flocks, visiting barn-yards, and hopping about with the domestic poultry and small birds. The song of the male in the breeding season consists of a few very low, sweet warbling notes. From its frequent familiar approach to human habitations, the snow-bird is regarded with favour throughout great part of North America, as the redbreast is in Britain. The name is also given to all the species of the fringilline genus Junco, including *J. hiemalis*, found both in the United States and in Canada.

Snow-bunting, or SNOWFLICK (*Plectrophenax nivalis*), a bird of the Finch family (Fringillidæ), Bunting sub-family (Emberizinae), abundant in summer in the Arctic regions generally, where it has been found nesting very far north indeed; in winter migrating southwards to Georgia in North America, to Japan, northern China, Turkestan,

southern Russia, the northern shores of the Mediterranean, and Morocco. In Iceland it abounds all the year round; in the Faeroes it is common in winter, and many remain to breed;



Snow-bunting (*Plectrophenax nivalis*).

in the British Isles it occurs in large flocks in winter, and it has also been found nesting on high mountains in Sutherland and in the Shetlands. It is a bird about 6½ inches long; plumage black and white; bill, legs, and feet black; but in autumn the feathers of the upper parts are broadly edged with dull chestnut, the bill is yellow with a black tip, and the bird is then known as the Tawny Bunting. In habits it differs in several respects from the true buntings: it runs rapidly on the ground, it also hops, and not infrequently perches on trees; and the song of the male while the female is on the nest is a low melodious warble. The food in summer consists of insects, in winter of seeds. The nest, made of dry grass and moss, and lined with hair and feathers, is in northern breeding haunts placed on the ground not far above sea-level; but in more southern latitudes it is generally built in rocks on the rugged sides of mountains. The flesh of the snow-bunting is palatable, usually fat; the Greenlanders kill large numbers, and dry them for winter use. See the article BUNTING.

Snowden, PHILIP, Labour statesman, was born in 1864 at Cowling, Keighley. He entered the civil service in 1886, but retired in 1893 crippled by a cycle accident, and became journalist, lecturer, and Socialist worker. After sitting for a time on Keighley town council and school-board, and making unsuccessful attempts to enter parliament for Blackburn (1900) and Wakefield (1902), he was chairman of the Independent Labour Party from 1903 to 1906, when he was elected for Blackburn. He was again chairman from 1917 to 1920. A leader of pacificist opinion, he lost his seat in the election of 1918, and only in 1922 re-entered parliament for Colne Valley. He was chancellor of the exchequer in Mr MacDonald's government (1924). He has written a number of books on socialism and labour. His wife, Ethel Annakin, is well known as a speaker and writer on similar subjects.

Snowdon, a mountain-range in Carnarvonshire, North Wales, stretches in a north-east-by-north direction from a point 5 miles N. of Criccieth, near the head of Cardigan Bay, to near Conway, but is broken up by valleys and river-courses into five distinct summits, the chief of which, Moel-y-Wyddfa ('conspicuous peak'), the highest mountain in south Britain, rises 3560 feet above sea-level. Seen from the top, Moel-y-Wyddfa, the 'King of Snowdonia,' appears to send out three ridges, which gradually divide and subdivide, giving birth to numerous valleys and corries. Its ascent is effected from Llanberis (on the north),

Beddgelert (on the south), Snowdon Ranger station (on the west), and Capel Curig (on the east). The first is short (5 miles) and the easiest—a railway was opened in 1896; the last the longest (9 miles) and most difficult, but far the grandest. 'Snowdonia' was made a royal forest by Edward I. of England, and disafforested in 1649.—Snowdon was also an old name for Stirling.

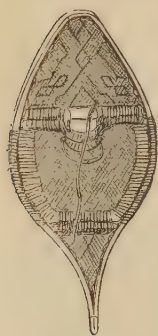


Common Snowdrop
(*Galanthus nivalis*).

Snowdrop (*Galanthus*), a genus of Amaryllidaceæ, of the same tribe with Amaryllis, Snowflake, Cricium, &c. The three outer segments of the perianth spread, so as to make a bell-shaped flower; the three inner are shorter, erect, and notched at the summit. The flowers arise from a spathe. The root is bulbous, and produces two leaves and one single-flowered leafless stem (*scape*). The Common Snowdrop (*G. nivalis*), a plant too well known to need description, is a native chiefly of the south of Europe, growing in woods and pastures. It is found apparently wild in some places both in England and Scotland, but is probably rather naturalised than native, having long been much cultivated in gardens. This welcome har-

binger of spring flowers usually in Britain in February and March. Another species of snowdrop (*G. plicatus*), with much broader leaves, is found in the south of Russia and in Asiatic Turkey.

Snow-shoes, a species of shoe whose broad surface prevents the foot from sinking in the snow. The Canadian snow-shoe (3 to 5 feet long and 1 to 2 feet wide) presents somewhat the shape of a tennis racquet with a short handle behind and long oval body contracted in front. It consists of a light frame of tough wood supporting a web of raw hide, to which, on the widest part, the foot is fastened by thongs, which leave the heel free. The Norwegian *ski* is simply a long, narrow wooden runner (5 to 10, but usually 8 feet long, by some 4 inches wide), about 1 inch thick at the middle, but thinner towards the ends, and turned up in a curve at the front (sometimes slightly at the back also).



Snow-shoe.

Snuff. See TOBACCO.

Snyders, FRANCIS, a Flemish painter, born at Antwerp in 1579, studied under Van Breughel and Van Balen. Originally he confined himself to painting fruits, game, vegetables, and other typical models of still-life; but under the influence of Rubens, for whom, as well as for Jordaens, he frequently painted animals and still-life subjects to go in their larger pictures, he cultivated more especially the painting of animals. His bear,

wolf, and boar fights have hardly ever been surpassed. He painted a stag-hunt and similar hunting subjects for Philip III. of Spain. Snyders died at Antwerp in August 1657.

Soane, SIR JOHN, an English architect, born of humble parentage at Reading on 10th September 1753. He managed to get trained as an architect, and, having gained the travelling scholarship of the Royal Academy, spent three years (1777-80) in Italy. After his return home he secured several official appointments—e.g. architect to the Bank of England, St James's Palace, Office of Woods and Forests—and was elected professor of Architecture at the Royal Academy (1806). He designed numerous country-houses in the eastern counties and parts of public buildings (Bank of England) in London, showing in his plans considerable ingenuity, but an uncertain taste, and frequently a lack of harmony in his completed plans. At his death, in London on 20th January 1837, he bequeathed his own house in Lincoln's Inn Fields, and the valuable art and antiquarian museum it contained, including pictures by Hogarth, Reynolds, Turner, models by Flaxman, the MS. of Tasso's *Gerusalemme Liberata*, &c., to the nation. He published amongst other books a set of folio plates of *Public and Private Buildings* (1828), and a *Description* (1832) of his own house and museum.

See the Memoir by J. Britton (1834), and the *Art Journal* (1882).

Soap is the term applied to that class of compounds formed when alkalies act on fats or fatty acids. Chemically it includes also the insoluble compounds formed from metallic oxides, as lime, litharge, &c.; but industrially it is mainly confined to the compounds of soda and potash. Soap is first mentioned by Pliny, who states that it was prepared from goat's tallow and beech-tree ashes, and was employed for giving brilliance to the hair. The excavations at Pompeii brought to light a complete soap-making establishment, containing some well-preserved soap. The industry, however, advanced very slowly, and it is only within comparatively recent years that it has really flourished. The most important discoveries which assisted its development and led to its present enormous proportions were Chevreul's researches on the constitution of fats and Leblanc's process for the manufacture of soda on a large scale. It has also been stimulated in Britain by the repeal in 1853 of the duty (amounting to from 1d. to 3d. per lb.), first imposed in 1711. Chevreul showed that the neutral fats are mixtures of 'glycerides,' consisting of glycerine combined with the elements of certain fatty acids. In the process of saponification the fat is decomposed, the fatty acids combining with the alkali to form soap, while the glycerine is set free.

Soaps are distinguished as 'hard' (soda-soaps) and 'soft' (potash-soaps). They have a characteristic taste, and are soluble in hot water and in alcohol. When agitated with water a 'lather' is produced, and when their hot concentrated solutions are allowed to cool, jellies are formed. Salt precipitates them from their solutions, but in the case of a potash-soap double decomposition takes place, with the result that a large proportion of soda-soap and potassium chloride is formed. Many theories have been advanced to explain the cleansing power of soap; it was formerly suggested that this was mainly due to the action of a small proportion of free alkali and acid soap which is formed when soap is dissolved in a large volume of water. This is now believed to be quite secondary, as the cleansing effect mainly depends on the penetrating and emulsifying property of the soap in solution.

The principal fats and oils employed in the

manufacture of soap are refined tallow, palm oil, palm-kernel oil, coconut oil, cotton-seed oil, soya-bean oil, ground-nut oil, and fatty acids obtained either by distillation from residues or from the oils and fats by being subjected to a preliminary splitting process, whereby the glycerine is separated from the fatty acids. The efficiency of a soap depends in a great measure on the proper blending of these oils and fats; for hard soaps a large proportion of tallow and nut oils is used, while for soft soaps the liquid oils such as cotton, soya-bean, and linseed oil are the chief constituents. Rosin enters largely into the composition of the lowest grade soaps, both hard and soft; and while a small proportion of this ingredient is generally accepted to be advantageous, an excessive proportion is detrimental, and is to be deprecated.

The following processes, arranged in order of simplicity, are those used in the manufacture.

(1) The direct union of free fatty or resin acids and alkalis.—This process is being more generally used, on account of its simplicity, by small manufacturers, as fatty acids combine at once with caustic lyes, and there is no glycerine to recover. The process is much the same as that detailed below, except that the alkaline lyes are run into the pan first, and then neutralised with the exact proportion of fatty acids. When all the free fatty acids are neutralised a slight excess of caustic lye is added, and the mass boiled to complete the saponification of any neutral fat or oil. The process may then be continued as described for any of the processes below.

(2) Treatment of fats with definite quantities of alkali, the glycerine remaining with the soap; known as the 'cold process.'—Given weights of fat are melted at a suitable temperature, and mechanically mixed in a pan with a definite quantity of caustic lye of known strength, just sufficient to effect complete saponification. After standing from one to four days, according to the quantity, saponification is complete and the soap is hard enough for use. This process possesses the advantages of economy of labour, fuel, and plant, but the resulting soap contains all the glycerine of the oils and fats used, and is liable to contain free caustic alkali; so the process is only used by small manufacturers, or for special soaps, when the retention of the glycerine is advantageous.

(3) Treatment of fats by boiling with alkaline lyes.—This process is the most important of the three, and will now be described as it is carried out for hard soaps.

Hard soaps constitute the great bulk of the soaps used, and may be divided into three varieties—curd, mottled, and yellow. The general method is the same for the three. The vessel used (called the 'pan') is made of wrought-iron plates riveted together, and is fitted with coils for supplying open and close steam. Pans are now generally of square form, and capable of turning out from 20 to 30 tons of soap at one operation, although some of them are much larger. In the first stage (called 'killing') a quantity of the fat is melted in the pan, weak caustic lye added, and the steam turned on. The mass becomes pasty after some time, and the boiling is continued, and the fat and lye added, until a sample appears somewhat firm, and has very little or no caustic taste. In the second stage ('graining the soap' or 'salting') the water is separated from the soap (the boiling being continued) by the cautious addition of common salt, or strong brine, until clear liquor runs from a small sample taken out. After standing for a few hours the 'spent lye' (containing the bulk of the glycerine of the fat, common salt, and the impurities of the caustic soda) is removed. In the third operation ('clear

boiling') the granulated soap is boiled for two or three hours with fresh lye, in order to cause more complete saponification, and to remove the brine retained by the soap. After settling the lye is removed, and may be used for the treatment of more fresh fat. The contents of the pan are again boiled with open steam and lye for several hours, to complete the saponification of the last traces of fat, and 'make' the soap.

The method of finishing the soap varies with the kind of soap required, and will now be explained under the names of the different varieties.

Of *curd soaps* the finest quality is made from tallow, but other fats may be used. When the soap has been 'made,' as just explained, it is concentrated by means of close steam, until a sample appears hard. The boiling is then stopped, and the soap allowed to settle, then removed.

Mottled soaps, as far as composition is concerned, are practically curd soaps; darker fats, however, are used in their manufacture, and after the soaps have been 'made,' the lye is not concentrated so far as with curd soaps. Many precautions require to be observed in order to obtain the natural 'mottling' which characterises them. It is due to the presence of small quantities of lime, magnesia, &c., from the materials used, and to oxide of iron from the pan. These oxides form insoluble soaps, and when the soap, retaining a little lye, is transferred to the cooling-frames, they collect together, producing the well-known appearance. Natural mottling is assumed to be a guarantee of the absence of an undue amount of water in a soap. Artificial mottling of inferior qualities of soap with ultramarine, oxide of iron, &c., has been largely practised. Mottled soaps are used for laundry work and similar purposes.

Yellow soaps contain rosin as an essential constituent. The finest qualities are made from the best tallow and light-coloured rosin; inferior qualities from darker tallow, bleached palm oil, &c., and darker rosin. The rosin is usually introduced after the second stage of the general process. The finishing operation, or 'fitting' of yellow soaps, requires much experience. After the soap has been 'made,' the pan is allowed to stand for about twelve hours, the lye removed, and the soap well boiled until homogeneous, with some fresh lye if necessary. When a sample has been found to be in the proper state, the pan is covered up, and allowed to stand for some days, when a separation into three layers takes place—the scum or 'fob' on the top, the 'nigre' (or dark alkaline soap-lye) underneath, and the finished soap in the centre, which is then removed to frames. The nigres are utilised in the making of darker soaps. The principal soap-manufacturers now recover the glycerine from their spent lyes.

For *marine soap* coconut oil is mixed with strong caustic lyes at 30° to 35° C., and after standing some time, sufficient heat is liberated to effect almost complete saponification. The soap is not salted out, but the 'fillings,' if required, are added direct, when the soap is transferred to frames, where it is allowed to cool. The sides of the frames are then removed, and the solid block of soap is cut into slabs, bars, or tablets as required. The 'fillings' are certain substances, added either with the view of increasing the detergent power of the soap, or simply to lessen the cost. Silicate of soda belongs to the first class, and is used with advantage in certain soaps. Such substances, however, as water, talc, clay, chalk, barium sulphate, &c., must be looked upon merely as adulterants.

Soft soaps are made by saponifying liquid oils, as stated above, with caustic potash, the glycerine usually, though not necessarily, being left in the

soap, which often contains a little free alkali as well. They form transparent jellies, and often exhibit, in cold weather, a white graining, or 'figging,' due to alkaline stearates. The oil is run into the pan, potash lye added, and the steam turned on. The boiling is continued, latterly by close steam or fire heat, and lye added, until a small sample appears clear on cooling, and no liquid separates from it. When finished the soap is run into barrels or tins.

For *toilet soaps* the base or 'stock' of the better qualities is generally curd soap, special precautions being taken to ensure absence of free alkali. The finest toilet soaps are now 'milled.' For this purpose the soap is cut into shavings, dried partially, the colouring material and perfumes added, and passed several times between granite rollers to make it perfectly homogeneous. It is then subjected to great pressure, or 'plodded' to form it into bars, which are afterwards cut and stamped into tablets. The lower qualities of toilet soaps are frequently made by the cold process.

'Transparent' soaps are prepared by dissolving good dry soap in alcohol, pouring off the clear solution, and removing the bulk of the spirit by distillation. The remaining soap is transferred to moulds, allowed to cool, and preserved in warm chambers for several months, until it becomes quite transparent. Many transparent soaps, however, are made by the cold process, their transparency being obtained by the addition of sugar. Glycerine is often added to both opaque and transparent soaps, imparting to them its characteristic emollient properties, while such substances as carbolic acid, coal-tar, eucalyptus oil, &c., are added to soaps intended for disinfecting purposes.

The following table gives the average composition of some genuine soaps of English make:

	Fatty Anhydride.	Alkali (Na ₂ O).	Water.	Salts.	Glycerine and Salts.
Curd	63.21	8.44	26.76	1.59	..
Mottled.....	64.17	7.30	25.66	2.37	..
Yellow (best)	61.95	7.07	30.45	0.53	..
Marine	52.65	8.55	30.03	..	8.77
Toilet ('milled')	80.06	9.56	9.11	1.27	..
		(K ₂ O).			
Soft.....	40.36	9.18	44.78	..	5.68

The commercial value of soap depends upon its percentage of fatty anhydride. Soap is used otherwise than as a detergent—as a base in making pills and plasters, in liniments, and as a test for the hardness of Water (q.v.).

See G. Martin, *Soap and Detergent Industry* (vol. i., 'Theory and Practice of Soapmaking,' 1923); E. G. Thomssen, *Soapmaking Manual* (1922); C. Deite, *Manual of Soapmaking* (1920); J. Lewkowitsch, *Chemical Technology of Oils, Fats, and Waxes* (6th ed. 1922); Hurst and Simmons, *Textile Soaps and Oils* (1914); L. Ubbelohde, *Chemie der Oele, Fette und Wachse* (1908).

Soapberry. The fruits of several species of trees belonging to the genus *Sapindus* (family Sapindaceæ) contain a pulp which is useful as a substitute for soap in cleaning linen and other textile fabrics. In the West Indies the fruit of *Sapindus Saponaria*, and in the East Indies those of *S. trifoliatus*, and *S. attenuatus* are much used for this purpose. The frothy mixture which these fruits make with hot water is said to be very serviceable for cleaning dyed fabrics which soap would injure. In France silk stuffs are cleaned with the seed vessels of *S. emarginatus*. The seeds of *S. Saponaria* are made up into rosaries, and were formerly worn in England tipped with gold, silver, &c., as buttons.

Soap-bubbles. As a form of amusement for children the blowing of soap-bubbles is of great antiquity, and is to be seen depicted on an Etruscan vase in the Louvre. In their scientific aspect soap-bubbles and soap-films have been studied specially by Plateau, who, by adding glycerine in a certain proportion to the soap solution, obtained remarkably durable films and bubbles. The beautiful play of colours familiar to all is due to the excessive but variable thinness of the soap-film. It is in fact an illustration of the interference phenomenon known as Newton's Rings (see INTERFERENCE, NEWTON). If at any part the film becomes thin enough the black spot appears. If this black portion is touched the film is shattered at once, although it may in its thicker portions be pierced by a needle without losing continuity. The spherical form of the ordinary soap-bubble is a direct result of the action of Surface-tension (q.v.), the geometrical condition being that with given volume the surface must have minimum area. With soap-films formed on frames of wire the same principle holds—for given boundary and given internal volume the area must be a minimum. Thus, by a skilful arrangement of soap-films, we may make visible many highly interesting problems in pure mathematics. See *Soap-bubbles*, by Professor Boys (S.P.C.K., 1890).

Soap-root. See SOAPWORT.

Soap-stone. See STEATITE.

Soap-tree. See SOAPBERRY.

Soapwort (*Saponaria*), a genus of plants of the family Caryophyllaceæ, having a cylindrical or ventricose five-toothed calyx, without any outer calyx or attendant bractæ, five undivided petals with long claws, ten stamens, two stigmas, and a capsule opening at the top by four valves. Some of the species have very beautiful flowers. *S. calabrica* is one of the most favourite annuals of British flower-gardens. Common Soapwort (*S. officinalis*) is found on waysides,



Soapwort (*Saponaria officinalis*).

in thickets, and on the banks of streams in most parts of Europe, although it is a somewhat doubtful native of Britain. Both the root and the leaves contain Saponin (q.v.), in consequence of which they are sometimes employed for washing. The brownish-red colour of the bark of the root, however, is apt to tinge white articles. The root of this plant has also medicinal properties, being aperient, resolvent, and alterative. It is sometimes sold as Red Soap-root.

Nearly allied to the genus *Saponaria* is the genus *Gypsophila*, some species of which are called Soap-root, and contain much saponin. Thus, the Egyptian Soap-root (*G. Struthium*), and the Spanish Soap-root (*G. hispanica*), called *Jabonera* in Spain, have been employed for washing from time immemorial, and the roots, not having a dark rind, can be used for washing white articles, and are to some extent an article of commerce, being used for silken and other stuffs, the colours of which will

not bear the application of soap. The roots of *Lychnis dioica*, one of the most common British plants, possess the same properties in an inferior degree. The bark of the Chilean Soap-tree (*Quilaja Saponaria*), of the family Rosaceae, contains much saponin, is generally used for washing in Chile and Peru, and there forms a considerable article of commerce. It is said to give a remarkable lustre to wool, and to be an invigorating wash for the hair. Some of the tropical South Sea Islands produce a species of vine (*Vitis Saponaria*), the stem of which, especially the thicker part, cut into pieces, and softened by cooking on hot stones, produces in water a rich lather almost equal to that of soap. See also SOLANUM.

Sobat, a tributary of the Nile (q.v.).

Sobbing is merely a modification of the ordinary movements of respiration excited by mental emotions. It is the consequence of a series of short convulsive contractions of the diaphragm, and is usually accompanied by a closure of the glottis, preventing the entrance of air into the lungs.

Sobieski, the surname of JOHN III., king of Poland, one of the greatest soldiers of the 17th century, who was born at Olesko in Galicia on 2d June 1624, his father being castellan of Cracow. He early distinguished himself in the wars in which Poland was at that period almost constantly engaged, against the Russians, the Tatars, and the Turks. Upon the last he inflicted crushing defeats at Buczacz (in Galicia) in 1669, and at Choczim (Khotin) on 11th November 1673, capturing the green standard of Hussein Pasha, commander of the Turks, and slaying more than 20,000 of his soldiers. In the next year he was chosen king of Poland. A high-minded, brave, and disinterested man, and a shrewd statesman, he conceived it to be his special mission to contend with all his energy and power against the enemy of Christendom that threatened from the shores of the Bosphorus. He again routed the Turks at Lemberg in August 1675, and in 1676 successfully defied their utmost efforts to storm his entrenched camp near the Dniester. After a truce of five years—a breathing-time employed by the sultan to gather fresh armies and war material—the Turks once more overran Hungary, and even laid siege to Vienna. Sobieski, always swift in his marches, and vigorous and determined in his attacks, hastened to its relief at the head of 18,000 Poles. With these, and 50,000 German troops, who joined him on the way, he smote the great Turkish army so terribly, on 12th September 1683, that the siege was at once raised and the Turks hastened to retire. Sobieski died at his castle of Williamow on 17th June 1696. This prince was a lover of books and of knowledge, and himself a clever linguist.

See books by Salvandy (1876), Dupont (1885), and Tatham (1881); and Waliszewski's *Marysiencka* (trans. 1899).

Sobral, a town of Brazil, in the province of Ceara, on the Aracaty, 78 miles by rail SSE. of the seaport Camocim; pop. 35,000.

Sobraon, a village of the Punjab, on the west bank of the Sutlej, opposite which, on the east bank, was fought on 10th February 1846 a most obstinate battle between the British under Sir Hugh Gough and the Sikhs (q.v.), which put an end to the first Sikh war.

Socage. See TENURE.

Social Contract. See GOVERNMENT, ROUSSEAU, SOPHISTS.

Socialism. Socialism is defined in the *New English Dictionary* (1919) as 'a theory or policy of social organisation which aims at or advocates

the ownership and control of the means of production, capital, land, property, &c., by the community as a whole, and their administration or distribution in the interests of all.' This definition, though somewhat diffuse, would be accepted by most socialists.

Robert Owen.—The word appears to have been first used in English in *The Poor Man's Guardian* in 1833, and it became familiar in 1835 in connection with Robert Owen's *Association of all Classes of all Nations*. Owen (1771–1858), who may be called the founder of the socialist movement, chose this name for his ideas in order to distinguish his policy of social reconstruction from the political reforms advocated by others. His schemes were devised for the purpose of introducing socialism by private enterprise. He supposed that it was possible for a few people voluntarily to carry out his principles, and to live in accordance with his ideas in the midst of a capitalist society. Experience has shown that such projects always fail, and Owen's attempts broke up before they were well started. But it must be remembered that the great co-operative movement, begun as the result of his teaching by the Rochdale pioneers in 1844, is, in fact, socialism for a limited range of purposes, and has succeeded within these limits in the midst of capitalism. It is now believed by many that the co-operative movement will find a place without material change, in any socialist state which may be established. Owen attempted to found communities, associations of a few hundreds or thousands of people living together in a central building or village, cultivating 1000 or 1500 acres of land, producing for themselves food, clothes, and other necessities, and jointly owning the land and capital employed. Of course the communists promptly quarrelled, and, for ordinary people, any such project was economically unsound in Owen's day, and is obviously absurd now. The communities which have here and there succeeded in America sometimes even for a generation, have been cemented by special religious beliefs, as those of the Shakers.

The Christian Socialists and J. S. Mill.—The social unrest created by the industrial revolution, that is, the introduction of machine industry and of capitalist production, was too deep-seated to be dispelled by the failure of Owen's schemes. The Chartist movement (1838–1850) was socialist on its critical side, that is, in so far as the speeches and writings of the Chartists were coloured with passionate protests against the evils of capitalism, and to some extent also in the esoteric projects of its leading thinkers. Chartism too failed, and was succeeded by the Christian Socialist movement of 1848–1852. This was led by F. D. Maurice and Charles Kingsley, and was definitely socialist on its critical side only. The remedy advocated was the formation of co-operative societies of producers, groups of workmen owning the capital with which they worked, and selling their products for profit. This form of co-operation is not in harmony with socialism, and only under exceptional circumstances does it seem able to compete with capitalist production; so failure again followed. Meanwhile the grosser evils introduced by the industrial revolution were gradually mitigated by Factory Acts, Truck Acts, Public Health Acts, Education Acts, Housing Acts, and the growing strength of Trade Unionism. Labour unrest diminished, and the demand for drastic social change died away. Nothing more was heard of popular socialism in England between 1860 and 1880.

But there was one clear thinker who saw farther ahead than his contemporaries. John Stuart Mill (1806–1873), the most influential of English political writers during the 19th century, was for many

years regarded almost as a pope in the realm of economics, and it is therefore strange that his extremely sympathetic description of the very impracticable forms of socialism known to him attracted so little attention. In his *Principles of Political Economy*, which went into six editions between 1848 and 1865, he sums up his discussion of communism with the pregnant words, 'It is for experience to determine how far or how soon any one or more of the possible systems of community of property will be fitted to substitute itself for the "organisation of industry," based on private ownership of land and capital.'

Early French Socialists.—Mill had chiefly in mind the writings of two Frenchmen. One of these was Comte Henri de Saint-Simon (1760–1825), who in the last decade of his life published works advocating the reconstruction of society on communist lines. A community was founded by his followers in 1831, and lasted about a year. The other, François M. C. Fourier (1772–1837), drew up plans for a 'phalange' of 400 families living on a square league of land, in a 'phalanstère', that is, a central building adapted for communal life. Both these thinkers, though their ideas are now entirely superseded, had considerable influence amongst political idealists in the middle of the 19th century.

Louis Blanc (1811–1882) was the next prominent socialist. His *L'Organisation du Travail* attributed the evils of society to competition, and demanded the establishment of 'social workshops,' self-governing and self-supporting, but promoted and financed by the state. It was from him that the Christian Socialists in England derived their projects of similar workshops without state aid. In the revolution of 1848 Blanc became a member of the provisional government, and busied himself with the formation of his social workshops, which were not altogether without success. Meanwhile, however, other ministries set going on a great scale in Paris what were termed 'national workshops,' but what were, in fact, mere relief works for the temporary maintenance of the unemployed, entirely without reference to the reconstruction of industry. These relief works were, for reasons that have since been well understood, a calamitous failure, and at once Blanc disclaimed all responsibility for them. They are almost invariably confused with his entirely different experiment. He lived in England in exile until 1870, when he returned to France, took no part in the Commune, was elected to the National Assembly, and after his death had a state funeral.

German Socialists.—The leadership in socialist thought now passed to Germany, where, in the opinion of most foreign socialists it remained until the Great War. Karl Johann Rodbertus (1805–1875) may be mentioned as one of the forerunners. He was the son of a professor, was a Prussian landowner, and took only a brief part in politics during the revolution of 1848. His economic writings had great influence on Lassalle and Marx, and he has a disputed claim to be the originator of what is called 'scientific socialism.'

Ferdinand Lassalle (1825–1864) was a more important personage, whose meteoric career was cut short by a tragedy which forms the theme of George Meredith's *Tragic Comedians*. He was a Jew by birth, and after a university education, became well known in Berlin as a man of extraordinary abilities. A law-suit on behalf of the Countess Hatzfeldt occupied some eight years, during which, in 1848, he joined the group of Marx, Engels, and others. In 1862 he began socialist agitation with lectures, addresses, and publications, including a Working Men's Programme. A triumphal progress through the

country followed, and in 1863 the Universal German Working-men's Association was founded with Lassalle as president. In August 1864 he was killed in a duel on behalf of the lady he was engaged to marry. He followed Louis Blanc in advocating workmen's productive associations provided with state capital, but in other respects his general ideas were similar to those of Marx, and it is not necessary here to discuss their points of difference.

Karl Marx.—We now come to the greatest figure in the history of socialism, Karl Marx. Future historians will dwell on the strange contrast between the obscure life and posthumous fame of this Jew. Born at Treves in 1818, expelled from Germany at the age of twenty-seven, he spent the rest of his life as an exile in London, reading at the British Museum, writing for American newspapers, corresponding with groups of revolutionists and agitators in Germany and elsewhere, but so little known to the English public that on his death on the 14th March 1883 the brief obituary paragraph in the *Times* begins with the words, 'Our Paris correspondent informs us of the death of Dr Karl Marx in London.' Yet this obscure student, through his ideas mainly embodied in *Das Kapital*, in less than forty years proved to be a force that had determined the destinies of two great empires, and seems certain to play a part in the history of every civilised country of the world. Of his life little need be said. He was the son of a lawyer; was educated at the universities of Berlin and Bonn; edited a newspaper in 1842; married a lady belonging to the official class, who was a descendant of the Earl of Argyle beheaded by James II.; met his life-long friend and collaborator, Friedrich Engels (1820–95), at Paris in 1844; was expelled from Paris and settled in Brussels; returned to Germany in the year of revolutions, 1848, and finally settled in London in 1849. His wife died in 1881, leaving three daughters. One of these, Eleanor, was well known in the early socialist movement in London; the other two married in Paris; and his grandson, M. Jean Longuet, is a well-known leader of the French socialists.

Marx's Scientific Socialism.—We now turn to Marx's writings. In 1847 he and Engels published the *Manifesto of the Communist Party*, which advocated the socialism of a proletarian state, and is generally regarded as the first exposition of modern socialism. It may be useful here to point out the four stages in the use of the words Communist and Communism, which must be carefully distinguished. (1) In the first half of the 19th century Mill and Marx used the word as a synonym for socialism. (2) After the insurrection of the Paris Commune in 1871 its adherents were called communists because they advocated the autonomy of the commune or town council of Paris. (3) Subsequently down to 1916 communism meant the principle of common ownership without restriction, as in the communities of Robert Owen and others, in the name 'communist anarchists' adopted by the adherents of that creed, and, as applied to politics, in the parks, roads, public libraries, &c., provided for the public free of charge; and communism, 'each according to his needs,' was regarded as an alternative to socialism, 'each according to his deeds.' This usage is probably confined to the English language. (4) In 1917 Lenin adopted the name communism for his policy in order to distinguish it from that of the majority of the German socialists who had supported their government during the war; and since that date the name communist has come to be applied exclusively to the adherents, inside and outside Russia, of the Russian school of socialism,

which is rigidly Marxian with special stress on certain doctrines of policy.

The 'party' mentioned in the title of the *Manifesto* was some temporary organisation in London of no other consequence. The *Manifesto* has been translated into innumerable languages, and reprinted countless times. In 1867 Marx published the first volume of *Das Kapital*, the book on which his reputation rests. Two subsequent volumes were prepared after his death from MS. drafts and notes arranged and edited by Engels, and a fourth has been issued. His other works, mostly concerned with contemporary controversies, are of minor importance. It is difficult to understand how it has happened that Marx, an obscure exile throughout his life, has since his death become a prophet almost as influential amongst large sections of people as Mahomet, or Buddha, worshipped by thousands in fact, though not in form, as if he were a god. England and the British dominions have been free from this strange superstition; but in the United States, throughout Europe, and, above all, in Russia, it is, or has been, a vital force. It began indeed in Marx's life-time, and we are justified in calling it a superstition, because Marx himself once said to his son-in-law, Paul Lafargue, 'one thing is certain, and that is that I am not a Marxist.' The socialists who preceded Marx endeavoured to build up socialism within the community, just as religious sects or co-operative societies have been built up. Marx proposed that the community as a whole should become a socialist state, and this new and correct view of the significance of socialism is the justification for the outstanding position which he holds amongst the founders of the movement. He based his theory partly on history and partly on economics. His 'economic interpretation of history' is the thesis that economic conditions are the determining factors of history, as, for example, that the old Roman Empire was destroyed by slave labour on *latifundia* dispossessing the Roman peasantry. As capitalism had replaced peasant and handicraft industries in England and Germany, and was in process of replacing them everywhere, so the next step would be the change from capitalism to socialism. Everywhere big capital was ousting small because of its inherent strength. Marx anticipated that capital would steadily and inevitably pass into fewer and fewer hands; the people would become in ever increasing proportions, 'proletarians,' that is, workmen solely dependent on wages, 'with nothing to lose but their chains,' and at last, when a little group of wealthy possessors was confronted by a nation of proletarians, the revolution would break out and socialism would be established. It must be remembered that Marx lived in the era of revolutions, 1830, 1848, 1871, when Garibaldi, Kossuth, Mazzini, and many others were popular heroes.

The 'Marxian law of value' was the second principle on which he based socialism. Labour, he said, following Ricardo, or rather Thomas Hodgskin and William Thompson, whose scarcely-noticed works he read at the British Museum, is the sole source of wealth. The capitalist, possessing machinery and raw materials, hires labour which creates value in the product. Part of this value goes to pay wages and incidental expenses. The remainder is 'surplus value,' the employer's profit which his economic power enables him to take from the workmen who were its creators. The workman works so many hours in each day to produce his wages for himself, and the latter hours of each day's work are for the profit of the employer. The capitalist ever eager for more surplus value, introduces more machinery and

so displaces labour. More goods are produced than consumers can take. Then follow gluts, and commercial crises. These grow constantly more severe; the *bourgeoisie* proves incapable of controlling the monster which it has created. The commercial system breaks down, and the revolution supervenes. After the revolution the private ownership of land and capital would cease; both would be owned and controlled by the state, for the benefit of the community as a whole. 'Exploitation' of labour by capitalists would come to an end, and the 'wage system' would perish with it.

The First International and Anarchism.—Marxian socialism first came into notice through the First International, which was started in London in 1864 as a result of the visit of French workmen to the Exhibition of 1862. Mazzini proposed a constitution, which was rejected in favour of a draft by Marx, who thenceforth became its virtual chief. Conferences were held at Geneva in 1866, at Lausanne in 1867, at Brussels in 1868, at Basel in 1869, and at the Hague in 1872. The last was famous for the culmination of the controversy with Bakunin and the anarchists, who were defeated by Marx and expelled. We must now turn aside to describe in a few words this form of socialism, as it may be called from one point of view, though from another it is the antithesis of socialism. Modern socialism following Marx regards the community as a whole, that is in effect, the government, as the proper possessor of land and capital, and the rightful administrator of industry. But in Russia the government, up to the fall of tsarism (and some would say after it), was generally regarded as a malign force. The Russian village was a self-supporting community and the government only touched it to collect taxes, to take away men for the army, and occasionally to repress free political thought. Russians, thinking in terms of their villages, imagined that the ideal life was for each to possess the land and instruments of production which he used, so long as he used them. Government with its taxes, and its army and its police, might be abolished, and all would be better off without it. There would be no rich and no poor, and hardly any crime, since most crime is against property. The village commune, the mir, which controlled the distribution of the land, would be all the government needed. It is true that the first anarchist writer, P. J. Proudhon (1809-65), was a Frenchman, who is best remembered by his saying 'property is robbery.' Michael Bakunin (1814-76), Prince Peter Kropotkin (1842-1921), and Count Leo Tolstoy (1828-1910), were all Russians; the last-named, though anarchist in his teachings, took no part in the organisation of the anarchist party. Anarchist-communists opposed all government, and worked for an ideal form of society in which property would be held in common, as in a family, each appropriating land and tools only as long as he used them. Such an ideal is hardly compatible with machine industry, even in words; a railway under anarchism can hardly be described. But the ideal is attractive to artists and poets, and William Morris, as indicated in his romance *News from Nowhere*, had more real sympathy with anarchism than with the Marxist collectivism to which he nominally adhered. Holding the belief that 'government of man by man is oppression,' anarchists were always disposed to rebel against the oppressor. Ill-balanced persons and criminals often joined their ranks, and assassination of princes and governors by dynamite or other means was frequently resorted to. Anarchism was a factor in the socialist movement until after the end of the 19th century. It prevailed chiefly in the Latin countries, especially in Spain.

In Germany and in England it was at no time of great importance, and in this country it has been little heard of in the present century. Its later developments will be dealt with further on.

The Progress of Socialism in Germany.—The battle-royal between Marx and Bakunin broke up the First International, which finally petered out in 1873. Meanwhile a socialist movement had been growing up in Germany. Lassalle's vivid personality and whirl-wind agitation of 1863-64 had borne fruit of two kinds. His Universal Working Men's Association made progress in north Germany; in the south and in Saxony a rival network of workmen's educative associations was formed, which soon tended to move in the same direction. At the congress of these associations at Nürnberg in 1868 the principles of the International were accepted, and at Eisenach in 1869 the Social Democratic Working-men's Party was founded. The two parties, both represented in the Reichstag, kept separate until 1875 when they were amalgamated, and in 1877 they polled nearly half a million votes. By this time their two great leaders had emerged, Wilhelm Liebknecht (1826-1900) and August Bebel (1840-1913), who held undisputed control of the party from its formation to the end of their lives. Liebknecht, after a university education, had a remarkably adventurous career, until about 1849 when he came to London and lived for thirteen years in close association with Marx. In 1862 the amnesty enabled him to return to Germany; in 1867 he was elected to the Reichstag, and in 1872 he was condemned to two years' imprisonment for treasonable intentions. From 1874 till his death he was continuously a member of the Reichstag and leader of the Social Democratic party. Bebel was a wood-worker by trade, and became a follower of Liebknecht. He too was elected to the Reichstag in 1867, and these two were the only members who opposed the Franco-German war. He also was condemned to two years' imprisonment in 1872. After this period his eloquence and energy gave him a commanding position in the party which he retained until his death.

Under the leadership of these two men the German Social Democratic party made steady and remarkable progress up to the outbreak of the Great War. Bismarck's anti-socialistic laws of 1878 were but a temporary set-back, and by 1912 the party cast 4,250,329 votes, and elected 110 members to the Reichstag. In fact they were entitled to many more, as they controlled all the big towns, including Berlin, and the other industrial centres, all of which in the absence of redistribution since 1871 were grossly under-represented. The party was thoroughly organised, and had in 1914 1,085,905 paying members, 91 newspapers and journals, and a head-office income of £100,000. German socialism was strictly Marxist, and this meant a policy of antagonism and isolation. The Marxists have always regarded socialism as a plan rather than a principle, and have themselves usually acted on the maxim, 'He that is not with us is against us.' In theory, though not altogether in practice, they opposed all measures of the government, made no alliances with other parties, and saw no good in any other movement. The two great leaders were the pillars of Marxian orthodoxy, but after 1901 when Eduard Bernstein, a social democratic leader who had lived as an exile in London since 1888, returned to Germany a 'revisionist' movement was started. Bernstein had learnt in England that Marx had not written down everything there was to be said about socialism, and largely through his efforts a more liberal spirit was making progress amongst the

German socialists when the war opened a new chapter.

Socialism in France and elsewhere.—The German Social Democratic party was remarkable for its solidarity. Such disputes as arose were settled within the party. Secessions were rare and negligible. Far otherwise was the case in France. Here the important socialist movement has a history of faction fights, quarrels, and reconciliations. Prominent leaders have been expelled or have deserted, and, such as Millerand and Briand, have subsequently become ministers in Republican governments. The party achieved great electoral successes, although it never had an efficient organisation like that in Germany, or like the Labour party in England, and its central income was stated to be in 1913 no more than £6380, largely derived from a levy on the salary (£600) of each deputy. In 1910, the last general election prior to the war, the party polled 1,125,877 votes, and returned 76 members. In 1912 no less than 282 communes (towns or villages) were controlled by a socialist majority of elected councillors, and in all 5530 socialists were successful at municipal elections. One outstanding personality must be mentioned. Jean Jaurès (1859-1914) began his career as a university professor of philosophy, and was first elected in 1885. His participation in the Dreyfus case made him known outside France, and from that period his magnificent eloquence, his energy, and his fine character made him not only the foremost of the socialists, but latterly perhaps the most powerful of French political leaders. His assassination in the first days of the war was an international calamity.

It is not possible in the space available to give many details of the socialist parties in the other countries. In Belgium there is a large and influential Labour party (*Parti Ouvrier*), which has united the trade unions and an extremely successful system of co-operative societies into an effective socialist party. Italy had a large party characterised by a series of internal discords like those of France, until it was for the time suppressed by Fascism. In Spain the socialists have been somewhat overshadowed by the anarchists, who, perhaps less numerous, are certainly more noisy. Norway, Sweden, Denmark, Holland, and Finland all have important bodies of socialists, which have in some cases polled more votes than any of their rivals. In Austria 83 members were elected in 1911, and out of 33 seats in Vienna 20 were held by socialists. There was also a large Christian Socialist party which apparently was based on anti-Semitism and was socialist (as well as possibly Christian) only in name. Russia we will treat of later on. In the United States the Socialist party was for many years excessively Marxist, and failed to obtain much popular support even from trade unionists. In Australasia socialism took a special form. In such 'new' countries government is the easiest source of capital for public undertakings, and is without the tradition of administrative nihilism which dies so hard in Great Britain. Therefore all sorts of commercial and industrial undertakings have from the first been organised by the Australasian States. In New Zealand the Liberal-Labour party under Richard Seddon, a miner by trade, gave a lead to the world by Women's Suffrage, Old Age Pensions, Compulsory Arbitration in Wages Disputes, and much else. In the Commonwealth, and in most of the States of Australia, Labour parties from 1904 onwards frequently took office, and carried out a policy which was practical socialism with little reference to theory. But it may be noted that in 1918 the Queensland government entitled an official report of its activities *Socialism at Work*. In later

years definitely socialist parties have made some progress in these dominions. Abyssinia, Afghanistan, the Central American republics, and, until quite recently, Ireland are about the only countries where socialism has not taken root.

The Socialist Organisation in Great Britain.—Throughout the 'Continent of Europe and the United States socialism from its beginning up to the war was predominantly Marxist, and followed the lead of Germany. In England and Australasia the movement developed on somewhat different lines. In 1881, H. M. Hyndman (1842-1921) founded the Democratic Federation; he was already a student, perhaps a follower, of Marx, but the federation did not become definitely socialist until in 1884 it changed its name into the Social Democratic Federation, commonly called the S.D.F. In addition to Hyndman, William Morris (1834-1896) and Mr John Burns were its best-known members. Its policy was Marxist, and great stress was laid on the Marxian law of value and on the 'Klassenkampf,' which is Englished into 'class war,' but more accurately means class struggle. Its vigorous agitation soon attracted wide-spread attention and alarm, much of which was dispelled when the Federation ran three unsuccessful candidates at the General Election of 1885. Mr Burns polled 598 votes at Nottingham, but the two London candidates only obtained 27 and 32. In the same year William Morris left the federation and founded the Socialist League, a similar body which also carried on active propaganda, and ultimately moved towards anarchism. It lost all influence when Morris left it in 1890. The influence of Morris on the movement was profound. The S.D.F. taking their socialism from the bible of Marx, which was not published in English until 1886, was dogmatic and doctrinaire. Morris was accustomed to think for himself, and although he adopted the Marxian formulae, it may be taken that he hardly understood them and was not interested in them. What did interest him was the effects of capitalism on art and character. He loved the middle ages with their little towns, their handicraftsmen, artists as well as artisans, and their ordered life, free from the struggle for wealth amongst the few and grinding poverty amongst the many. Whether this view of the middle ages is historically accurate need not be discussed here. Morris wished to abolish all that the industrial revolution had created, and emphatically capitalist industry with its product, the vulgarity and ostentation of the rich capitalist, and the ill-paid routine labour of the poor. His extraordinary attractive character and world-wide reputation brought into the movement a large number of artistic and literary people, and gave to English socialism a breadth of view which it has never since lost.

The definite revolt against the intellectual tyranny of Marx came from another source. The Fabian Society, founded in January 1884, arose quite independently of Marx, and was based rather on the spirit of Henry George, who proposed to abolish poverty by legislative action, to wit, a tax on rent of land; and also on the positivism of August Comte. Begun in a very small way, it was promptly joined by a group of people who have subsequently become famous, amongst whom may be mentioned Mr George Bernard Shaw, Mr Sidney Webb, and for a short time, Mrs Annie Besant. They soon began to study *Das Kapital*, and came to the conclusion that the Marxian law of value was not economically sound, and also that the validity of the doctrines of socialism was in no way dependent on that or any other Marxian dogma. Land taxation they also rejected as an inadequate remedy. *Fabian Essays in Socialism*,

by seven leading members, an exposition of the principles of socialism from the standpoint of English political and industrial conditions, was published in 1889, and at once made an epoch in English socialism. By this time socialism had become notorious throughout the country. Trafalgar Square riots (1886 and 1887) and the Dockers' Strike (1889) together with a period of severe industrial distress, kept the socialist agitators constantly before the public, and 'when the new doctrine was published in language free from the obscurities of Marxian dialectic with its foreign vocabulary and revolutionary violence, the younger working class leaders welcomed it gladly. The Fabian Society never endeavoured to form a political party, but this political method was preferred by the working class agitators, with the result that in 1893 the Independent Labour Party was founded at Bradford by J. Keir Hardie (1856-1915). He was Secretary of the Ayrshire Miners' Association, and his eloquence, sincerity, and charm of character quickly made him a leader of men. He was elected in 1892 member of parliament for West Ham on independent lines, and except for an interval, 1895-1900, sat for the rest of his life. He served his society and the Labour party of which he was in 1906 the first parliamentary chairman, with unswerving loyalty, until his death in the second year of the war. The I.L.P. (as it is often called) designed as a Labour Party, soon became and has since remained, a strictly socialist propaganda society. It was from the first thoroughly English in its temperament, practical rather than theoretical in policy, conciliatory in methods, and above all, free from the anti-religious taint which hung about the Marxists. It made rapid progress in Yorkshire and Lancashire and later in the Midlands, Scotland, and in London. It attracted the younger leaders of the trade unions, and quickly obtained a hearing in the Trade Union Congress. It made a principal aim of inducing trade unionism to break away politically from the Liberal party, and in 1899 succeeded in getting the Trade Union Congress to decide on summoning a conference of trade unions and socialist societies for united political action. This conference met early in 1900 when the Labour Representative Committee was established, which six years later changed its name to the Labour Party. The S.D.F., the I.L.P., and the Fabian Society took part in this organisation of working-class forces, but the first-named withdrew in 1901. Mr J. Ramsay MacDonald (Prime Minister, 1923-24), was the secretary from the beginning. One other factor in the socialist movement should be named. The *Clarion*, a weekly newspaper, edited by Robert Blatchford, was founded in 1891, and for over twenty years exercised a strong influence, notably in the northern and midland industrial areas, and was specially successful in keeping the movement good-humoured. The *Clarion* was full of fun, and was connected with a whole series of allied organisations for cycling, dancing, &c. Always socialist, its teaching was the antithesis of the grim bitterness characteristic of most of the continental movements.

Between 1890 and 1906 the socialist movement made steady progress. The I.L.P. had branches in every city and, in the industrial counties, in almost every village. The Social Democratic Federation (or Party, as it was called later on) was less numerous and influential, but played its part with vigour. The Fabian Society, mostly middle-class, and largely recruited from the older universities, devoted itself to 'permeation,' that is, to working out the application of its principles to current politics, and persuading political parties and personages to carry them into effect. The

Marxists visualised socialism as a plan to be adopted 'on the morrow of the Revolution' when the old order had been swept away. Fabians held that socialism is a principle already moulding the structure of society and destined to do so increasingly in future decades. The Post Office and the Death Duties, Municipal Gas-works and Tramways, Factory Acts, Education Acts, Workmen's Compensation Acts, were all regarded as steps in the direction of the regulation of social life by the community in the interests of the whole. The individualism of the mid-Victorian Radicals was already a thing of the past. The Charity Organisation Society had become a voice crying in the wilderness for self-help, and Mr Harold Cox was almost its only echo.

In 1906 the political world woke up with a start to the new order. The Labour party put forward fifty candidates at the general election in January, and twenty-nine were successful. It is true that the Labour party was not then avowedly socialist, but nearly all its leaders, most of whom were the secretaries of important trade unions, were actual members of socialist societies, and whilst it had no written programme, its policy was in fact always socialist. This is further indicated by the fact that its first chairman, J. Keir Hardie, was no longer a trade union official, but the leader of the I.L.P. The anti-socialist 'stunt' which immediately followed in the press, added to the membership and influence of the socialist societies; for although the maxim that 'the blood of the martyrs is the seed of the church' was not always true when persecution took the extreme forms not uncommon three or four centuries ago, it is certainly true of such mild methods as result from an English newspaper campaign. Keir Hardie, Mr J. Ramsay MacDonald, and Mr Philip Snowden, of the I.L.P., were now in the House of Commons, whilst amongst trade unionists, who were also socialists, may be named Messrs Arthur Henderson, J. R. Clynes, George Roberts, and G. N. Barnes, all subsequently cabinet ministers. By 1910 practically the whole of the principal trade unions had joined the party, which at the two elections in that year secured forty and forty-two seats.

Having described the growth of the socialist movement in Great Britain up to the beginning of the war, we must now turn back to take up again two threads dropped at an earlier point in this article; one concerns theory; the other organisation.

Syndicalism.—We have already described the origin of anarchism, and outlined its theory. It failed to convince all but a few idealists among the educated, and somewhat more of the natural-born rebels among the half-educated, because the economic methods of a Russian village will not work in a cotton factory or on a railway. Trade unions, natives of British soil, were almost unknown elsewhere till the latter end of the 19th century. In France they were only legalised in 1884, but thereafter they grew rapidly. Anarchism postulates a voluntary group of workers to carry on each industry. A trade union is such a group. That a trade union should own and manage a coal mine or a cotton factory is not perhaps a practical proposition, but certainly is a plausible suggestion, and in France as soon as trade unions became strong this idea rapidly gained ground. Syndicalism is merely the French word for trade unionism; and syndicalism is a proposal for substituting trade unions both for capitalists and for the capitalist state. Politics in France at this period were not in good repute; government was an affair of factions rather than parties, corruption was believed to prevail, and several prominent socialist leaders had gone over to take

ministerial office in the Republican party. Hence the cry caught on that workmen should adopt 'direct action' instead of politics; capitalism must be overthrown by incessant strikes; capitalists must be attacked by 'sabotage,' that is, by damaging machinery, spoiling finished goods, 'ca' canny,' and similar measures. Then when the time came for the workers to seize the factories after a successful General Strike, the wearied proprietors would resign them with little reluctance. Followers of the popular philosopher Bergson, who placed instinct above reason, and impulse above plan, supplied the movement with an intellectual justification. The *Confédération Générale du Travail*, the French equivalent to our Trade Union Congress, constituted under that name in 1895, became the centre of syndicalism, but it must be remembered that trade unions in France were not then (or subsequently) so well organised, or so rich as those of Great Britain. In 1898 the income of C.G.T. was no more than £78. Syndicalism spread wherever anarchism had taken root, that is, in Spain and Italy, as well as France. It also obtained a footing in the United States, under a slightly different form, as the Independent Workers of the World, a fighting trade union commonly called the I.W.W. In England its career lasted for only two or three years between 1910 and 1913.

The ideal towards which syndicalism looked was complete national government by trade unions. The existing state based on geographical franchise was to be replaced by a state based on occupational franchise. It was said that the trade in which a man passes most of his waking hours throughout his active adult life, is more to him than the street in which he happens to live, and that he has more in common with his fellow-workmen than with his neighbours. Hence the new idea of occupational franchise. Syndicalism involves industrial unionism, that is, the organisation of a single union for all persons engaged in one occupation, e.g. railways, mines, shipbuilding, instead of craft unionism, in which engineers belonged to one union, wood-workers to another, labourers to another, and so on. Craft unionism generally prevails in England, and it makes the acceptance of syndicalism difficult. But the vital distinction between syndicalism and socialism is that the one is an organisation of producers, the other of consumers. Socialism is based on the maxim 'production for use and not for profit.' As at present the municipality hires men to make gas, to run trams, to cultivate parks for the ratepayers who desire the product, so in the socialist state the citizen as consumer will employ the citizen as producer to carry on all forms of industry which are at any given time socialised. The objection to control of industry by producers is, that the producer is always conservative; he dislikes changes in the methods of production which diminish the value of his acquired skill, whether it be in composing Greek epigrams or working a hand-loom. And he also objects to altering the product; he prefers to go on making exactly what he has made before. On the other hand, the ideal of the older socialists, implicit rather than expressed in England, a universal state carrying on all industry through a hierarchy of officials, is not exactly alluring. Government is, in the opinion of most people, like the doctor, called in imperiously when anything goes wrong, but otherwise preferably rather in the background. Especially to the ordinary artisan and labourer, the difference to himself in his daily life between Woolwich Arsenal and Armstrongs is small although the one produces for, and is controlled by, the community, whilst the other produces for private profit. Hence the cry caught on that

socialism would lead to the 'servile state,' would be a bureaucracy no better for the average man than the present plutocracy.

Guild Socialism.—About 1911 a new set of ideas began to make itself felt. Started by a group of younger members of the Fabian Society, and advocated in a weekly paper, *The New Age*, guild socialism quickly attracted much attention both amongst political thinkers and in the ranks of trade unionism. It was a compromise between socialism and syndicalism. It proposed to revive the guild system which prevailed in the middle ages, to make trade unions, like the guilds, the authority for the trade with which they are concerned; but it retained the existing territorial state for all public business other than industry. There would be a guild parliament for the control of industry and a territorial parliament for other affairs. The guilds would pay rent to the state for mines, railways, land, and similar monopolies. The National Guilds League, formed in 1915 to advocate these ideas, was not a body of extensive membership, but the teaching of the guildsmen for a time found widespread acceptance. Mr G. D. H. Cole was their most important leader, and published numerous books on the subject. The 'self-governing' workshop has always been an idea attractive to middle-class philanthropists and political thinkers, and the self-governing guild found supporters amongst those who feared the 'servile state.' But a few years after the war one section of the guildsmen joined the Communist Party and another devoted themselves to establishing building and other 'guilds,' that is, bodies of trade unionists engaging in industry in competition with capitalist employers. These failed, as such schemes usually do, the National Guilds League broke up, and all that remained was a more general recognition of the claims of labour to a share in the control of any socialised industry.

The Second International.—The second thread which we have to take up in order to complete our account of socialism up to the war is the Socialist International. We have touched on the First International which expired about 1874. By 1889 Marxian socialism had gained a footing in most European countries, and in that year an international congress, or rather two congresses, met in Paris, out of which grew the organisation now commonly styled the Second International. Congresses followed in Brussels in 1891, Zurich in 1893, and London in 1896, and thereafter they were held regularly every three or four years up to 1910. The congress due in 1914 was fixed for September in Vienna, and, on the outbreak of war, naturally did not take place. The early congresses devoted much of their energies to expelling the anarchists who had got themselves sent as delegates in order to engage in controversy with the socialists. English trade unions were admitted, not because they were necessarily socialist but because it was held that a trade union is by its nature engaged in conflict with capitalism. Gradually a considerable international organisation was perfected. At first voting was by nations, and the one Greek or Argentine delegate counted as a nation equivalent to Germany or France. Latterly each nation was allotted votes according to scale varying from two to twenty. A permanent 'bureau' was established in Brussels, an executive committee held meetings every few months, and in each country there was a national organisation which also met to consider communications from or to the bureau, and to arrange for the quota which each nation contributed to its upkeep. In Great Britain the secretary of the Labour Party, the largest labour and socialist organisation, was the international secretary. As

far as Britain was concerned, the congresses of the international were important chiefly for the purpose of exchange of ideas. British trade unionists and socialists are accustomed to decide on their political policy for themselves, and are not greatly concerned with the views of other nationals. Continental socialists attach more importance to the resolutions of these congresses, as the following incident will indicate. Millerand, the French socialist leader, had joined the republican cabinet of M. Waldeck-Rousseau, and Jaurès had approved his action, thus splitting the French socialist party. The matter was debated at the Amsterdam congress of 1904, Jaurès leading on one side and Bebel on the other. Bebel secured a majority, and Jaurès bowed to the opinions of the Germans and other foreign socialists and withdrew his support of Millerand. A topic always discussed at international congresses is militarism. The Marxist view, accepted by the great majority of socialists, is that wars are always caused by capitalists, both for the purpose of extending their exploitation of non-European people and in order to make profit by the manufacture of munitions, the issue of loans, &c. Whether this doctrine, which no doubt has a kernel of truth, has survived the Great War is not yet clear. Socialists accordingly always protested against war, and a section, led by Keir Hardie, was anxious to make preparations for declaring a General Strike in countries about to be concerned in any war. The German party always opposed this plan, not because they objected to the principle, but because they foresaw that in Germany it would not be practicable. In 1912, when a European war appeared to be imminent, a special international congress was summoned at Basle for 24th November, and at a few weeks' notice 555 delegates, including 13 from Great Britain, met to record the protest of the socialist and labour movement of the world. A demonstration in the cathedral and a session of one day sufficed to register a unanimous verdict.

The war broke up the International, and its headquarters at Brussels were occupied by conquerors. During the war various meetings of socialist leaders were held with a view to formulating terms of peace, which attracted attention at the time, but had no permanent results. The rise of communism created an element of discord, but ultimately, in May 1923, a new Labour and Socialist International was formed at Hamburg at a conference attended by 424 delegates representing thirty countries.

The Third International, confined to communists under the leadership of the Russian Soviet Government, has been much discussed, but has not attained importance.

Before the war the socialists in the European empires were revolutionists confronting great military autocracies; elsewhere they were minorities with little hope of attaining power. Thus they had much in common, since their concern was the unknown future. The war replaced the three empires by a number of republics, and socialists since the British election of 1923 have nearly everywhere become political parties, and have held office or expect to do so. Their problems are no longer abstract and international, but concrete and national. The only country where socialism has permanently prevailed has shown itself hostile to the socialists of other countries, and its hostility is reciprocated. This demonstrates that the idea of the universal brotherhood of socialists was but a dream. Hence it is likely that international socialist congresses will in the future attract less attention than in the decades before the war.

Socialism in the Great War.—By 1914 there was

an important socialist political party in the parliament of nearly every civilised country except the United States of America, but everywhere they were a minority and in opposition. In the few days before the declaration of war the socialists, especially in Germany, took such steps as were practicable, by meetings, demonstrations, and newspaper propaganda, to advocate peace. But in such times political agitation counts for little. When the war was actually begun the socialist parties on the whole supported their respective governments. In Germany, at the start, it was generally believed that the war was really an attack on Germany by the hordes of half-savage Russians. After some hesitation patriotism prevailed, and the social-democrats, for the first time, supported the Kaiser's government. France and Belgium were attacked, and socialists there naturally rallied to the defence of their countries. Great Britain joined the conflict in defence of Belgium, and the Labour Party as a whole decided to support the government; a policy which it maintained until the armistice. Marxian socialists have never objected to fighting, as recent events in eastern Europe have shown, or to conscription, which they regard as the most democratic or equalitarian method of raising an army: they hold that the British method of hiring ill-paid labourers to fight for wages partakes more of capitalism than the continental plan of every citizen doing his share. On the other hand, the British I.L.P., which was never Marxist, had always opposed wars, as for example that in South Africa in 1900, and during the Great War its members formed the most prominent section of the pacifist party. They did not carry the Labour Party with them, and some prominent trade unionists left the I.L.P. on this question. In the United States and in the Dominions the socialist parties adopted more or less the same attitude. But it must be clearly understood that pacifism is not a generally accepted doctrine of socialism. The resolutions against militarism which have been so often carried at international congresses may be taken to mean no more than that socialists have the strongest objection to wars the purposes of which they do not approve.

The first effect of the war was enormously to enhance the importance of organised labour, which in England for most purposes may from this period be considered as identical with the essentially socialist Labour Party. In order to maintain production of necessities, to secure an adequate output of munitions, and to create an enormous army, the co-operation of the trade union leaders was indispensable, and the government accordingly consulted with them before any new measure affecting labour was adopted. Then came the Coalition, and Mr Arthur Henderson, the leader of the Labour Party, accepted office in the small war cabinet with the approval of his party. Later on he was succeeded by Mr G. N. Barnes, for many years the secretary of the Amalgamated Society of Engineers, and a socialist of even longer standing than Mr Henderson. The same policy was adopted in France, where M. Albert Thomas and two others, members of the Socialist Party, joined the government, and by the Belgians, for whom M. Vandervelde, standing chairman of the International Socialist Bureau, became a minister, and for a long period represented the Belgian cabinet in London.

The Russian Revolution.—We now turn to Russia, and must revert to an earlier period in order to complete the story. Although the leaders of anarchist thought came from Russia, it does not appear that an anarchist movement of any importance was developed there. Throughout the

last half of the 19th century a revolutionary agitation against the terrible tyranny of tsardom prevailed. It was known in the west by the name nihilism, which properly applied only to a small school of philosophical materialists. The revolutionary movement was of course political and not economic; every old nation has had a revolutionary struggle when autocracy was compelled to give place to constitutionalism. But in fact all the nihilists (as we may call them) were also socialists, or, in a few cases, anarchists. Refused all constitutional methods of reform, the nihilists resorted to assassination, and the government in return hunted them down, and punished by death or life-long imprisonment or exile to Siberia all who could be in any way implicated with socialist or anarchist doctrines. But the apparently hopeless struggle had more effect than was apparent. After the defeat of Russia by Japan, the demand for a Duma, the traditional Russian parliament, culminated in a General Strike of all trades and classes in October 1905, and the tsar gave way. The socialist parties refused to participate in the election of the first Duma in 1906, but in the second, elected in January 1907, out of 524 members 132 were socialists. The government soon reverted to repression, and during 1908 no less than 782 persons were executed for political offences, and 70,000 were exiled. The bureaucracy of Russia were sowing seeds from which a dozen years later they were to reap a terrible crop. Russian socialists were divided into two schools. The social-democrats, pure Marxists, who were nicknamed bolsheviks (meaning merely that at a certain decisive vote they were the 'majority'), believed that the evolution of society, as described by Marx, must even occur in Russia, where the bulk of the people are land-owning peasants, and therefore that no revolution could take place until these small landowners had in the inevitable economic evolution become landless proletarians. The other school, the social revolutionists, moderates in spite of their name, believed that the evolution of Russia would proceed on its own lines, perhaps on the basis of the quasi-communism of the Russian village community, the Mir. In March 1917 with the deposition of the tsar came the political revolution. Although the actual seizure of power was the work of liberals rather than of socialists, it soon appeared that the Social Revolutionary party was the only one ready to undertake the government, and A. F. Kerensky, a socialist barrister, became its head. In November his government was overthrown by N. Lenin (otherwise V. I. Ulianov) and Leon Trotsky, who had returned from exile to lead the Marxists. From this time onwards Russia has been ruled by this party, which calls itself the Communist party, whilst by others it is sometimes designated bolshevik. They endeavoured to govern Russia according to the teaching of Marx as they understood it; and they attempted the almost impossible task of carrying out a complete economic revolution concurrently with a political revolution in a country demoralised by centuries of autocracy. The communists have adopted a principle based on a phrase used, but not explained, by Marx in 1875, 'the dictatorship of the proletariat,' according to which, after 'the Revolution,' all other classes are excluded from power. By their constitution, therefore, only the workers are allowed to vote. This, of course, is inconsistent with the universal democracy which is the opinion of most socialists in all other countries is an integral part of their creed. What is called the soviet system of government is merely a very crude form of electoral organisation, by which (to use English terms) over the greater part of the country each parish elects a council; that council elects

delegates to form, with the delegates of other parishes, a district council; district councils in the same way elect county councils, and county councils elect parliament. In practice some soviet members appear to be elected by factories, which is a concession to syndicalism. There appears to be no Marxian authority for this plan of indirect election, which in fact had arisen spontaneously before the arrival of Lenin in Russia, and it may well have been the only practicable plan in such a country at that moment. It has the advantage to those in command of making the government in practice irremovable. The communists introduced, suddenly and universally, the industrial methods which most other socialists hope to reach in some industries by slow degrees. In 1918 the large industries were nationalised. In 1920 all enterprises employing more than five workers with machinery or ten without, were also nationalised by decree. But before this was carried into effect the disastrous results were so apparent that in 1921 a 'New Economic Policy' was adopted at the instance of Lenin, which reversed the process, first in respect of the smaller industries, and in 1923 in respect of the larger. A system of state-controlled trusts was then established for the management of big industry and finance, of which 426 had been formed by the end of 1922. Private property, which had been abolished in principle, was again permitted, and industry under the N.E.P. was carried on partly by the state, partly by co-operative societies, and partly by private enterprise.

Lenin died in January 1924, and since then Russia appears to have been governed by a self-appointed group of communist leaders, whose happily bloodless quarrels are not controlled by any really representative assembly. A description of the ruthless violence with which the communists established their rule, and any discussion as to its alleged necessity or justification, are both outside the scope of this article.

At the End of the War.—The defeat of Germany and the abdication of the Kaiser were followed in Germany, as in Russia, by the emergence of the socialists as the one party able to control the nation, and in Austria, in Hungary, and, in fact, in nearly all the new countries which sprang up on the ruins of the Austrian and Russian empires, the socialist parties were at first in control, though in some cases they retained power only for a short time. In Germany the majority socialists, who had supported the war, were attacked by various groups, more or less in sympathy with the Russian communists, and for some time disorder prevailed, in the course of which two leaders of the extremists, Karl Liebknecht, son of the leader of earlier days, and Rosa Luxemburg, were killed, some say murdered. Ultimately things settled down; the majority socialists were wise enough not to attempt to change the industrial system otherwise than by degrees, and they retained power until the election of 1920, at which they were greatly weakened by the 'separatist' tactics of the above-named dissentient groups, with the result that a coalition of other parties assumed the responsibilities of office.

Socialism in Great Britain after the War.—In 1918 the Labour Party for the first time formally adopted a definitely socialist policy. According to its constitution, its objects are to form a political labour party, to co-operate with the Trade Union Congress, and 'To secure for the producers by hand and by brain the full fruits of their industry and the most equitable distribution thereof that may be possible, upon the basis of the common ownership of the means of production and the best obtainable system of public administration and control of each industry and service.' In the 1918

election it ran 361 candidates, of whom only 57 were successful; but this result was a greater success than appears on paper, since in many contests the 'free' liberal was at the bottom of the poll, and as the Liberal Party won only twenty-eight seats, the Labour Party became the official opposition. The more prominent I.L.P. members who were pacifists lost their seats. In the election of 1922 the party won 142 seats; in 1923 it obtained 191, and with the assistance of the liberals defeated the conservative government by 328 to 236 votes. Mr Ramsay Macdonald thereupon formed a labour government, which held office, with liberal support, until defeated by the withdrawal of that support. A general election followed in October 1924, and led to the victory of the conservatives, who won 412 seats against 152 labour, 42 liberal, and 6 other.

With the attainment to office of the Labour Party, it may be said that socialism in England, as a sectional movement, came to an end. It began about 1883 as a number of thinkers and agitators who formed small propagandist societies; gradually it grew into a minority political party; in 1918 it became the opposition; in 1923 the government. As such it has become a constituent part of the history of England, and the successes and failures of the Labour Party are factors in the life of the nation.

It is therefore unnecessary to give details of the socialist societies since the war. The I.L.P. and the Fabian Society do their political work through the Labour Party, and are chiefly useful as organs for devising and popularising the application of the principles of socialism to the political and social problems of the day. The Social Democratic Federation changed its name in 1911 to the British Socialist Party, and in 1916, after many years of isolation, rejoined the Labour Party. Subsequently many of its members became communists, and the rest in 1920 reverted to their old name. Since the death of H. M. Hyndman in 1921, the S.D.F. has lost its importance.

The Communist Party.—A brief notice of this small but noisy party is necessary. Throughout the history of the socialist movement in England there has been a left wing, consisting of fanatic extremists, who denounce the majority as weak-kneed time-servers. In the 'eighties' they were anarchists. In the early years of the Labour Party the Social Democratic Federation and its successor, the British Socialist Party played the part. Then came the guild socialists, and the last phase is the communists. In many cases the people are the same, though the battle-cry has been changed.

Communism differs from the other left-wing movements in that it is closely connected with a foreign government. It takes its ideas and its orders from Russia, and, what is more, obtains funds from the same source. Hitherto it has been a healthy factor in all forms of popular agitation that the money available was roughly correlated with the number and devotion of the adherents. The law of the survival of the fittest operated. Only those movements could go on which were able to obtain substantial popular support. It is another matter when a small group in any country is subsidised by a foreign government. Such success as communism has had is not necessarily due to its merits, but may be attributed in part to Russian gold. The communists desire to affiliate to the Labour Party in order to use its platform for advocating their own policy, but their admission has been refused by enormous majorities, and individual communists are not allowed to join the Labour Party directly. Indirectly, as members of affiliated trade unions, they cannot be excluded.

In 1925 the leading communists were convicted of sedition, and sentenced to imprisonment. Many

members were imprisoned or fined for violent speeches during the miners' lock-out of 1926.

In Germany, France, and other European countries the communist parties have attained considerable electoral strength, and division into two hostile sections has everywhere weakened the effective force of socialism.

The Policy of Modern Socialism.—It remains to describe socialism as understood by its adherents in England. Let us first state what socialism is not. In a Report to the International Congress of 1896, prepared by the Fabian Society, that society states that 'it has no distinctive opinions on the marriage question, religion, art, abstract economics, historic evolution, currency, or any other subject than its special business of practical democracy and socialism.' In the 19th century the early German and other socialists attacked both religion and the existing form of marriage. But it was soon recognised that these subjects had no necessary connection with socialism, and, in fact, socialists as individuals hold different opinions about them. In England no socialist party of any consequence has adopted a policy on religion or marriage.

The constitution of the I.L.P. states that it is a socialist organisation, having for its object the establishment of a socialist commonwealth—that is, a state of society in which land and capital are communally owned, and the processes of production, distribution, and exchange are social functions. The I.L.P. believes in democracy organised, both in its political and industrial aspects, for communal ends. Political democracy is defined as practically the existing system of central and local government, apart from the hereditary elements of the former: industrial democracy as the organisation of producers and that of consumers. Each industry should be managed by representatives of those engaged in it, together with representatives of organised consumers, and a central body representing both sides should control production as a whole. The immediate objects of the I.L.P. include assisting trade unionism and the co-operative movement. It is opposed to war, imperialism, and the exploitation of native races.

The basis of the Fabian Society, as revised in 1918, says:

'The Fabian Society consists of socialists. It therefore aims at the reorganisation of society by the emancipation of land and industrial capital from individual ownership, and the vesting of them in the community for the general benefit. In this way only can the natural and acquired advantages of the country be equitably shared by the whole people.'

'The society accordingly works for the extinction of private property in land, with equitable consideration of established expectations, and the due provision as to the tenure of the home and the homestead; for the transfer to the community, by constitutional methods, of all such industries as can be conducted socially; and for the establishment, as the governing consideration in the regulation of production, distribution and service, of the common good instead of private profit.'

The Labour party has a much fuller programme entitled 'Labour and the New Social Order,' adopted by the party as a whole at a conference held in June 1918, before the end of the war was actually in sight. It may be taken to be an exposition of the aims of the socialism which is the policy of the British party, moderately worded, but accepted by all sections of the party and therefore authoritative. Its authorship is commonly ascribed to Mr Sidney Webb, who became a member of the Labour Party executive in 1915, and was elected at the head of the poll in 1919. It should be said that modern socialism owes more

to Mr Webb than to any other thinker since Marx. The constructive socialism formulated by the Fabian Society is largely his work, and his numerous books, mostly written jointly with his wife, contain implicitly or explicitly nearly all the ideas which differentiate British from Marxian socialism.

'The Programme of the Labour Party on Reconstruction' (this is the sub-title) begins by stating that 'Society itself' must be reconstructed. It was foreseen months before it happened in Central Europe that the war was 'the culmination and collapse of a distinctive industrial civilisation.' 'Capitalist production' and all that it involves 'have received a death-blow.' The new social order must be based on production and distribution 'for the benefit of all who participate by hand or by brain.' Four main objects are specified: '(a) The universal enforcement of the national minimum; (b) The democratic control of industry; (c) The revolution in national finance; and (d) The surplus wealth for the common good.' The first is the securing to every member of the community in good and bad times alike of all the requisites of healthy life and worthy citizenship. This involves the principle of legally prescribed minimum wages and the prevention of unemployment. Democratic control of industry must be based on the common ownership of the means of production, with the immediate nationalisation of railways, mines, and electricity. In agriculture the future is seen in a combination of national farms, small holdings, municipal enterprises, and farming by consumers' co-operative societies. In finance, taxation of the wealthy by extension of income-tax and super-tax, and a capital levy to pay off the debt or part of it. Ultimately the surplus wealth above the standard of life must go, not to the senseless luxury of the idle rich, but to common good. For the wise carrying-out of these plans the Labour Party looks to the scientific investigation of each problem, deliberate organisation of research, and in all fields of life, democratic co-operation. This is a brief summary of a pamphlet of 24 pages.

A Constitution for the Socialist Commonwealth of Great Britain.—The socialist movement has always been weakest on the side of reconstruction. The majority of writers and speakers find sufficient scope for their energies in describing the evils they see in existing institutions, and advocating their prompt abolition. The wiser thinkers have been discouraged by the complexity of the problem, and have put their trust in the maxim *solvitur ambulando*. The only serious forecast of the future under socialism is a volume with the above title written by Mr and Mrs Sidney Webb in 1920. This deals in the first place with central and local government, subjects on which we must not embark, beyond stating that the authors propose that there be two parliaments, one dealing with politics, in the Victorian sense of that word, and the other with social and industrial matters. No catastrophic change is contemplated, but rapid progress on existing lines, that is, the transfer of one industry after another from private ownership to the central or local state, and the gradual abolition of 'living by owning' by means of taxation and death duties. Compensation must be given for each particular industry or piece of land taken over, as at present, but the wealthy as a class must bear the taxation necessary to pay interest on and redeem the debt thus incurred. Consumers' co-operation is regarded as a permanent part of the future state, and its wide extension anticipated, until it takes over virtually the whole supply of common household requisites, and perhaps a good deal more. The authors assert 'that there is no reason to assume that in the socialist commonwealth every adult

citizen will be engaged, at salary or wages, in some vast administrative machine. . . . There is nothing in socialism that requires or even makes probable the suppression of the independent craftsman or brain-working practitioner.' Each vocation must have the right of self-determination, but must be in the last resort subject to the social parliament. As for private property, socialism will enormously increase it. The fault of the present system is not excess but defect in private property. The vast majority of families possess far too little, and many of them virtually nothing at all. Socialism will put an end to most of the private ownership of the means of production, but it will increase private property in the home and homestead, the paraphernalia and the hoard, involving all the amenities of life. Finally, it will replace the passion for riches, which capitalism has regarded as the master-motive, by the spirit of service, which already animates some of the professions, and must ultimately dominate industry as well.

Such in brief outline is the forecast of Mr and Mrs Webb. All socialists are persuaded that socialism in some form is the hope and the certainty of the future. Whether it will come about in Great Britain in the orderly and peaceful way anticipated in the above-named volume depends, as socialists think, on the spirit in which the claims of the workers are met by the possessing classes.

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Societies are associations for some particular object, such as the promotion of science, art, and literature; the diffusion of knowledge, religion, and morality; intercourse between those of the same profession or trade; the removal of legal grievances; mutual aid in case of distress; and an abundance of other aims, which are either beneficial to the general public or to the members of the society alone. The great scientific, literary, and art associations are many of them separately treated in this work (see ROYAL SOCIETY, ROYAL ACADEMY, &c.). So are many special institutions like the Humane Society (q.v.), the S.P.C.K. (see CHRISTIAN KNOWLEDGE). Others are dealt with in the articles on the subjects with which they concern themselves (LIFEBOAT, TEMPERANCE, &c.). In Britain the term academy is usually reserved for art associations; but on the Continent the great national literary and scientific organisations are usually styled academies, and are treated at the article ACADEMY. See also BOOK-CLUBS, SECRET SOCIETIES.

Society Islands. See TAHITI.

Socinus, the name of two celebrated heresiarchs, uncle and nephew, who have given name to a sect of Christians, the Socinians, whose doctrines, though by no means identical, are to a large extent those of the modern Unitarians.—LÆLIUS SOCINUS, or LELIO SOZZINI, was born in 1525 at Siena in Tuscany, of a family long distinguished for its cultivation of literature and science. He soon displayed a strong preference for theological inquiry, and in order better to prosecute his biblical studies made himself familiar with Greek, Hebrew, and Arabic. He became a member of a secret society formed in 1546 at Vicenza for the discussion of religious

questions. The conclusions arrived at were unfavourable to the dogma of the Trinity, held to have been borrowed by the early church from the speculations of Greek philosophers. The society was discovered and broken up, and among those who sought safety in flight was Socinus, who travelled in France, England, Holland, Germany, and Poland, and finally settled in Zurich, where he died in 1562. Lælius Socinus, unlike most heretics, was a modest and reticent man. He united in altogether unexampled degree the warmest piety with complete freedom in theological speculation, though this brought upon him the disapproval of Calvin.—See Ilgen's *Vita Lælii Socini* (Leip. 1814), and *Symbolæ ad Vitam et Doctrinam Lælii Socini* (Leip. 1826).

FAUSTUS SOCINUS, or FAUSTO SOZZINI, nephew of the preceding, was born at Siena, 5th December 1539, and lost his parents while still young. After visiting Lyons and Switzerland, he entered the service of the Grand-duke of Tuscany's sister in 1563, but in 1575 retired to Basel, to prosecute his theological studies more closely. Three years later he set out for Klausenburg, at the request of George Blandrata, whence next year he went to Poland. Anti-Trinitarianism was even stronger there than in Transylvania, and Socinus soon obtained enormous influence, insisting that Christ was to be worshipped and invoked in prayer (for the *adorantes*, and against the *non-adorantes*), that the only solid basis on which Protestantism could rest was human reason, that everything that contradicted it should be rejected as false and incredible, and that dogmas that were absurd should not be allowed to shelter themselves from criticism because their defenders chose to call them mysteries. The Protestants were alarmed, and the ablest among them undertook publicly to confute Socinus. A disputation was held in the college of Posna, which ended in Socinus reducing all his opponents to silence; but they retaliated after the unscrupulous fashion of the times by trumping up against their vanquisher a charge of sedition, which, although ridiculously groundless, made it necessary for Socinus to withdraw from Cracow. While living in retirement on the estate of a Polish noble, Christopher Morszyn, he married the daughter of his protector. In 1588 he took part in the synod of Brest (on the borders of Lithuania), and combated all the principal dogmas of the church—the divinity of Christ, propitiatory sacrifice, original sin, human depravity, the doctrine of necessity, and justification by faith. In 1598, on the publication of his *De Jesu Christo Servatore*, his enemies stirred up the populace of Cracow against him; and Socinus was torn from a sick-bed and nearly murdered. Soon after, he left the city and found a refuge with one of his friends in the neighbouring village of Luclawice, where he died, 3rd March 1604. The doctrine of the Trinity, Socinus held to be contrary both to Scripture and to reason, and the Old Testament to have a mere historical value; predestination was abhorrent to him, while communion became a symbolic act. He believed strongly in the immortality of the spirit (but not of the flesh). He drafted the Racovian Catechism, used as a confession of the Socinians. Racow (q.v.) was for long their main centre, and seat of their college. A Roman Catholic reaction, however, set in, and in the reign of John Casimir (1648-68) Socinianism in Poland received its death-blow, but it continued to flourish in Transylvania to the 20th century.

See Przykowski's *Life*, prefixed to a collection of the works of Socinus in the *Bib. Frat. Polonorum* (Amst. 1636; Eng. trans. 1653; new ed. annotated by Sharpe, 1912); Bayle's article in the *Dictionnaire*; Toulmin's *Memoirs* (Lond. 1777); Fock, *Der Socinianismus* (1847); a *Life* by Wallace (1850); A. Gordon, *The Sozzini and their School*.

Sociology. The latest and most complex of sciences, sociology (the systematic study of human affairs), has, so far, attracted but few workers and teachers. Naturally, therefore, it lacks as yet that general agreement as to methods, results, and aims which, in other sciences, is the active agent of their advance. Nevertheless, anyone may intelligently, and even productively, begin social studies. Most simply, one may begin by realising that, since the very origin of language, people have been thinking and talking about their affairs. And what are 'affairs' but, in essence, a moving sense of communion with the society around us? Of old, no doubt, people conceived their affairs in relation especially to their family or horde, their tribe and larger grouping. And, incidentally, it is a useful sociological exercise to observe and reflect upon the persistence with which these primitive social perceptions survive, under disguises and modifications, in the complex societies of to-day. A similarly primitive, yet also contemporary, social process runs perennially from home to hamlet, and onwards to neighbourhood, village, town, embracing also the corresponding region, and readily extending to country and empire. The human and the geographic notes are always blended in this primary social attitude. And some sense of relations, friendly or hostile, with others beyond, inevitably emerges.

For simple examples of the social relations manifest in each and every grouping, take those existing between children and parents, or between workers and their employers; and, for more complex instances, those between state and church, or between nation and nation. These relations are partly material and economic, but also mental and moral. Hence arise the rich human interactions named morals, manners, customs. And each of these pervasive types of social interplay may carry a weight of authority not less than that of written and codified law. Every human group, however modern and complex, has thus its ways of living, its '*mores*' (Fr. *mœurs*) or 'folk-ways'; so that the archaeology of primitive man, the anthropology of savage or barbarian peoples, and the scrutiny of contemporary civilisations are studies fundamentally similar. Yet as these studies are pursued concretely, a great variety of specialisms arises, comparable to those which so long prevailed, and indeed must so far always prevail, among botanists and zoologists surveying their protean abundance and variety of life. And as these many specialised studies of organic beings have long been yielding a general science of biology, with its essential inquiries and results more or less common to all things living, so the concrete students of human societies and their ways are also searching to elucidate such general order as may be found through all forms of social life. There is therefore emerging a sociology which meets the requirements at once of observant and reflective minds. It inquires into man's ways of life in past and present, and strives to classify and interpret them as intelligible processes of social life. It not only searches into origins, but also estimates tendencies, and therefore peers into the future; for the social life it studies is in course of evolution. But evolution is not necessarily progressive. The evolutionary study of organic species shows them subject to arrest or decline, and even to extinction. So for human societies the same retrogressive processes are observable and have to be interpreted.

How can we define the relation between the recedite sociology of science and the unconscious sociology of plain folk? Well, admit that from simplest childhood to utmost age we are all of necessity interested in the society around us; assuredly it follows that to develop this common and natural interest to fuller understanding, and even to elicit

vital contributions, is an essential aim of sociology. Through its many portals we may advance from everyday experience to specialised knowledge, and yet integrate both towards social synthesis. Everyone, for instance, can realise how largely our yesterdays have determined to-day, and also that to-day has some range of freedom, some bearing on to-morrow. From observation and intelligence in the present, we thus look back into the past, calling in aid its biographies and histories. Some sort of sociology, however naïf and uninformed, we necessarily contrive for ourselves, as an aid to understand and interpret our arena of social affairs. The simplest occupations, the widest activities of life, have alike their sociological interest. Each day's work is normally of life-sustaining value; and this aspect of affairs can be viewed more and more widely in terms of the specialised studies, called by the learned political economy and speculative politics, each but a subdivision of sociology. And again, from house-door or garden-gate, we open into a widening world of social geography. Our interest in immediate neighbours may lead to ethnography and anthropology; and our friendships, our dislikes, are obviously psychological and even moral. And manifestly all these studies, from social geography through anthropology and psychology to ethics, are specialised approaches to one unifying study of social life in all its varied activities. In short, just as M. Jourdain talked prose without knowing it, so everyone, alike the plain man, the ardent specialist, and the critical philosopher, talks and thinks sociology, even though he may scorn that term or remain ignorant of its very existence.

In sociology, as in other sciences, the beginner tends first to follow a congenial leadership. In most cases the choice is from some specialised line of study, and generally there results a sociology of corresponding bias. Witness, for instance, the sociological pretensions of economists, from the Physiocrats to Adam Smith and onwards, one way through Ricardo and another through his antithesis Marx, to the comprehensive claims of their contrasted successors in the present. Others, following the lead of history, are at first necessarily limited to some nation or people, religion or period. Yet such workers collectively are building up a world-history which tends to push further and further into the past. And reaching beyond the limitation of annals, the inquiring mind reflects upon the significance of chronicled events; and hence arise philosophies of history, which seek also to understand the mentalities, the views of life, the 'social representations,' which underlie material events, and which by turns inspire them or result from them.

Similarly might be traced the enlarging surveys and amplifying interpretations reached from other specialised approaches, whether starting from the side of elaborated knowledge or of everyday experience. Their complementary products accumulate through the succession of generations, mingle into systems of thought, and generate customary attitudes towards life. Thus arises in each civilisation a tangled mass of survivals—moral, intellectual, and æsthetic. This ever-growing accumulation of experience, ideas, and ideals is the social heritage. Besides our organic heredity, and our material inheritance from the labours of the past, we are thus endowed with an immaterial and spiritual heritage, our body of social tradition. Its 'filiation' with the past is transmitted primarily by means of language; and manifestly with greater completeness and endurance through that invention of written records, which conspicuously marks the advance of barbarism into civilisation. By the interweaving of different social heritages the pattern

of every civilisation is shaped. However isolated or conflicting, all civilisations can thus be viewed as efforts towards unity. For are they not potential acts in an impassioned drama of creative humanity, waiting to be played upon the stage of our planet? This long-delayed consummation comes nearer, as sociology advances the knowledge and interpretation of all social formations, all civilisations.

To take some simple illustrations of the resources increasingly available to this end. Social knowledge aids the understanding of the current events we scan daily in our newspapers; it confirms or modifies their interpretations submitted in leading articles. Illuminated by history it may direct the statesman's conduct of affairs, external and internal. Fortified by experience it may guide the citizen's action. Enriched by altruism it may ennoble the plain man's life. In order to perform these services, sociology must incorporate into a working synthesis all the relevant knowledge available, and must adapt that synthesis to every-day usage. It must, for instance, assimilate historic annals, from far beyond Thucydides, once called the Father of History, and also their interpretations, from earliest sacred books to latest speeches. It must, for another example, incorporate economics from simplest food-gathering to world conditions and their adjustment. By means of observational and interpretative surveys, it must extend its domain throughout laws and politics, religions and philosophies, languages, literatures and arts. In all these respects the advance of sociology is dependent not less, but more, than the other sciences upon interaction with practical needs. As physical science alternately learns from industry and makes discoveries which promote inventions; as biological science draws from medicine and agriculture, and increasingly advances both; so a living social science not only learns from current events, but looks forward, with informed imagination, towards useful applications in social guidance. Examples of past endeavours might be drawn from codes of law and systems of religion, which coming down from ancestral tradition, survive by actual or professed adaptations to current needs. And in this process of adjustment a formative part is played by adventurous social thinkers who fashion their desires and hopes into inspiring presentments. Plato's ideal *Republic*, and Augustine's *City of God*, the Utopias of More and his modern successors, are all of them endeavours towards an ordering of affairs, which may be viewed as anticipations of an applied sociology.

There is thus ample scope for every mind to develop sociologically, from simplest observation of surroundings to furthest inquiries into the past, and highest aspirations towards the future. Manifestly no particular path is sufficient in itself; and experience shows that, since the present is so much conditioned by the past, and the living are so much governed by the dead, we must survey the present and interpret the past, before trying to forecast the future. Yet prevision is the highest goal of every science. And, in foresight of the future, sociology has to make good its scientific status. But significant distinctions emerge. From astronomy to meteorology, physical science foresees the future as unconditioned by human effort. But in the biological sciences, foresight goes with increasing control of the future, as in applications to agriculture and medicine, to hygiene and education. And social records show also examples of this combined foresight and control in deepening thought and enlarging statesmanship. It is evident, indeed, if not immediately, yet, on reflection, that the increasing complexity of things from the physical, through the organic to the social, is accompanied by increasing powers of control, *provided our knowledge of tendencies be adequate.*

And it is essentially to unveil, interpret and estimate, current tendencies that the sociologist surveys the present as quick with survivals of the past, yet also big with events of the future.

So vast a sociological programme affords room for specialists without number; and its comprehension seems far beyond individual powers. Yet in every period of science generalising minds appear, and accelerate the advance of order upon chaos in each field of enlarging knowledge. Witness the mastery of mathematics through its all-embracing notations; the advance of physics with the doctrine of energy; and the increasing grasp of biology in terms of evolution. But all the sciences are fundamentally one, and the rate of progress in late-comers depends largely on the use they can make of their predecessors. Thus, for instance, as physical science subserves physiology, so biological studies of organic life in its nutrition and reproduction, its self-maintaining and its species-continuing activities, and of life in general as interaction of organism with environment, throw light upon the like processes in human society. For every human society is confronted with the organic problems of its maintenance and continuance. And as the development of every species proceeds through its interaction of organism with environment, so we are bound to assume does the development of a people proceed through interplay of their life-work with its place. Again, the biologist contributes to social science when he studies the interaction of hunger and love in man regarded as the dominant species of the organic series. But the concepts of struggle and selection, thus passing over from biology into sociology, submit, under influence of the social heritage, to modifications, which out-range biological criteria. Physical science also aids directly, as in interpreting our human activities in terms of the energy and matter with which they are so largely concerned, either towards conservation or dissipation. The mathematician renders a fundamental service to the social sciences as statistician; as in compiling the census, constructing life-insurance tables, and very conspicuously in those pecuniary notations which have attained such significance throughout social life, even to dominating what seemed not so long ago the main field of political economy.

We have now outlined the spontaneous origins of sociology, or in other words, its elementary beginnings in every active mind. We have indicated the course of its natural growth and future prospects as culminating member in the circle of the sciences. It is time to turn to the historic facts of its formal origins, definite constitution, present state and precise requirements for prospective development as at once a natural science and a humanist study. But for final emphasis let us repeat the gist of what has been said. It is this. Starting as plain folk, more or less interested in human society around us, we advance towards sociological competence in the measure that we become students and searchers, by turns acquiring increasing knowledge of facts, and increasing command of them, through such order and progress as we can discern. Here the slogan of advance is, 'everyman his own sociologist.' And to that end we may consult articles like History, Geography, Political Economy, Anthropology, Folklore, Jurisprudence, Religion, Psychology, and Politics, with lesser references and biographies. But sociology, like other sciences, has a history of fairly definite origins and well-marked stages of advance. It has, in short, its precursors, initiators, and continuators. With these a working acquaintance is necessary for the serious student. Of innumerable precursors two stand out conspicuous. First came the Italian Vico, whose *Scienza Nuova* (1725) was sociological

in everything but name. And the same may be said of Condorcet's *Esquisse d'un Tableau Historique des Progrès de l'Esprit Humain* (1794). Vico in his 'new science' offered an interpretation of history, which boldly sketches a naturalistic view of social development in religions, laws, and governments, running its course through a recurrent cycle of phases. First comes the 'age of gods,' next the 'age of heroes,' and finally that of 'men.' The first of these phases is patriarchal and theocratic; and the next is patrician and plebeian (but fundamentally aristocratic); and it passes into the third phase of the cycle, that of increasing democracy. Law, for instance, is first sacred and ceremonial, then is expressed in solemn formulæ, and finally in terms of natural rights; while its judges are first conceived as gods to be supplicated, next as a high senate, and at length as the arbiters of authorised tribunals. Great religions, each with its mythos, doctrine, and ritual, rise, change, and fade; and kings, at first divine and heroic, next lose their odour of sanctity, then diminish in political significance, and finally, reduced in moral stature, they sink into decorative appendages or disappear. This endeavour of Vico towards a 'new science' attracted little notice at the time, and has failed to win critical attention since; but to-day we witness something which is almost a fashion, amongst the learned, for the cyclical view of history (as notably in Oswald Spengler's *Decline of the West*), but, so far, without reference to the originative work of Vico.

Condorcet's interpretative outline is more concrete than Vico's, and indeed comes very near to current views established in anthropology and culture history. He shows us, in the social dawn, family and horde living crudely by hunting and fishing, yet inventing language. Next appear the pastoral and nomadic beginnings of civilisation, with development of property and the rudiments of art and even science, of wealth and communications. All these endeavours towards civilisation are increasingly expanded in the next formative stage, that of agriculture. In his view of social development Condorcet emphasises Greek civilisation and culture, its philosophy and science, its literature and art, all taken in conjunction with the evolving law and extending empire of Rome as the historic matrix of modern civilisation. He depicts the mediæval order as retrogressive because lapsing from the classical culture. Next is valued the Renaissance for its recovery of the classical culture, and its development of that intellectual and moral heritage towards culmination in the science and philosophy of Descartes. Finally, in Condorcet's philosophy of progress comes his interpretative view of the revolution, in which he himself participated so dramatically both as agent and spectator. From the endeavours and aspirations of this upheaval—the Great Revolution, as French historians term it—he formulated those democratic ideals of progress towards an ever-brightening future, which, during the 19th century, animated the doctrine, and directed the practice, of the finer and more informed Liberalism throughout the western world.

From this late 18th-century revolution—in France mainly political, in Britain emphatically industrial, and in Germany predominantly intellectual—there issued, in the succeeding generation, many tentatives towards reconstruction in thought and action. In England, the most familiar is that growth and popularisation of economic doctrine, which later underwent a fissiparous division into rival schools, respectively classic and socialist. But for sociological initiative, other post-revolutionary developments are more significant. Notably so is that rich and varied counter-revolution which, going back on the cold intellectual classicism

of the 18th century, revalued the Middle Ages as an impassioned endeavour towards a civilisation founded on mercy and love no less than on truth and justice. Of the resulting movements many, to be sure, were filiated to the counter-revolution only indirectly or even unconsciously. Romanticism in literature and the Gothic revival in art, for instance, were without deliberate political or social aim. But the ultramontanism of the Continent, built upon doctrines expounded in Joseph de Maistre's great work, *Du Pape*, deliberately sought to infuse the political and social world with mediæval ideals of public action and private conduct. Pale reflections of this thorough-going Continental endeavour to reconstruct society on a more religious basis are exemplified by the Oxford Movement in England and the Disruption in Scotland.

The revolution and the counter-revolution are doubly significant for sociology. First, because they are active and expanding movements in contemporary civilisation; and next, because the endeavour to harmonise them, by uniting the intellectual and practical idealism of the one with the emotional and æsthetic appeal of the other into a single efficient instrument of social progress, affords a main clue to the life and labours of Auguste Comte. Through science Comte hoped not only to integrate complementary movements of post-revolutionary reconstruction, but also to correct their respective deficiencies by an appreciative incorporation of every historic initiative. Yet science must first unify itself into a well-knit body of doctrine at once naturalist and humanist. And for that synthetic purpose Comte affirmed the need of a culminating order of science, specialised upon man and his world, past, present, and future, yet so generalised in respect of all the other sciences as to bring their body of verified knowledge to bear upon the understanding and better ordering of human affairs. It was this crowning science that Comte sought to establish under the term sociology. He explained the hybrid origin of this new word as uniting the logical scientific spirit of Greek culture with the wider social order of the Roman world. For the word itself, therefore, he claimed justification on the ground that its etymology exposed the main historic bases of modern civilisation.

What, then, are the master conceptions on which Comte reared the structure of his new study, at once a science and a philosophy, a history and a doctrine? First, a regulative idea recalling Vico's, that of a progress of social thought through distinguishable stages. These he termed theological, metaphysical, and positive; and his disciple, John Stuart Mill, less controversially described them as volitional, abstractional, and scientific. For familiar instance take the interpretation of striking natural and social occurrences, such as lightning and epidemics, first, definitely, in terms of divine volition, as, respectively, thunderbolts and punishments; next abstractly and vaguely, as operations of nature; and at length, in terms of science, as electrical and pathological respectively, and thereby related definitely to the wider categories of, in the one instance, weather, and, in the other, disease. In the first or volitional stage, the explanations in terms of religion fail to satisfy inquiring minds, since devoid of suggestion for further research. In the next historic phase the abstractions offered, though of metaphysical impressiveness, have lost the previous completeness and simplicity; and so afford no effective interpretation at all. But in the third phase phenomena are freely submitted to that methodic search and experimental test which give them place within the expansive system of verifiable knowledge. But what precisely is this system of knowledge called science? How did it arise? What is, or should be, its relation

to the outer world of affairs and to the inner life of emotion and ideals?

To answer these questions was for Comte the necessary condition of equipping the barque of science with prow and helm. His sociology was designed for that double rôle. He demonstrated the need for a new science of sociology by pointing to the order (at once historic and logical) in which the larger groupings of science had grown towards maturity. First, because dealing with phenomena in their simplest aspects (i.e. most generalised and least complex) came the mathematical group (with astronomy as appendage). Next in natural sequence, as dealing with phenomena in an order of decreasing generality and increasing complexity, came first the material sciences (physics and chemistry, with their own specialised studies and integrating philosophies); and thereafter, at a considerable interval, the definite organisation of the life-sciences common to the plant, animal, and human world. But these life-sciences, even if extended (as Comte desired) to include psychology, manifestly do not exhaust the remaining field of knowledge open to the march of methodic research and experimental test. There remains, for conquest by scientific advance, the most complex and least generalised aspect of phenomena, viz. the world of social affairs.

And this fully human world, being by its very nature most modifiable in the scheme of things, would, if brought within the domain of science, be most open to scientific direction. Such was Comte's argument for claiming that sociology, once established, could and should yield guiding principles for systematic application of the whole body of science—material, vital, and social—to the enhancement of human life and the betterment of its environment. For this high purpose sociologists should, said Comte, deliberately prepare themselves. Two kinds of theoretical studies he indicated as essential. One was a grounding in each of the main groups of the 'preliminary sciences,' which was Comte's phrase for mathematics and astronomy, physics and chemistry, biology and psychology. The other imperative requirement was a grasp of history in all its essential aspects. The avenue to the first of these two preparatory achievements was manifestly open to studious ardour. But as to the essentials of history, what are they, where to be found, and how to build them into the structure of the new science? To the solution of these enigmas Comte devoted the master effort of his constructive genius. He reviewed the historic accumulations of his day, and rearranged their records and interpretations into a consecutive and ordered presentment of western civilisation conceived as the central drama of man's unfolding life and purpose. In his re-reading of history he applied two main clues. One was his 'law of the three states' (volitional, abstract, scientific); and the other his generalisation of the standard concepts, state and church. Borrowing from Catholic doctrine, he took the correlative phrases temporal power and spiritual power, and adapted them to his purpose. That, to be sure, is no more than doing for science what Dante, some five centuries earlier, had done for poetry. Let us conceive, said Comte in effect, every society, while it is alive and active, as a full-orbed community of two hemispheres, its temporal power concerned with material things, and its spiritual power with their non-material aspects. With these twin concepts of social structure and function Comte proceeded to his reinterpretation of all historic phases—past, present, and prospective—as a continuing interplay of temporal and spiritual powers. But historic change takes place, for better or worse, through the agency of representative men and

women. On the stage of each and every social formation we have therefore to search for the actors, who, because they are at once personalities and types, take the leading parts in their contemporary drama of temporal and spiritual powers.

A working classification of social types is here needed. To this problem Comte proposed, as an approximate solution, a fourfold classification. In the temporal power, characteristic of each successive phase throughout history, he distinguished its directive types as 'chiefs' from its operative types as 'people.' In the corresponding spiritual power he distinguished its more contemplative or reflective types as 'intellectuals' (religious, philosophic, scientific, poetic, artistic) from its more active and expressive types as 'emotionals.' These are the four social types Comte discerned as renewing themselves, under modifications adapted to the 'spirit of the age,' in each successive period of history. His 'chiefs' and 'people' are easy to grasp in their representative significance as perennial types. They are, for instance, in the language of to-day, capitalists and labourers. His 'intellectuals' and 'emotionals' are less happily named, the terms being hardly self-explanatory. But a few examples will help to show their recurrent nature. St Paul, the clear thinker, and St Peter, the fervid apostle, for instance, stand at the foundation of the Catholic Church as its twin formative types, intellectual and emotional respectively. This pair of forerunners and founders in the Middle Ages developed and crystallised into monks and priests, or, in more general terms, the regulars and seculars, who, to this day, constitute the bipolar arms of the Roman hierarchy. Further, to illustrate the recurrent generality of these social types, we may trace their adaptation to the successive social formations of later times. In Protestantism the intellectuals and emotionals become respectively divines and pastors; in the revolution they reappear as social philosopher and political orator (recalling the similar manifestations of classical times); modern science knows them as researchers and popularisers; and in the everyday world of to-day they may be recognised in characteristic guise as thinkers and journalists. These are but simple, indeed obvious, examples. It is for the sociologist to discern, describe, and interpret the same four social types in all their manifold varieties generated by each age, even in each generation, and in every effective grouping. Women in their selective social rôle, artists as creators, statesmen and religious leaders at best, are ever found amongst those who, embodying the 'spiritual power' of their times, personalise and re-express it as characteristic 'emotionals,' and thereby bring its influence to bear more directly upon the 'chiefs' and the 'people' of the temporal power. More indirectly, through process of education and counsel, the 'intellectuals' or initiative-thinkers of each period operate upon the mind of its representative 'chiefs' and 'people.'

Inquire next how Comte connected his view of history as an interplay of temporal and spiritual powers, with his 'law of the three states.' To affirm the latter in terms of progress from theology as volitional, through metaphysics as abstractional, to science as concrete, is to claim for this 'law' an unfolding and development of 'spiritual powers.' A correlative development of 'temporal powers' was necessarily postulated. Thus Comte associated the theological phase of thought with militarism in action, since both are so characteristically volitional; and indeed their frequent association is manifest throughout history. With metaphysics he associated law and politics, and even much of political economy, because legal doctrines, as of 'rights,' political conceptions such as 'state and

individual,' and economic conceptions like that of 'value,' are all deeply abstractional, since hypostatizing entities instead of investigating realities. With science he naturally associated its applications in industry at its best. Hence his ardent anticipations of a scientific guidance and control of industry towards social well-being in all respects, material, social, and moral. For this direction and ennoblement of industry he looked forward to a new kind of priesthood, at once 'intellectual' and 'emotional,' and so educating, counselling, encouraging a new order of 'chiefs' and 'people' technically competent, yet fully socialised. In this vision of a realisable future, this coming of a 'sociocracy,' scientific critics, like Huxley, saw only 'Catholicism minus Christianity,' while Comte and his disciples claimed it to be 'Christianity plus Science.'

An untoward fate befell the vast structure of pure and applied sociology so elaborately reared by the initiator of the new science. The edifice fell to pieces in the hands of Comte's immediate successors, who carried away what appealed to their limited interests and left the rest to ruin. His acknowledged disciples, the French and English Positivists, concerned themselves with practice of their master's ritual, with exposition of the underlying philosophy, and with advocacy of the applied sociology taken as finished product of an established science. That theoretic or purely scientific part of the sociology, which the positivist groups adopted but failed to develop, found three notable 'continuator' in Herbert Spencer, Emile Durkheim, and Lester Ward, all of whom were hostile or indifferent to many of the practical applications proclaimed and cherished by Comte. Herbert Spencer, while rejecting, and even anathematising, much of the work of the originator (he lacked the historic erudition needed for its appreciation), yet recommended the new social science to English readers in his admirable *Introduction to Sociology*. But in his systematic treatises Spencer ran into a *cul de sac*. He lost sight of Comte's constructive framework in concentrating on two endeavours, one necessary, the other inevitably futile. Certainly it was necessary to incorporate into sociology the products of anthropological research garnered since Comte wrote. And assuredly it was futile, and even mischievous, to try and rebuild sociology on a doctrinal basis of mechanical evolutionism. Lester Ward, in importing the Comtist sociology to the United States, retained its double rôle of a pure and an applied science. But, like Spencer, he lacked historic equipment and ardour of reconstruction, and, like Spencer, he lost sight of Comte's constructive framework in a specialised effort. His endeavour, necessary and fruitful though it was, to restate sociological problems in terms of modern psychology gave a bias to his own work, which has deflected the course of studies and research in America. In France, Durkheim, specifically basing himself on Comte, founded a school of growing influence and output. This school has concentrated on incorporating, within the unity of sociology, all those numerous and growing specialisms (anthropologic, economic, psychologic, juristic, &c.) which for the most part have grown up or developed within the widening field of social science since Comte's day. But a criticism is unavoidable. All these specialisms (like sociology itself) are but aspects of the social heritage. How, therefore, can they be united except in and through a working theory of the social heritage? And yet the Durkheim school has, so far, neither replaced nor continued that theory of the social heritage, which is the very core of Comte's sociology, so elaborately built around the concept of history as an interplay of temporal and spiritual powers acting through

the perennial but changing social types of chiefs and people, intellectuals and emotionals.

In reviewing the contemporary state of sociology little else need be said. No expositor or continuator has creatively carried the initiative of Comte into Italy, Spain, Germany, Austria, Switzerland, Belgium, Holland, or Northern Europe; with the result that such sociology as exists in these countries is as yet either discursive or specialised, or of philosophic rather than scientific filiation. The conspicuous exception to this general state is that in Edinburgh, about 1890, Patrick Geddes started an extra-mural school, which, seizing the essential elements of Comte's pure sociology, re-adjusted them into a framework adapted to current observation of a field-naturalist-like kind in town and country. This renewal and re-systematising of social science (later continued more actively by a group working from Leplay House in London) was largely influenced by another French source, to which brief reference must be made.

The failure, as yet, of Comte's sociology to win an accepted place in the field of science has to be explained. The main obstacle, may be, is not far to seek. Comte himself relied too much on books and reflection; too little on those factual observations which, being open to verification, are the very substance of science. By one of those paradoxes which strew the pages of history, a social science directly observational arose first within the ranks of the counter-revolution, in repercussion, perhaps, from its intensity of emotional drive. The initiator is Frédéric Le Play, a Frenchman and a contemporary of Comte, but to the end of his life apparently unacquainted with the latter's work. Himself of rustic upbringing, Le Play became a metallurgist and mining engineer, and rose to such eminence as to be in demand as a reorganiser of mines in almost every country of Europe from Spain to Russia. He was aroused, in youth, by the revolution of 1830 to close study of industrial conditions. In his subsequent life of constant travel he developed a genuinely scientific method of social observation, and thereby amassed a systematic body of knowledge on working-class families in many countries. Hence his classic *Monographies des Ouvriers Européens*, with its 'family budgets' as estimates of real well-being. His now familiar terms of 'social service' and 'social economy' were moralised beyond conventional business and its economics. His Russian travels brought him in contact with Mongolian shepherd-folk; and thence arose his pioneering studies of the fundamental rural occupations—hunting, pasturage, agriculture, and fishery. He saw these fundamental occupations as determining specific types of family—patriarchal, communitary or individualistic, stable or instable. In each of these again he traced the essential origins of its institutions, and even much of its ideas and ideals. Comte had seen that social life, like organic life, subsists in interaction with its *milieu* or environment; but Le Play gave this conception its full concreteness, in each case tracing how environment occupationally determines the fundamentals of family and social life, yet how social progress is associated with increasing comprehension and mastery of environment. As a true social evolutionist, in his own way, he traced these fundamental occupations and their developments into our contemporary civilisations; and so linked up geography, anthropology, and economics with sociology, not incidentally and discursively, but through systematic observation. His first disciples were, for the most part, a moral *élite* of agricultural and industrial leaders, whose organ, *La Réforme Sociale*, was mainly of practical appeal; but later arose a second group of purely scientific intention, headed

by Tourville and Demolins, with their organ *La Science Sociale*, devoted to developing Le Play's geographico-occupational studies, with fuller interpretations for many characteristic regions and social types. Unhappily *La Science Sociale* came to an end with the Great War.

The sharp separation of revolutionary and counter-revolutionary traditions and parties, which has so long and widely divided France, practically isolated to the one side the influence of Comte (who, starting in the revolutionary tradition, ended by stealing, without acknowledgment, the counter-revolutionary ritual) and that of Le Play to the other; so that their complementary doctrines are only now beginning to be associated, towards a fuller comprehension of society, both in the abstract and concrete. And not less unfortunate than this isolation of Comte and Le Play in their pioneering labours was the fact that each of these two initiators stood more or less aloof from their contemporaries, who were moving, often unconsciously, and all of them without adequate guidance, towards a sociology originating in some specialised approach. Thus have appeared naïf, uncritical, and dispersive sociologies emanating from the generalising students of anthropology, economics, social geography, statistics, religion, social psychology, jurisprudence, politics, and history. The co-ordination of all these and other specialised approaches within a framework, observational, geographic, and economic like Le Play's, and historic and interpretative like Comte's, is manifestly an essential condition of sociological advance. This constructive work awaits the coming generation of sociologists. Their labours, in order to be fully fruitful, must follow and develop the initiatives already taken. Let us, in summary and conclusion, outline somewhat systematically the needed inquiries and activities.

Like the preliminary sciences, physical or biological, sociology must progress inductively from observation towards generalisation, from concrete towards abstract. Concrete and thorough observation (i.e. of place and people in all their aspects), is manifestly essential to sound interpretations, economic and other. Beginning, then, with observation (literally field-naturalist-like), the existing methods of collecting and interpreting social facts have to be harmonised. Hence the need, no less than in the natural sciences, of orderly description and classification, nomenclature and notation. Contributions towards these ends are scattered through the literature of sociology; social observation methods are manifest in everyday life, e.g. accountancy, census and other public records, press, &c. For that systematic study of the social world in all its areas and populations with which sociology has to grapple, all these methods must be utilised and standardised as fully as may be. As the naturalist can never too fully survey his region and observe and correlate its nature and life, so the sociologist must explore his region and its social life, with due records and statistics. Such observation once thoroughly in progress, all freedom of imagination with its audacity of hypothesis, all strength of deduction with its vastness of theory, all glow of social enthusiasm, yet coolness of criticism also, are needed to disclose those processes of social evolution of which we are in search. Without these quickening activities of synthetic aim, our collections of documents, records, and statistics remain at best but half-forgotten libraries, when not mere buried spoil.

The development of the preceding methods of observation is becoming widely known as regional survey; and such surveys are now in progress throughout Britain and many other countries in widening circles, from villages, towns, and their

regional surroundings to cities and states; and from nation to empire and language, to occident, orient, and the world. Thus arises the need and practicability of a social observatory for each city, with departments of study on all the above levels with their various outlooks. Hence also appears the possibility of corresponding practice, i.e. of correlating such a social observatory, on each level, as it were story by story, with the corresponding social laboratory. Examples of all these levels of thought and action are everywhere arising, and are combining towards social survey and social service respectively; so that practical adjustment of these is next needed. Experimental beginnings of such adjustment have long been in progress, as notably at the Edinburgh Outlook Tower and at Leplay House in London, with kindred endeavours elsewhere. Such experimental endeavours are based on surveys actually in progress, however inadequate as yet.

The prosecution of such widening regional surveys, the notation and co-ordination of their observations, involves also a more abstract mapping. For we have (a) to define the place of sociology among the sciences; and (b) to demarcate as clearly as may be the special fields of sociology. We have also (c) to inquire how far these may correspond to the special fields of other sciences, and (d) to investigate, if possible experimentally, the relation of theory to practice in all these fields of sociology and its subsocieties. Our scientific faith in an orderly universe implies that our sciences and arts should be, must be, in tune, their detail of daily thought and action in time, their generalisations of social philosophy and polity in harmony.

Investigation of social origins is plainly required. Hence the need of local and comparative ('anthropological' or 'ethnographic') study of the simpler nature-occupations (hunter, shepherd, peasant, &c.) with their masked developments in industry and in science, in family and in institutions, in contemporary customs and habits of mind. Thus may be unified those studies of place, work, and people (organism, function, and environment) upon which geographer, economist, and anthropologist respectively have been wont to specialise. Hence the importance of Le Play and later investigators, with their renewal of the Montesquieu-Buckle-Taine line of interpretation, yet with due psychological treatment also.

Beyond these fields, with which geographer, economist, and anthropologist are usually content, we have still to investigate the origins of higher social developments, as notably of regional art and literature, of education and philosophy, of political, ethical, and religious ideals. We have to recognise both upward progress and degeneration; and we cannot but ask what possibilities there may be of accelerating the one, of redeeming the other. Examples may be sought from antiquity, and especially from Israel, Hellas, Rome, but also from all national histories and from everyday life.

Elemental though are such outlines of the history of civilisation, they remain too environmental, too impersonal: to complement them we need an historic survey, personal and biographic, national and institutional. For this sociological use of narrative history, its facts and dates need orderly arrangement, witness historic charts and atlases. Similarly for historic processes ('philosophies of history') we need a chart of charts. How is this to be devised? History presents not only a phantasmagoria of events, but a succession of phases, with their survivals or continued growths. Primitive, matriarchal, patriarchal, classical, mediæval, renaissance elements are all still discernible, and moreover not merely as archaeological residues,

but as active elements. Fuller analysis of our 'modern order' (say rather 'transition') is necessary, whence increasing discernment within it of a potential or incipient order with its nascent phases. Thus appear dawning possibilities of scientific prevision in sociology as in other sciences; for, as the past is still here in survival, so the future is already here in germ. Fuller economic and ethical interpretations of history appear in the varying interactions of the 'temporal and spiritual powers,' in their permanent elements and their changes. The task of the sociological laboratory is thus not only to advance here politics or economics, or there morals, but to reunite both as etho-politics, the healthy life, both material and psychic, of the social body.

Towards this end we have to correlate the main sciences, mathematical, physical, biological, and social, with the corresponding arts. The mathematical sciences are obviously applied by statisticians and economists, while physical sciences subserve manufactures, transports, and communications, but also find superlative applications in their destructive methods. Our contemporary society is thus especially conditioned by the progress of the physical sciences; yet with the advance of biology, the corresponding vital arts (medicine, hygiene, agriculture) gain in practice and influence, as do education and social progress through the advance of psychology and sociology, and their increasing interaction. The mechanistic view of life, which from Descartes to contemporary physiology has superseded vitalistic theories, is now being subordinated to a more truly vital (because also psychological and social) conception of life and society. The essential biological distinction of nutritive and reproductive functions (i.e. of self-maintaining and species-continuing activities) is congruent with a more moral view of social life and action. Social policy can thus again be viewed as of old; as no mere struggle of political numbers or big battalions, but as etho-policy, and so as guiding the practical applications of the organic and physical sciences. Industries and business have thus to be understood as social service; and since every 'good job' has an aesthetic satisfaction beyond its merely material accomplishment, the fine arts acquire that economic justification which has been too long refused them. In such larger views, of social science and service together, the fundamental schools, especially those of Comte and of Le Play, are being united, and moreover with increasing incorporation of the various observations, interpretations, and endeavours of later workers.

Psychological and moral points of view have thus now clearly emerged. We think of the individual as resultant and spectator of social evolution, and also as an agent in it: and we have a larger yet corresponding view of the social 'spirit of the times,' as the complex expression of the present, and as the fermentation of the future towards new etho-politic ideals. A synthetic—that is, a philosophic—conception of society is thus coming into view. Our studies are now seen to admit of orderly arrangement, and even in harmonious and unified notations, utilisable alike by concrete sociologist and philosopher, by special worker and abstract moralist.

In conclusion we return again, therefore, to the affirmation made at the outset, that everyone starting as a naïf sociologist may increasingly gain competence in theory and practice. Each one cannot but make something of regional survey; he must have some interpretation of current events, and he takes some side in their practical issues. Our brains are therefore clearing-houses of ideas and activities. To know and interpret

our everyday world and its events, we need the collaboration of the best minds in science and in history, in journalism and in criticism, in religion and in philosophy. To aid in progress, not hinder, makes a high claim upon us, not only for sight and insight, but, even more, foresight, both scientific and practical. We need, beyond industry and intelligence, the courage, the statesmanship which guides events, and along with that the idealism of social evolution, which raises individuals to its level. To promote these conditions is the task of social science and social education; hence the need of schools of sociology (as well as of individual studies), and, moreover, schools which shall be at once centres of social philosophy and training-grounds of social action. To prepare and establish such observatory-laboratories for social science is thus as definite a task for investigators and for educationalists to-day as was lately the foundation of observatories, laboratories, and museums for each of the preliminary sciences. As already indicated, the beginnings of such institutions already exist here and there, and the possibility of further developments now lies more clearly before us in every city, especially in association with its educational advances, its civic progress and development.

LITERATURE.—The best of current writings will be found in the periodicals of which the following are the chief: *The Sociological Review* (beginning in 1904 as *Sociological Papers*, this *Review* is the organ of the (British) Sociological Society, quarterly, Leplay House Press, 65 Belgrave Road, London, S.W.1.); *Année Sociologique* (organ of the Durkheim School); *The American Journal of Sociology* (University of Chicago); *Revue Internationale de Sociologie* (organ of the Institut International de Sociologie, Paris); *Revue de l'Institut de Sociologie* (Brussels); *Archiv für Sozialwissenschaft und Sozialpolitik*; *Kölner Vierteljahrschrift für Soziologie*; *Jahrbuch für Soziologie, Geschichte und Kultur-Philosophie*; *Zeitschrift für Völkerpsychologie und Soziologie*.

No satisfactory text-book of sociology has yet appeared. The works of Comte and Le Play, like those of their precursors, as also of their first continuators, are, in detail, mainly of historic interest. A book for beginners, who wish to start on observational lines, is *Introduction to Regional Survey*, by Sybella Branford and Alexander Farquharson (Leplay House Press). The following works are studies of contemporary civilisation interpreted on the lines followed in the present article: *The Coming Polity* (revised edition, 1919), *Our Social Inheritance* (1919), both by Branford and Geddes; and by V. Branford, *Whitherwards* (1920), *Science and Sanctity* (1923), and *Living Religions* (1924), all Leplay House Press. Leonard Hobhouse's *Metaphysical Theory of the State* (1918), *The Rational Good* (1921), *The Elements of Social Justice* (1921), and *Social Development* (1923), together constitute his *Principles of Sociology*. Graham Wallas's *The Great Society* is a good example of many books moving towards a general sociology from some specialised approach, in this case psychology. In America, text-books by Giddings, Albion Small, E. A. Ross, Ellwood, Cooley, Vincent, and Barnes are in much use.

Socotra, or **SOKOTRA**, an island in the Indian Ocean, 150 miles E. by N. from Cape Guardafui, and 220 from the southern coast of Arabia. Seventy miles long by twenty broad, it has an area of 1382 sq. m. The interior embraces numerous barren plateaus (1500 to 2000 feet), with several well-wooded mountains, rising to 4500 feet; there are fertile valleys between the ranges and belts of rich soil along the coasts. The climate is warm, but healthy. Dragon's blood, myrrh, frankincense, aloes, gum, dates, and ghi are produced. The inhabitants, about 12,000 in all, live on dates and the produce of their sheep, goats, and cows, and occupy themselves with fishing. They belong to two distinct types—one with a comparatively light-coloured skin and straight hair, the other darker with curly hair. But all alike speak the same

peculiar language, which has certain affinities with the South Arabian dialect of Mahra. The people show traces of intermixture with Negro, Arab, and Indian tribes; and in ancient times the inhabitants of Socotra were believed to have been acquainted with Greek civilisation and later to have been Nestorian Christians. From the 16th century at least they owed some sort of allegiance to the sultan of Keshin on the Arabian coast, and adopted the Mohammedan faith. After being occupied by Britain in 1835-39, the island was taken under British protection in 1876 and formally annexed in 1886. The chief town is Tamarida on the north coast.

See ARABIA, also Yule's *Marco Polo* (vol. ii.), and *The Natural History of Sokotra*, by H. O. Forbes (1903).

Socrates, the Athenian philosopher, was the son of Sophroniscus, a sculptor, and Phænaretē, a midwife. As he was at least seventy years old at his death, he cannot have been born later than 469 B.C. He is said, though only by late writers, to have followed his father's profession for a time; and, in the days of the traveller Pausanias (about 160 A.D.), a statue of the Graces, standing at the entrance to the Acropolis, was ascribed to him—with what amount of truth it is impossible to say. He received the usual education of an Athenian youth, and learned also geometry and astronomy. He was acquainted with the philosophy of Anaxagoras (q.v.), probably only through reading his books, and with other speculations about the physical universe. But he came to consider such inquiries fruitless and disappointing. 'To know one's self' was a more pressing task than to know about nature. The most important influence on his mental development was his intercourse with the various Sophists (q.v.) who frequented Athens. Plato (*Meno* 96 D) makes him speak as if he had been a pupil of Prodicus; but he was in no sense a disciple of that sophist. Though in Xenophon's *Memorabilia* (ii. 1) he reproduces Prodicus' moral tale of 'The Choice of Hercules' with approval, he apologises, with obvious irony, for not adorning it with the fine language employed by the sophist, who, we know from Plato's *Protagoras*, was fond of pedantic verbal distinctions. With the other famous sophists of the time (Protagoras, Gorgias, Hippias, &c.) Socrates stood only in the relation of a controversial disputant, though it is clear from the caricature of him by Aristophanes in the *Clouds* (423 B.C.) that ordinary Athenian opinion regarded Socrates as a typical sophist. It may be noted also that Aristophanes, following the vulgar conception of a philosopher, represents his sophist Socrates as engaged in physical researches, though many of the sophists, like Socrates himself, occupied themselves not with nature but with questions of direct practical human interest. Socrates, in bringing down philosophy from heaven to the common life of men (as Cicero puts it), was only carrying out in a conspicuous and earnest way one of the new intellectual tendencies of his age. Socrates, we might say, was the greatest of the sophists, and therefore more than a sophist. Euripides, the poet of the new ideas, is said to have been intimate with Socrates; and the comic poets alleged that Socrates helped him with his tragedies. Whether Socrates really met Parmenides (q.v.), as represented by Plato, we have no means of saying.

Socrates took part in three campaigns: he served at Potidæa between 432 and 429, at Delium in 424, and at Amphipolis in 422. His bravery, his extraordinary physical vigour and indifference to fatigue, or cold, or heat, became known to his comrades during these campaigns. He was a good citizen, obedient on principle to the laws of his city; and he did not hesitate to face the anger of the people

or of tyrants when duty required. The only political office he ever held was when in 406 he was one of the senate of Five Hundred, and then, whilst he was one of the presiding tribe, he alone refused, at great personal risk, to put to the vote the illegal proposal to try in a body (instead of individually) the generals who had deserted the disabled vessels and left the dead unburied at Arginusæ. And, again, during the usurpation of 'The Thirty' he dared to disobey an illegal order. He held aloof from politics, restrained by what he believed to be a divine warning, and considering that he had received a call to the pursuit of philosophy and could serve his country best in that way. Socrates wrote no books. He set up no regular school of philosophy. He simply lived constantly in public, frequenting the gymnasia and the market-place. He did not care to go outside the city walls; 'the trees had nothing to teach him' (as he says in Plato's *Phædrus*). It was from men and about men, men of all sorts and conditions, that he desired to learn, wiser than others only in being conscious of his own ignorance. It was in this sense that he interpreted the Delphic oracle, which had said that no one was wiser than Socrates. Out of his wide circle of acquaintances some came to be attached to him more closely by ties of affection and admiration; yet there was no formal bond of discipleship. We should rather speak of the young friends or the companions than of the disciples of Socrates. From two of these, Xenophon and Plato, we learn all we can know with certainty about his strange personality and his way of thinking. Yet there is this difficulty, that, while Plato often makes Socrates the mouth-piece of ideas that were in all probability not held by him, Xenophon, a soldier and by no means a philosopher, makes Socrates a very much more commonplace person than he must have been. And it must be remembered that Xenophon wrote expressly to justify Socrates to the average Athenian. If we were dependent on Xenophon alone, it would be unintelligible how Socrates could have been the initiator of a great movement in philosophy, and how the Athenians could have been suspicious of so safe and conservative a moralist. Though Plato is apparently not bound by any rigid considerations of historical accuracy in his dialogues, we may yet accept the picture he gives us of the habits and conversation of Socrates as a true portrait—a portrait painted by a great imaginative artist. Aristotle, though of course he could only know about Socrates through Plato and others, sometimes supplies us with a valuable test to discriminate the genuinely Socratic from the purely Platonic elements in the dialogues. Xenophon becomes a useful authority when read in the light of what we know from Plato. Many sayings of Socrates convey profounder meanings to the readers of Plato than they probably did to Xenophon himself. Where Xenophon sees only a prudential maxim, Plato finds the germ of a philosophical principle.

In personal appearance Socrates was odd and even ugly, conspicuously so among a handsome race. He had a flat nose, thick lips, prominent eyes. Alcibiades (in Plato's *Symposium*) compares him to a figure of Silenus. His robust constitution has already been referred to. He always went barefooted, even during a Thracian winter, and wore the same homely clothing all the year round. He was indifferent to luxury and even to ordinary comfort; but he was by no means an ascetic. Habitually abstemious and simple, and possessing perfect control over all his appetites, he could at a banquet drink more than any one else without being overcome. He delighted in the society of youths, especially if they had fair minds in fair bodies.

From a modern point of view, he might seem to pay too little regard to the duties of family life. But we must remember that, though above his age in many ways, he was still of it, an Athenian living almost entirely in a society of men. The well-known gossip about his wife Xanthippe comes to us mostly from late sources. Xenophon only tells us that she had a shrewish temper, which Socrates bore patiently, admonishing his eldest son Lamprocles of the duty of gratitude to his mother (*Mem.* ii. 2). It is easy to believe that a man who had a mission, who was willingly poor, and lived very much in public may have been a trying husband, even to an Athenian wife.

There has been much discussion about the 'divine sign' (*daimonion*) of which Socrates used to speak as a supernatural voice which guided him every now and then, according to Xenophon telling him to act or not to act, according to Plato only restraining him from action, never instigating. Later writers, especially in Christian times, speak of it as a daemon, genius, or attendant spirit. For this there is no authority whatever in Plato and Xenophon. On the other hand, we cannot, with some modern writers, identify it with the voice of conscience. Socrates speaks of it as a peculiarity of his own, and it had not to do with the moral quality of actions in general: it was an occasional inward oracle about the future. Socrates, not disbelieving in oracles and divinations (though very likely laying less stress on them than the pious Xenophon would have us suppose), seems to have had certain vivid presentiments which he took for special divine monitions; and it is possible, as has been suggested, that he was subject to occasional hallucinations of hearing, such as may occur even in quite sane and healthy persons. Socrates was eccentric in some ways, and we know that he occasionally became so absorbed in meditation as to become insensible of the outer world. Alcibiades (Plato, *Symp.* 220) relates that Socrates once stood still for twenty-four hours continuously, entranced in thought. It has also been suggested that in some of his allusions to the divine sign there is a trace of irony, and that he may be indirectly satirising the prevalent belief in divination, claiming to have an oracle of his own.

In any case the average Athenian thought there was something blasphemous in the attitude of Socrates to religion. He was charged in 399, under the restored democracy, (1) with neglecting the gods of the state and introducing new divinities (*daimonia*), and (2) with corrupting the morals of the young. These were very much the same charges which had been made against him as the typical sophist by Aristophanes twenty-four years before. They were now made the subject of a legal prosecution by Melētus, Anytus, and Lyco. The Athenian people, though generally tolerant, were liable to outbursts of fanaticism; and it must be remembered that the religion of a Greek state was an integral part of its social and political institutions. Furthermore, among the companions of Socrates had been several of the leading men in the oligarchical faction, such as Critias, Charmides, &c.; and he had also been associated with Alcibiades, who had done so much injury to Athens. A mixture of democratic indignation with that bigoted religious and moral conservatism which is not incompatible with democracy must account for the prosecution and its issues. Plato's *Apology* probably gives the substance of the actual defence made by Socrates—a bold vindication of his whole life, and not such as would be likely to conciliate an Athenian popular jury. Yet the vote of condemnation was carried only by a very small majority (six out of, probably, 500). The punishment had still to be decided on. Socrates himself declared that, if he

were treated as his life deserved, he should be maintained at the public expense in the Prytaneum. But at length, yielding to the pressure of his friends, who were trying to save him, he agreed to pay a fine of thirty minæ (i.e. about £120), for which his friends undertook to be his sureties. Provoked by what doubtless seemed to them obstinacy and insolence in the old man, the judges voted the penalty of 'death,' which Melētus had proposed in the indictment: according to Diogenes Laertius (q.v.), this was carried by eighty more votes than the original condemnation. The execution of the sentence was delayed for thirty days because of a sacred embassy to Delos. His friends, who had free access to him, planned his escape from prison; but he refused to break the laws of the state. His last day was spent with his friends, as described in Plato's *Phædo*; and in the evening he drank the hemlock. 'Such was the end,' Plato makes Phædo say, 'of our friend, whom I may truly call the wisest and justest and best of all the men whom I have ever known.' Later writers tell how the Athenians repented and punished his accusers; but there is no evidence for this in the writers of the 4th century B.C.

The life and philosophy of Socrates are inseparably connected. Yet he must not be thought of as simply a good man who tried to influence others for good. He sought to base conduct on knowledge. He went about convincing men not so much of sin as of ignorance. What is called the 'irony' of Socrates is his manner of affecting ignorance in the presence of the seeming wise, in order to draw from them an admission of the confusions and contradictions resulting from their opinions. But his conclusion was not mere scepticism or despair of knowledge. He claimed to follow, in the intellectual sphere, his mother's profession, and to help those in labour with new ideas to bring them to the birth: this is his 'maieutic,' i.e. obstetric art. For this reason he always adopted the method of question and answer—the 'dialectic' method in its literal sense. Aristotle (*Met.* xiii. 4) says that Socrates introduced the method of *induction* and the search for *general definitions*. This is a somewhat technical and formal description of the manner and aim of the conversations of Socrates. The Socratic 'induction' consists in going to particular instances. Socrates was laughed at for the homeliness of his illustrations: he was always talking about carpenters and weavers and shoemakers.

Ethics was the only part of philosophy with which Socrates cared to occupy himself, and in ethics his main doctrine may be summed up in the formula 'Virtue is knowledge; vice is ignorance.' (Bentham's saying, 'Vice is miscalculation,' is a somewhat mean-looking version of this.) It follows from this fundamental principle that virtue is one, the excellence of each good quality just consisting in the *knowing* what ought or ought not to be done. It follows also that no one can know (in the truest sense) what is right and yet do what is wrong. In Xenophon we do not find Socrates maintaining any of these opinions in quite so explicit and paradoxical a form. In Plato they are carried out to their logical consequences (see PLATO). We find, e.g., that Xenophon makes Socrates say that rulers should be those who *know* the art of ruling. This sounds commonplace enough. But we cannot say that Socrates did not go on to propound Plato's paradox that the perfect state would therefore be one in which the rulers were philosophers.

Xenophon represents Socrates as using the argument from design to prove the existence of the gods. But we cannot say with certainty how far his opinions about the gods differed from those of the popular religion. We may fairly suppose that

they approached more nearly to those of Plato than to those of the average Athenian. On the other hand, from the language of Plato's *Apology*, it seems pretty clear that Socrates did not hold the definite views about the immortality of the soul which are maintained in the *Phædo*, but left the question of a future life quite uncertain.

Socrates founded no special school of philosophy, but gave their starting-point to several distinct schools. Euclides of Megara (not to be confounded with the great mathematician of Alexandria who lived a century later) took up the Socratic dialectic as his main object of study, and, combining Socratic with Eleatic influences, became the founder of the Megaric or 'Eristic' (i.e. disputatious) school. On the other hand, Antisthenes (q.v.) the 'Cynic,' who taught that virtue was the sole end of life, and Aristippus (q.v.) of Cyrene, who taught that pleasure was the end, neglected the intellectual and logical aspects of the Socratic teaching and took a narrowly practical view of the object of philosophy, each maintaining an opposite extreme in his view of goodness. These are often called the 'one-sided' or imperfect Socratics. Plato alone inherited his master's spirit in its fullness.

The part of Zeller's *History of Greek Philosophy* dealing with Socrates is published separately in the English translation (1877), and Lélut, *Du Démon de Socrate* is important. The materials for the life and teaching of Socrates are Xenophon's *Memorabilia* and *Symposium* (the *Apology* ascribed to Xenophon is probably spurious), and Plato, *Apology* (most strictly historical of his writings), *Crito*, the narrative parts of the *Phædo*, *Symposium*. For further reference, see XENOPHON, PLATO; also books in German by Joel (1901), Röck (1903), in French by Piat (1900), in English by R. N. Cross (1914); Burnet, *Socratic Doctrine of the Soul* (1916); Dawson, *Ethics of Socrates* (1925).

Socrates, a church historian, born and brought up at Constantinople about the end of the 4th century A.D. Little is known of his life save that he followed the profession of an advocate. His *Ekklesiastikē Historia* covers the period from 306 to 439, and was most probably written about 440. As history its chief value lies in its transparent honesty, for the writer's grasp of the subject was feeble and his knowledge small. He borrowed from Eusebius, Rufinus, Athanasius, besides eye-witness and oral tradition, mainly from the members of the Novatian party at Constantinople. He had a profound reverence for Origen, and a high regard for Greek culture; and while he himself maintains an easy orthodoxy, he is indifferent to dogmatic definitions and tolerant of erroneous opinion when not noisy. Editions are by Hussey (1853) and W. Bright, with Introduction (1878); there is an English translation in Bohn's Library (1851), another by Professor A. C. Zenos in Schaff's 'Select Library of Nicene and Post-Nicene Fathers' (2d series, vol. ii., New York, 1891).

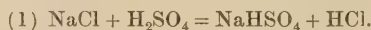
Soda. In its widest sense the manufacture of soda embraces a chain of operations which includes the making of Sulphuric Acid (q.v.), sulphate of soda, Hydrochloric Acid (q.v.), Bleaching Powder (q.v.), caustic-soda, soda-ash (alkali), and crystals of soda (washing-soda). From some of these processes valuable by-products are also obtained, such as iron, copper, and even silver from the pyrites, after the latter is burned to yield the sulphur required to make the sulphuric acid. This sulphur is now recovered on a very large scale from exhausted black-ash by Chance's process.

Formerly most of the soda of commerce was extracted along with other products from the ashes of certain seashore plants (see BARILLA, and KELP). Natural carbonates of soda (sodium carbonates) are found in different parts of the world, and in some places are worked for use. See SODIUM.

The quantity of soda obtained from all other sources is, however, now quite insignificant in comparison with that produced by the decomposition of common salt (chloride of sodium). This manufacture occupies the chief place among British chemical industries, and is conducted on a gigantic scale. Two processes are employed for obtaining soda, one of these being known as Leblanc's and the other, which is of comparatively recent date, as the Ammonia-soda process.

Leblanc's process was first made known to the world by a commission of the French republic in 1794, although dating some years earlier. It has been one of the most valuable discoveries in the entire range of chemical manufactures, and has been practised for a century without any important alteration. The author of this invention reaped no benefit from it himself, but spent the last of his days in an hospital, 'a wreck in fortune, health, and hope.' Owing partly to the war between France and England, and partly also to the existence of a duty of £30 per ton on common salt, which continued for eight years after the close of the war, Leblanc's process was not adopted in Great Britain except on a very limited scale till 1823. After the repeal of the tax in that year Mr James Muspratt erected his celebrated works at Liverpool, adopted the process in its entirety, and succeeded, after overcoming many difficulties, in establishing this great industry in Great Britain. The object of the process is (1) to convert common salt by the action of sulphuric acid into sulphate of soda (sodium sulphate); (2) to reduce this sulphate to the sulphide of sodium by the abstraction of oxygen; and (3) by certain reactions, in which carbonate of lime (calcium carbonate) takes part, to produce either carbonate of soda (sodium carbonate) or caustic-soda. The several stages are as follows.

Production of Salt-cake or Sulphate of Soda (Sodium Sulphate).—The decomposition of common salt is effected by treating it with sulphuric acid, which converts it into sulphate of soda and hydrochloric acid. The reaction takes place in two stages, and is represented by the two equations.



This reaction takes place in the pan A; the mass is scraped out on to the bed of the furnace B when



The gaseous hydrochloric acid produced was for a long period allowed to escape into the air, to the destruction of all vegetation in the neighbourhood, but is now condensed with water. Fig. 1 will serve as a diagram to explain the nature of the salt-cake furnace, called a *blind-roaster* or *muffle-furnace*, for making salt-cake. A is the iron pan in which the charge of common salt and sulphuric acid is first placed, and B is the muffle in which the calcination of the half-finished sulphate is completed, the charge being raked from A into B. The fire (C) heating

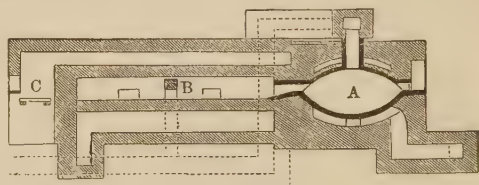


Fig. 1.—Vertical Section of Furnace for making Sulphate of Soda.

the muffle is so placed that the fire gases do not get inside, but heat it by external flues. Usually the pan is heated by a separate fire, but in some

instances by the waste heat from the muffle fire. The gaseous hydrochloric acid evolved during the time the reaction between the salt and the sulphuric acid is going on in the pan is sometimes led away to a separate condenser; but if a comparatively pure acid is not required then the gases from both pan and muffle go into the same condenser.

In the case of the *open roaster*, an older kind still used, there is a direct opening from the fire into the bed of the furnace, which is then of an ordinary reverberatory type (see LEAD, fig. 1), with the pan placed at the end as in the blind-roaster; but in this case the pan has always a separate fire. Coke is generally used for fuel in the open roaster, and with it the pan gas is usually separately condensed. Each of these kinds of furnaces has its advantages and disadvantages. The usual charge for open roasters is about 9 cwt. of common salt, and for close roasters one-half more. With the equivalent quantity of sulphuric acid 100 parts by weight of pure chloride of sodium would theoretically yield 121.45 parts of sulphate of soda, but in practice only about 110 are obtained, owing to the presence of moisture in the common salt. The specific gravity of the sulphuric acid employed varies from 1.700 to 1.720.

Of rotating furnaces for making sulphate of soda, the one patented in 1875 by Jones and Walsh was the first to come into actual operation. It has since been improved by the patentees and others, and is now in use at several large alkali-works. Fig. 2 is a diagram of this furnace. It consists of a rotating iron pan, 16 feet and upwards in diameter, placed in a chamber arched over with firebrick. From the fireplace at one side the fire gases pass over the surface of the charge to the flue at the other side. The salt is admitted by a hopper closed by a balanced cone, and there are lead-pipes for admitting the sulphuric acid at the edge of the pan. Fixed stirrers or ploughs are used for turning over the charge, which, in the largest sized pans, is now sometimes as much as 25 tons of common salt, and this with 20 tons of sulphuric acid gives 27 tons of sulphate of soda every twelve hours. Gas from a producer is sometimes used to heat the furnace, and a self-acting method of emptying the pan was patented by the inventors in 1880. There is a great saving of manual labour by the use of this furnace. Sulphate of soda, although chiefly consumed as an intermediate product in alkali-making, is used by itself in glass-making, in the manufacture of ultramarine, for cold-producing mixtures, and for making various chemicals.

From any of these salt-cake furnaces the hydrochloric acid gas is led away by pipes or flues to condensing towers sometimes 100 feet high, and filled with pieces of coke. The acid vapour enters at the bottom of the tower, and in ascending through the piled coke meets with a descending stream of water from the cistern on the top by which it is absorbed, and flows away as liquid acid through a pipe at the base of the tower to stock-cisterns. Strong hydrochloric acid, which is chiefly used in the manufacture of Bleaching Powder (q.v.), is easily obtained by good condensing appliances either from the rotatory pan furnace or from the pan of a stationary furnace, but the acid from the roaster gas is usually weak. The Alkali Acts of 1863 and 1874 make the condensation of nearly the whole of the gaseous hydrochloric acid produced at soda-works imperative.

Conversion of the Sulphate of Soda into Black-ash.—The sulphate of soda is roasted with coal

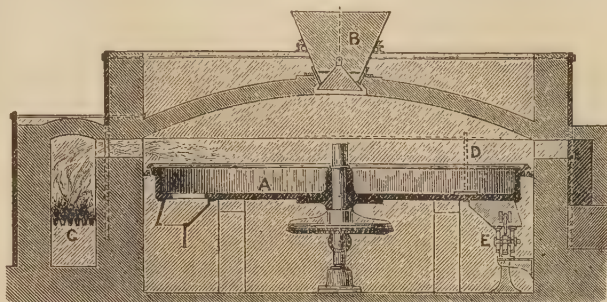
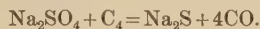


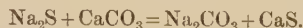
Fig. 2.—Rotating Furnace for making Sulphate of Soda:

A, iron pan for containing charge; B, hopper, with balanced cone for charging; C, fireplace; D, one of the stirrers; E, self-acting arrangement for discharging pan.

and limestone to produce crude carbonate of soda. In this operation the oxygen of the sulphate combines with carbon furnished by the coal to form carbonic oxide. The remaining sodium sulphide interchanges combinations with the calcium carbonate (limestone), forming sodium carbonate, easily soluble in water, and calcium sulphide, which is insoluble. The action of the carbon in reducing the sulphate of soda to the sulphide is shown by the equation



The further change which occurs is thus represented:



The proportions of the materials as now used are the same as those first recommended by Leblanc—viz. sodium sulphate, 100 parts; calcium carbonate (limestone), 100 parts; carbon (charcoal), 55 parts. But as coal is employed in England instead of charcoal, the quantity used is generally 75 to 100 of each of the other two ingredients.

This part of the process is carried out in a revolving furnace, which was first patented in 1853, though many difficulties had to be overcome before it became a success. J. C. Stevenson, of the Jarrow Chemical Works, after much labour succeeded about 1870 in establishing its superiority over the older kinds of balling furnaces. A longitudinal section of this furnace is shown in fig. 3. It is either cylindrical or barrel-shaped, about 18 feet long and 10 feet in diameter, lined with firebrick. The furnace is driven by steam and the necessary gearing, a spur-wheel being placed round and fixed to the cylinder, which turns on friction rollers. At one end it is furnished with a large fireplace, the fire gases from which pass through the 'barrel,' and onwards to heat the boiling-down pans, which are placed at the opposite end and arranged much in the same way as in the stationary furnace. The larger-sized revolving furnaces produce 30 tons of black-ash in twenty-four hours.

Lixiviation of the Black-ash.—The crude soda so named requires to be porous, so that water will easily penetrate the broken lumps of it when placed in iron tanks. Formerly a series, say of four of these, was placed in a step-like arrangement in which the lowest contained the fresh black-ash and the highest that which was nearly exhausted of its soda. Fresh water flowed in at the top, and, as it dissolved out the soda, became gradually stronger in descending from tank to tank, till it reached its full strength in the lowest one. A

more recent plan is to have the tanks all on a level and communicating with each other by tubes; but the exhaustion of the black-ash takes place in a similar way. Weak soda liquor is present in the tank with the nearly exhausted ash, and strong liquor in the one containing fresh black-ash, while the other two have liquors of intermediate but unequal strengths. The level of the liquor differs in each, being highest where weakest and lowest where strongest. When communication is opened between these tanks circulation is caused by hydrostatic pressure. The soda liquor from the black-ash is treated differently, according to whether soda-ash or caustic-soda is to be made from it.

Caustic-soda.—As the tank liquor consists of a strong solution of carbonate of soda, it requires to be diluted before it can be causticised with lime. Long iron cylinders contain this diluted liquor, into which

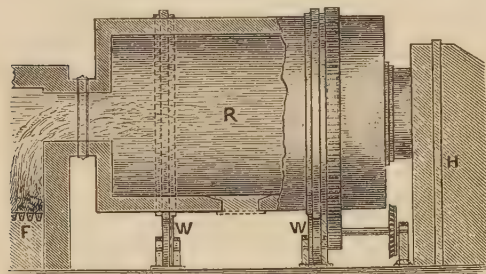


Fig. 3.—Revolving Black-ash Furnace, partly in section: F, fire; R, revolving cylinder; W, friction wheels; H, tanks, &c., for evaporating soda-lye by waste heat of furnace.

lime is placed, and at the same time it is heated and agitated. After being allowed to settle, the clear liquor is drawn off and pumped into liquor-settlers, the lime mud in these being saved and used in the black-ash furnace. Several iron concentrating cisterns are successively used with the aid of heat to bring up by degrees the causticised soda liquor to the required strength. From the last of these cisterns (boat-pans) the liquor, having a specific gravity of 1.550, is run into cast-iron pots, each of a capacity of 10 tons, which are heated by strong fires, and here the concentration of the liquor is completed, and the caustic-soda ladled into sheet-iron drums containing 6 cwt. each. On cooling it solidifies into a white mass of sodium hydroxide or caustic-soda, NaOH , which is now manufactured in large quantities, containing as much as 77 per cent. of sodium monoxide, Na_2O . During the concentration sodium nitrate is used to decompose any sodium sulphide present in the liquor. Caustic-soda is most largely used in soap-making and paper-making, but also in the manufacture of some coal-tar dyes and oxalic acid.

Soda-ash.—When this substance (sodium carbonate) and not caustic soda is to be made, the black-ash liquor is differently treated. In referring to the black-ash furnaces (see fig. 3) it has been stated that their waste heat is used to boil down the black-ash liquor. As the concentration of the liquor proceeds granular crystals of soda are deposited and scraped out into drainers. When heated these crystals yield soda-ash; but impure soda remains in the boiling-down vessel. This soda, which is mostly carbonate but also contains caustic-soda and sodium sulphide, is mixed with some sawdust and evaporated to dryness. The black-salt, as this residual substance is called, is then heated in a carbonating oven in which the burning off of the sawdust generates carbonic acid, and this converts the caustic-soda and sodium sulphide present into carbonate, and soda-

ash is the result. The composition of commercial soda-ash is very variable, but it frequently contains about 80 per cent. of the carbonate, the remainder consisting of other compounds of sodium and small quantities of other substances. None of these, however, interfere with its use for the purposes for which it is usually employed. When it is sold the available percentage of soda (sodium oxide or Na_2O) is quoted. For certain purposes soda-ash is refined by dissolving, settling, evaporating, and calcining. It is then called *refined* or *white alkali*, which should be free of caustic-soda and contain no trace of sodium sulphide, sodium sulphite, or of iron.

Crystals of Soda, Washing-soda, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$.—The soda-ash used for making soda-crystals is previously calcined and dissolved in hot water in iron vessels, the solution being then allowed to cool. From this solution large crystals of almost pure carbonate of soda separate. Ordinary washing-soda consists of these crystals, which are of uniform composition and easily dissolved. They contain ten molecules of water—that is to say, they are composed of 37 per cent. of carbonate of soda and 63 per cent. of water. Crystal soda being quite free from caustic-soda and other compounds acting on the skin, the hands of washerwomen suffer less from it than from other kinds of alkali.

Sodium Bicarbonate, NaHCO_3 .—As will be presently explained, this salt is now prepared on a large scale as a stage in the ammonia-soda process. See SODIUM.

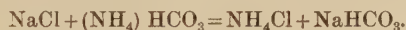
Sulphur Recovery.—The recovery of sulphur from the exhausted black-ash, which forms the waste heaps of the alkali-maker, is now, after many unsuccessful attempts to do so economically, practised on a large scale by Chance's process patented in 1888. This residue, as has been stated, is essentially calcium sulphide, which when brought into contact with carbon dioxide in the presence of water is converted into carbonate of lime, and sulphuretted hydrogen is liberated. The practical difficulty had long been the getting of hydrogen sulphide in a sufficiently concentrated state. Chance's process is as follows: The vat mud (black-ash waste) has the coarser extraneous pieces removed by a sifting process, and is then made into a creamy consistency with water. In this state it is distributed into a series of cylindrical iron vessels for the purpose of having carbon dioxide passed through it. These cylinders have three main pipes passing over them, with branches to each. By one pipe the carbon dioxide is introduced at the bottom of the liquid, and the other two lead the gases away from the top of the cylinder.

The carbon dioxide is produced in a limekiln, and passes, unavoidably mixed with nitrogen, into the cylinders, which successively become richer in sulphur compounds. The result is that for a time little else than nitrogen comes away from the last cylinder. But when the reactions in the cylinders are completed the final vessel of the series gives off gas rich in sulphuretted hydrogen. By means of stopcocks one of the pipes at the top of each cylinder conveys the nearly unmixed nitrogen to an open chimney, and the other takes the rich mixture of nitrogen and sulphuretted hydrogen to a gasholder. When the carbon dioxide from the limekiln passes into the first cylinder containing the black-ash waste, carbonate of lime is produced with evolution of sulphuretted hydrogen H_2S . The latter passes on with the excess of nitrogen into the second cylinder, where there is formed sulphhydrate of calcium, CaH_2S_2 , which is a compound of H_2S and CaS . In this way we have the sulphur concentrating from first to last in the series of cylindrical vessels until it is finally expelled as sulphuretted hydrogen gas. In the process the carbon dioxide combines

with the calcium of the sulphhydrate, giving off the two atoms of sulphur as H_2S , so that for one molecule of carbon dioxide two atoms of sulphur are produced. All the time the vessels at the beginning of the series remain unsaturated, the nitrogen, amounting to about 70 per cent. of the gases pumped in, passes away in pipes, and is allowed to escape. It contains little or no sulphur; but by-and-by the gas in the vessels consists of from 30 to 35 per cent. of sulphuretted hydrogen and from 1 to 2 per cent. of carbon dioxide, the remainder being nitrogen. This mixed gas is collected in a gasholder to enable it to be treated as required. The carbonated mud left in the vessels is drained, and used in place of limestone in the black-ash furnaces, so that any soda this dried mud contains is recovered.

A definite mixture of the sulphuretted hydrogen (present in the gas in the gasholder) and air is passed through a layer of anhydrous oxide of iron in a Claus kiln, the oxygen present being only enough to unite with the hydrogen (of the H_2S) to form water, the sulphur being set free. Iron oxide has the power of producing the combination without itself suffering change, the bed of this material becoming (without the use of fuel) sufficiently hot, by the chemical change which goes on, to volatilise the sulphur vapour along with the steam produced. The change is represented by the formula $2\text{H}_2\text{S} + \text{O}_2 = 2\text{H}_2\text{O} + 2\text{S}$. The sulphur is obtained in a very pure state in cakes and flowers of sulphur by this operation.

The Ammonia-soda process is gradually superseding that of Leblanc. It is based on the mutual reaction which takes place at ordinary temperatures between common salt and ammonium bicarbonate in strong aqueous solutions. The sodium of the salt combines with the carbonic acid radicle and the chlorine with the ammonia, giving sodium bicarbonate, which is insoluble, and chloride of ammonium, which remains dissolved in the liquid, thus:



The ammonia is recovered from the chloride and one-half of the carbon dioxide from the bicarbonate for future use. Where possible natural brine is used, and this is brought to a specific gravity of nearly 1200, either by the addition of salt if too weak or by adding water if too strong. Ammonia in the free gaseous state is now passed into the brine until the required quantity is present, which is known by the amount of increase in the volume of the liquid. The ammonia enters a mixing tank under a perforated diaphragm, and the liquid is kept in agitation. A great rise of temperature is caused by the condensation of the gaseous ammonia, and this necessitates the running of a stream of water through a coil of piping inside the mixer to keep the heat as low as possible. The brine in running off passes through a filter to retain solid impurities, and then through another worm of piping surrounded by cold water. To form the bicarbonate of soda the ammoniacal brine requires to be saturated with carbonic acid. Air-pumps draw the carbon dioxide from a limekiln and force it (after being properly cooled) at a pressure of nearly two atmospheres in at the bottom of a tower 50 feet high, which is kept nearly full of the liquid. This tower has perforated plates at every three feet of height to make sure that the gaseous bubbles are spread equally through the liquid. Every half-hour some of the pasty mixture in the tower is run off at the bottom. This is full of the small crystals of bicarbonate of soda, and these are separated by running the mass over a wire-gauze filter covered by a cloth, a vacuum being

maintained below. The bicarbonate of soda on the filter is nearly pure, and the liquid which passes through is ammonium chloride. The bicarbonate thus obtained is washed with water and carefully dried in apparatus of which there are various forms. As there is a comparatively limited demand for this kind of soda, it is afterwards heated in close vessels in which half of its carbon dioxide is given off, thereby reducing it to the normal or common carbonate of soda (soda-ash). The gas given off is pumped back to the tower and used along with the kiln gas for carbonating fresh material. To expel any ammoniacal salts adhering to the carbonate of soda and render it denser for packing, the heat is continued until fusion takes place. The ammonia is recovered from the liquid filtered from the bicarbonate of soda by heating it with lime. After the ammonia is driven off by heat the remaining liquid is calcium chloride, which is generally run to waste.

Soda Water. See AERATED WATERS.

Söderhamn, a seaport of Sweden, on a bay of the Gulf of Bothnia, 13 miles N. of Gävle, has a large export trade in iron and timber. It has been frequently burned down, the last time in 1865. Pop. 11,500.

Sodium (Na; atom. number 11, atom. wt. 23, sp. grav. 0.973) is one of the metals of the alkalis, its oxide being soda. Its properties closely resemble those of the allied metal potassium. It is of a bluish-white colour, is somewhat more volatile than potassium, and further differs from that metal in having a higher fusing-point—about 97°C .—a greater specific gravity, and in not setting fire to the liberated hydrogen when dropped in water (unless the water is heated). If, however, a piece of unsized paper is placed on the surface of cold water, and the sodium is placed on the paper, the hydrogen takes fire and burns with a deep yellow flame. When heated in the air sodium burns with its characteristic yellow flame, and is converted into soda. When exposed *in vacuo* to a red heat it assumes the form of vapour, and admits of distillation. Like potassium, it must be kept immersed in naphtha, so as to exclude the oxidising action of the air. As a reducing agent it is little inferior to potassium; and as its combining power is lower, and it is obtained much more cheaply, it may usually be advantageously substituted for potassium in reducing operations. Sodium does not occur in the metallic form in nature, but its compounds are very widely distributed. It is found by far the most abundantly in the form of chloride of sodium (or common salt), but it likewise occurs as albite or soda-felspar, cryolite (the double fluoride of sodium and aluminium), borax (the baborate of soda), trona (the sesquicarbonate of soda), and Chile saltpetre (sodium nitrate). Duhamel in 1736 discovered that potash and soda (now known to be the oxides of potassium and sodium) were distinct bodies. Sir H. Davy first obtained the metal *Sodium* in 1807. In 1890 it cost 8s. per lb.; in 1908, thanks to Castner's process, it sold at 8d. The symbol Na, an abbreviation of *Natrum*, is derived from *Natron*, one of the old names of native carbonate of soda. The metal is prepared either by the electrolysis of the fused chloride or by electrolysis of the fused hydroxide (Castner's process).

Sodium combines with the elementary gaseous bodies, and two of these combinations, those with oxygen and chlorine, are of extreme importance and value. With oxygen sodium forms two compounds—an oxide, Na_2O , and a peroxide, Na_2O_2 . Anhydrous soda, Na_2O , is procured by heating the metal in a limited supply of air at a temperature below 180°C . and distilling off the metal *in vacuo*.

With full supply of the air and at higher temperature the peroxide Na_2O_2 is formed; Na_2O is of a yellowish-white colour, powerfully attracts moisture, and retains the water so firmly that it cannot be expelled by heat. Caustic soda, NaHO , closely resembles, both in its properties and in the mode of procuring it, the corresponding potash compound. It is, however, not so fusible as the latter, and is gradually converted, by exposure to the air, into carbonate of soda, which is also an infusible salt in its anhydrous state. Solution of sodium hydroxide (or soda lye) is largely employed in the arts. It is prepared by boiling a tolerably strong solution of carbonate of soda in milk of lime until a portion of the filtrate ceases to effervesce on the addition of an acid. The solid hydroxide has a specific gravity of 2.13, and the quantity of anhydrous soda in any solution may be closely approximated to by determining the specific gravity of the fluid and referring to a table indicating the strength corresponding to the specific gravity.

Many of the combinations of the oxide of sodium (soda) with acids—constituting sodium-salts—are of great importance. There are two carbonates, acid and normal.

Sodium Carbonate.— $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$, the *Soda* of commerce, is a colourless, inodorous salt, with a nauseous alkaline taste. It crystallises in large transparent rhomboidal prisms, which contain nearly 63 per cent. of water, but it readily parts with all this water on the application of heat. The crystals also lose the greater part of their water on mere exposure to the air, when they effloresce, and fall to powder. Water at 60° (15° C.) dissolves half its weight of the crystals, and boiling water considerably more, the solution acting like an alkali on vegetable colours. This salt, the *natron* of commerce, occurs native in the natron-lakes of Hungary, Armenia, &c., in association with sulphate of sodium and chloride of sodium. In other regions it appears in an efflorescent form on the surface of the earth. For its manufacture, see SODA.

Sodium Bicarbonate, NaHCO_3 , may be formed by passing a current of carbon dioxide through a strong solution of sodium carbonate, till saturation takes place, and allowing the mixture to crystallise; or it may be produced on a large scale by exposing crystals of sodium carbonate to a prolonged current of carbon dioxide. Most of the bicarbonate in commerce is now, however, prepared by the ammonia-soda process (see SODA). This salt is used largely in medicine. See AERATED WATERS.

Sulphuric acid forms with soda a normal and an acid sulphate. The normal *Sodium Sulphate*, $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, has been already described under its synonym of *Glauber's Salt* (see GLAUBER). The acid salt, or *sodium bisulphate*, NaHSO_4 , is of no special interest.

Sodium Thiosulphate, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$, occurs in large colourless, striated, rhombic prisms, of a cooling and sweet taste. When strongly heated in the air it burns with a blue flame. It dissolves readily in water, the solution depositing sulphur when exposed to air. It may be obtained by digesting a solution of sodium sulphite with powdered sulphur. The sulphur is gradually dissolved, and forms a colourless solution, which, on evaporation, yields crystals of sodium thiosulphate. This salt is largely employed in photography, and is occasionally prescribed medicinally. Sulphurous acid forms two salts with soda—viz. a sulphite and a bisulphite. The *Sulphite*, $\text{Na}_2\text{SO}_3 + 7\text{H}_2\text{O}$, is obtained by passing sulphurous acid over carbonate of soda, dissolving the resulting mass in water, and crystallising, when the salt is

obtained in efflorescent oblique prisms, which are soluble in 4 parts of cold water, the solution having a slightly alkaline reaction and a sulphurous taste. This compound was at one time commercially known as *Antichlor*, and was largely used in paper-manufactories for the purpose of removing the last trace of chlorine from the bleached rag-pulp. The term is now applied only to the thiosulphate, which is both cheaper and more efficacious. The *Bisulphite* is of use in the arts. *Nitrate of Soda*, NaNO_3 , known also as *Cubic Nitre* or *Chile Saltpetre*, occurs as a natural product on the surface of the soil of certain South American districts. In most of its properties, excepting its crystalline form, and further in its being deliquescent, it resembles nitrate of potash. It is used as a Manure (q.v.). The *Phosphates of Soda* are comparatively numerous. *Hypo-chlorite of Soda*, NaClO , is at present known only in solution, in which it occurs as a yellowish-green fluid, evolving a smell of chlorine; it has strong bleaching power, and when boiled becomes decolorised, and evolves chlorine freely. It is formed by passing a stream of chlorine gas through a solution of carbonate of soda, the resulting solution containing the hypochlorite, together with undecomposed carbonate of soda and chloride of sodium. This solution is useful as a bleaching agent, as an oxidising agent in analytical chemistry, and as a disinfectant agent. There are two *Borates of Soda*, of which the only important one, the *Biborate*, is already described under its ordinary name of *Borax* (q.v.). Various *Silicates of Soda* have been formed (see SILICON, GLASS, SLAGS).

The *Haloid Salts* of sodium resemble, in their general characters, the corresponding salts of potash. Of these by far the most important is *Chloride of Sodium* or *Common Salt*, formerly known as *Muriate of Soda*, NaCl . It occurs naturally in far greater quantity than any other soluble salt, and is fully described at SALT. The other haloid salts—the iodide, bromide, and fluoride of sodium—require no notice.

Sodium has been found to enter into various groups of organic bodies—the sodium-alcohols, for example. When sodium or potassium is gradually added to anhydrous alcohol the temperature rapidly rises, the metal is dissolved, hydrogen is evolved, and a fusible deliquescent compound is formed, which has received the name of *Sodium-alcohol* (or potassium-alcohol), or of *ethylate of soda* (or potash), its composition being such that it may be regarded as alcohol in which one atom of hydrogen is replaced by one of the metal.

The *tests* for the salts of sodium are not very satisfactory, because the metal forms scarcely any insoluble compounds. A salt of sodium is usually concluded to be present when, the absence of all other bases having been proved, a saline residue remains, which, with bichloride of platinum, yields yellow striated prisms by spontaneous evaporation. Before the blowpipe the salts of sodium are known by the intense yellow which they communicate to the outer flame, and if a weak alcoholic solution of one of the salts is burned a similar yellow tint is communicated to the flame. Spectrum analysis is too delicate to be of much practical use.

The *medicinal uses* of the sodium compounds may be considered alphabetically. *Acetate of Soda* is a mild diuretic, similar in operation to acetate of potash, for which it may be substituted. *Arsenate of Soda* is serviceable in periodic affections, chronic skin diseases, and the cases in which arsenic is generally employed in medicine. Paper impregnated with a solution of arseniate of soda sweetened with sugar is sold as a poison for flies. *Biborate of Soda*, or *Borax*, is employed principally as a topical astringent, and is used with advantage

in aphthous eruptions of the mouth and throat. A solution of *Chlorinated Soda* is preferable to hypochlorite of lime in destroying noxious effluvia, as the salt which is left does not deliquesce. *Phosphate of Soda*, known also as Tasteless Purgative Salt, is a mild saline purgative, with a far less unpleasant taste than sulphate of magnesia. *Sulphate of Soda* and *Tartrate of Soda and Potash* have been already described under their ordinary names of Glauber's Salt (see GLAUBER) and Rochelle Salt (q.v.).

Sodom, APPLE OF, the name given to the fruit of a species of *Solanum* (q.v.). But it is possible that the true Apple of Sodom, or Mad Apple, of the shores of the Dead Sea, mentioned by Strabo, Tacitus, and Josephus, and described as beautiful to the eye, but filling the mouth with bitter ashes if tasted, is a kind of gall growing on dwarf oaks, and produced by a species of gall-insect.

Sodom and Gomorrah, two ancient cities, almost invariably spoken of in conjunction in the Bible, and forming with Admah, Zeboiim, and other towns the 'cities of the plain,' which on account of the enormous wickedness of their inhabitants (the nature of which is indicated in the term Sodomy), are said to have been overthrown, prior to the formation of the Dead Sea (q.v.). The name Sodom is found on the southern shore, at the salt ridge of Usdum, and not far from the supposed site of Zoar. The story (Gen. xviii. sq.) is that of some widespread cataclysm, the punishment of heinous sin and the reward of the pious, hospitable Abraham; and it ends with the birth of Moab and Ammon; see ABRAHAM. On the many questions which the narrative raises, see especially Skinner's *Genesis*, pp. 311 sq., 314.

Sodoma, or SODONA, IL, was the usual appellation of Giovanni Antonio Bazzi (1477-1549), religious and historical painter, born at Vercelli, who painted in Rome, but chiefly at Siena, where he died. His best-known pictures are the famous frescoes in the Villa Farnesina at Rome. See *Life* by the Countess Priuli-Bon (1901), and books by Cust (1906) and Gielly (1911).

Sodomy, an unnatural crime, is punishable with penal servitude for life, or any term not less than ten years, and the attempt to commit it is punishable with penal servitude from three to ten years. In Scotland it was till 1887 nominally a capital offence, though not punished except by penal servitude and imprisonment.

Sodor and Man. See HEBRIDES, and MAN.

Soest, in Westphalia, 37 miles SE. of Münster by rail, once a fortified Hanse town and a free imperial city of considerable importance. The municipal law of Soest served as the model for Lübeck, Hamburg, &c. In 1180 the Archbishop of Cologne seized the sovereignty; but in 1441 the people rose and sought the protection of the Duke of Cleves, and this led to a siege and heroic defence. The Gothic Cathedral (Catholic), built in 1314, was restored in 1846. Pop. 20,000.

Sofala, the name given to that portion of the south-east coast of Africa which extends from the Zambezi as far south as Delagoa Bay. The inland region at the back of the coast district, partly corresponding to Matabeleland, was anciently known as the Empire of Monomotapa (though the word is rather the name of the prince than of the state). Sofala was described by the old geographers as a very rich, gold-producing country, and was judged by some to be the Ophir of Solomon, an idea afterwards long discredited, but revived since Mauch discovered the disused mine-workings around Zimbabwe (q.v.), and in-

terest was aroused in them through the British South Africa Company penetrating into that region. Sofala belongs to the Portuguese, who established themselves here in 1505. Their headquarters, the town of Sofala, once a large commercial town, is now a wretched place of 1200 inhabitants.

Sofia, the capital of Bulgaria, stands on a plateau some 1800 feet above sea-level, surrounded by mountains, including Mount Vitoska. The city, on the railway connecting Constantinople with Belgrade and Vienna, has undergone thorough reconstruction since 1891, most of the crooked dirty streets, with their tumble-down houses and ruinous mosques, of the old Turkish city being demolished to make way for broad tree-planted boulevards, large public gardens, new French-looking houses, shops and hotels, and large public buildings (national library, banks, post-office, &c.). The national opera-house and national theatre, the government buildings, and the royal palace are worth special mention. There are many Orthodox churches and a large Mohammedan mosque. The Cathedral of Alexander Nevsky, with its golden dome, was practically completed at the time of the Balkan Wars, but was only consecrated in 1924. The next year it suffered very greatly from the explosion of a bomb placed in the roof (as the outcome of a Communist plot), when 140 persons were killed during an official memorial service. Sofia is the seat of the Exarchate of the Bulgarian Church (since 1913), and of the national university (1888). There is a considerable trade in hides, spirits, maize, and wheat, and since the Great War Sofia has become an extremely busy commercial centre. For centuries the place has been renowned for its hot mineral springs (117° F.). Pop. (1870) 19,000; (1893) 46,593; (1910) 85,000; (1920) 154,025. Over two-thirds of the population (which is rapidly increasing) are Bulgarians, the remainder being (Spanish) Jews, Turks, &c. Sofia is the *Serdica* of the Romans, and was the seat of a famous church council in 343. Attila plundered it, and Justinian I. rebuilt it; it was in the possession of the Bulgarians from the beginning of the 9th century until its capture by the Turks in 1386. Both Hunyady and the Albanian chief Mustapha Pasha (in 1829) utterly devastated the place, and it was occupied by the Russians under General Gurko in January 1878. The same year it was chosen as the capital of the new principality of Bulgaria.

Softa, a student of Mohammedan theology and sacred law.

Soft-grass (*Holcus*), a genus of Grasses (q.v.).

Sogdiana, anciently a province of the empire of Persia in the time of the Achæmenians, corresponded to the modern districts of Samarkand and Bokhara and the valley of Zerafshan. Under the Greeks, after its conquest by Alexander the Great, it was united with Bactria. The Arab geographers eulogise its fertility and beauty.

Sohar, a seaport of Oman in Arabia, stands on the Gulf of Oman, 130 miles NW. of Muscat, and is a well-built place with town-walls and a castle, some weaving and working of metals, a good harbour, and an active trade. It was a famous trading-town in the end of the 10th century, but has sunk to a place of 5000 inhabitants. The Portuguese occupied it from 1508 to 1650.

Sohrab and Rustam. See FIRDAUSI.

Soignies, a town of the Belgian province of Hainault, 22 miles by rail S. by W. of Brussels. The church of St Vincent dates from the 12th century, though it was first founded in 650. Pop. 11,000. Near here the French defeated the Netherlands on 10th July 1794.

Soils. 'Soil' is the term applied to the loose earthy layer which normally covers the solid rocks of the earth's crust. Soils are formed from rocks by the process of weathering (see DENUDATION), which process is, in part, one of mechanical disintegration. Thus moving ice, running and freezing water, and blown sand are well known to have a pulverising effect on rocks. Natural soils, however, differ chemically as well as physically from the rocks which give them origin. The main chemical processes of weathering are oxidation, due to contact of the rock material with the atmosphere or with water containing oxygen, and leaching by natural waters which contain small amounts of carbonic and other acids. Further, natural soils always contain, mixed with their mineral constituents, a greater or less proportion of vegetable or animal remains in process of decay.

Of the minerals which compose the rocks of the earth's crust, *silica*, in the form of quartz, flint, &c., is the most abundant. It suffers no chemical change in the process of weathering, and hence quartz sand is the commonest constituent of soils. Chemically pure silica has no value in plant nutrition, but natural silicas frequently contain impurities in sensible quantities, some of which are important as plant foods. Quartz sand, owing to its mode of formation by purely physical processes, generally occurs in the form of relatively large grains. Sandy soils have little coherence and are easily tilled ('light' in the farmer's sense), but they have little capacity for retaining moisture or soluble manures. They are warm and early, but 'hungry,' and crops growing on them are liable to suffer from drought. Next to silica, the commonest rock-forming minerals are the group of double silicates of alumina with an alkali or alkaline earth. Some of these, such as the micas, are very resistant to chemical change, and occur in soils largely undecomposed. Others, notably the feldspars, yield readily to natural chemical agents, the potash, soda, lime, magnesia, &c., being leached out by carbonated water. The end product of this process is a hydrated silicate of alumina, which constitutes *clay*. In humid climates the soluble salts formed in this process are largely washed out of the soil by percolating rain and are carried in the drainage waters to the sea. In arid and semi-arid regions, on the contrary, they accumulate in the soil, and are often to be found as solid incrustations on the surface, left by the evaporating soil waters. Where such excessive quantities of soluble salts are present, the soil may be practically sterile, or may support only a few peculiar salt-resistant species of plants. Such are known as *alkali lands*. Many such soils can be rendered fertile by appropriate treatment. Chemically pure clay, like quartz sand, contains no element valuable as plant food. The natural clay in soils is, however, always impure, and in particular usually contains quantities of *zeolite* material, which is an intermediate stage in the formation of clay from the rock minerals. Zeolites are an important source of plant food. Clay generally occurs in the form of minute particles, and in soils a proportion is always found in the colloidal condition. Clay soils are plastic, tenacious, and difficult to till (hence 'heavy'), are retentive of water and manurial salts, and shrink and crack on drying.

A third substance which occurs in soils in considerable but varying amounts is *humus*, a mixture of complex organic compounds resulting from the decay of vegetable and animal remains. The humus of soils is continually in process of decomposition, which is most rapid in moist, aerated, cultivated ground, and slowest where, for example by stagnant water, air is excluded. Humus is a dark-coloured spongy material, with great capacity for

absorbing and retaining water, but without the tenacity of clay. It necessarily contains all the elements of plant food, but these are yielded up in available form only as the material decays. Soils containing large quantities of neutral humus in process of decomposition—e.g. the black soils of the fens of England—are very fertile; on the other hand, the stable and acid form which constitutes ordinary peat is of little agricultural value. The physical qualities of humus are of greater importance than the chemical. Its admixture with sandy soils renders them more retentive of water, while to clay it gives a friable and crumbly structure, which facilitates cultivation and improves tilth. Since cultivation speeds up greatly the natural rate of decay, measures for the maintenance of the humus content of the soil are of prime importance in any lasting system of arable farming. Such measures are the application of farm-yard manure and the ploughing under of portions of plants, or more rarely of entire crops grown for the purpose. The value of such materials has of course been recognised from the earliest times, and is only in part explained by the quantities which they contain of the elements valuable as plant food.

Chemically, the soil is to be considered as the source of the majority of those elements which are essential to the life of plants. Some of these elements—*calcium*, *magnesium*, *sulphur*, and *iron*—are contained in practically all natural soils in quantities that are abundantly sufficient for plant requirements. On the other hand, supplies of any or all of the three elements, *nitrogen*, *potassium*, and *phosphorus*, in available form, may be insufficient, in so far as to set a definite limit to the amount of plant growth that the soil is capable of supporting. Hence salts containing nitrogen, such as nitrates and ammonium salts, and also potassium salts and phosphates, are largely used as Manure (q.v.). The soil is not, however, to be regarded simply as a storehouse of these materials, but rather as a factory with a continuous output of plant food. The general truth of this view has been conclusively demonstrated at Rothamsted Experiment Station, where on certain plots wheat has been grown continuously since 1852, no manure of any kind having been applied in the interval. The yield has long ceased to show any secular change, and reaches an average, over series of years, of about 12 bushels per acre; this figure being therefore a measure of the rate of production, in the soil, of available plant food. In so far as concerns the substances of mineral origin, such as potash and phosphates, the processes by which plant food is rendered available are only a continuation of the general process of weathering—i.e. they are physico-chemical in character. On the other hand, the preparation of nitrogen for the plant is carried on mainly by biological agents, bacteria and other micro-organisms which occur in vast numbers in all fertile soils. These organisms are of two essentially different types, the one being concerned in the decomposition of organic compounds of nitrogen and in the oxidation of the resulting ammonia to the form of nitrates, in which form the nitrogen is available to all higher plants; while the other type are concerned in the fixation of free atmospheric nitrogen which is not directly available. Some of the latter, such as *Azotobacter*, are free living, while the *Bacillus radicicola* lives in a condition of symbiosis or partnership with plants of the leguminous order. It is clear that the soil must be considered as a medium for the life of these organisms, and from this point of view aeration, warmth, and the presence of a *base* are essential. The latter requirement furnishes the chief explanation of the value of lime (calcium carbonate) in soils, the addition of lime being a

most important measure in all cases where it is naturally lacking. The removal of stagnant soil water by drainage is also of prime importance to the welfare of the soil organisms.

For a fuller discussion of Soil Science, see Hall, *The Soil*; Lyon and Buckman, *Soils*; Russell, *Soil Conditions and Plant Growth*. See also AGRICULTURE, MANURE, NITRIFICATION, NITROGEN FIXATION, &c.

Soissons, a town and former fortress of France, dept. Aisne, stands on the river Aisne, 65 miles NE. of Paris by rail. Soissons is the key of Paris for an army invading France from the Netherlands, and is the meeting-point of several military roads. The principal building is the fine 13th century Gothic cathedral, the library of which contains many rare MSS. The beautiful south transept (dating from the end of the 12th century) has two triforium galleries beneath the clerestory. During the Great War the north transept and nave suffered severely by bombardment, as did also the remains both of the great castellated abbey of St Jean des Vignes (1076), where Thomas à Becket found refuge when in exile, and of the abbey church of St Léger (1139). The church of St Peter (Romanesque) dates from the 12th century. Quite near to Soissons is an institution for deaf and dumb, which occupies the site of the famous abbey of St Médard (560), where Clothaire and Siegbert were buried. The town hall contains a library and museum of antiquities. Soissons has a busy trade in corn, acting as source of supply for Paris, and has some manufactures. Pop. (1921) 14,391. Soissons is one of the oldest towns in France, and was celebrated even in the time of the Romans, when it bore the name first of *Noviodunum*, and afterwards of *Augusta Suessionum*; hence its modern name of Soissons. It was the second capital of Gallia Belgica, and subsequently the most important town of the Romans in northern Gaul. Near to it Clovis overthrew Syagrius, the Roman commander, in 486. The same prince made Soissons the seat of the Frankish monarchy of Neustria. Here Pepin was crowned king, and Louis the Pious imprisoned. It was the gathering-place of more than one important council, and has been repeatedly captured and sacked in war—e.g. six times during the Hundred Years' War, by the Armagnac party in 1414, by Charles V. (1544), the Huguenots (1565), three times in 1814, and by the Germans in 1870. Soissons was occupied by the Germans in 1914, but after the battle of the Marne (September 1914) they were forced to retire to the heights (including the famous 'Chemin des Dames') which covered the town from the NE., when the battles of the Aisne began. From this position they were dislodged by Nivelle's offensive (April 1917), but they occupied the town again from May to August 1918.

Soke, a form of the word *Soc*, meant in old English times both the privilege of holding a court and the district held by tenure of Socage.

Sokoto, a Central African state, forming the north-west portion of the British protectorate of Nigeria since 1900, when the Niger Company surrendered its rights to the Crown. The people are Hausa (q.v.), ruled by Fulahs (q.v.). The area of the province, considerably smaller than that of the empire ruled over by the Fulahs in the 19th century, is estimated at about 35,000 sq. m. The country is generally level, but rises to 10,000 feet in the province of Adamawa; and it is well watered by the Benue and its tributaries. There are large deposits of good iron; fruit is grown, and there are possibilities for cotton. The inhabitants number about 500,000. In 1885 the sultan of Sokoto, known as the Sarkin Musulmi (Commander of the Faithful), put his kingdom under the protectorate

of Britain, and granted to the Royal Niger Company a monopoly of the trade. The town of Sokoto, or Sakatu, in the north-west corner, has shared with Wurnu, 18 miles east, the rank of capital. Its surrender in 1903 terminated the Fulah tyranny. Near it Clapperton died (1827). See books named at NIGERIA.—There is also a town called Sokoto in Abyssinia, 100 miles east of Gondar.

Solanaceae, a family of dicotyledons, mainly herbaceous plants and shrubs, but including a few tropical trees. The leaves are mostly alternate, undivided or lobed, without stipules. The flowers are regular, or nearly so; the calyx and corolla generally five-cleft; the stamens generally five. The fruit is either a capsule or a berry, usually two-celled. The plants of this family are mostly natives of tropical countries, a small number extending into the temperate climates; in the coldest regions they are entirely wanting. They are mostly distinguished by an offensive smell and by containing a narcotic, poisonous substance, usually associated with a pungent principle, and some of them are amongst the most active poisons. Sometimes the narcotic substance predominates, as in Mandrake (q.v.) and Henbane (q.v.); sometimes the pungent substance predominates, or is alone present, as in Cayenne Pepper (Capsicum); sometimes both are present in more or less equal proportion, as in Tobacco, Thorn-apple, and Belladonna. The fruit is generally poisonous; but that of a considerable number of species, in which acids and mucilage predominate, is eatable—e.g. the berries of the Winter Cherry and other species of *Physalis*, of the Egg-plant (q.v.) and some other species of *Solanum*, and of the Tomato (q.v.). The tubers, which occur in a few species, contain much starch, and serve for food, the Potato being the chief example. The seeds of all contain a fixed oil, which in the south of Germany is expressed from the seeds of the Belladonna itself.

Solan Goose. See GANNET.

Solanum, a genus of Solanaceae, containing a great number of species, distributed all over the world, but particularly abundant in South America and the West Indies. Some are herbaceous, others shrubs; some unarmed, and some spiny; many covered with a down of starlike hairs. The flowers are in false umbels, or almost in panicles; seldom in racemes or solitary. The anthers open by two holes at the top. The berries are two-celled, and contain many smooth seeds. The species of this genus almost always contain in all their parts a poisonous alkaloid, *Solanine*, sometimes so much that the leaves or berries cannot be eaten without danger, whilst in a few species the quantity present is so small that these parts are eaten freely, being agreeable and harmless. By far the most important of all the species is the Potato (q.v.), in which, however, solanine is found in considerable quantity, so that not only the herbage, but the juice of the raw tubers, is unwholesome. Of the species with eatable fruit the principal is the Egg-plant (q.v.). The only British species are the Bitter-sweet (q.v.) and Common Night-shade (q.v.), both of which possess poisonous and medicinal qualities. The berries, leaves, bark, and roots of various species are employed for different medicinal uses in warm countries. The berries of *S. saponaceum* are used as a substitute for soap. The fruit of *S. sodomum*, Apple of Sodom, a native of North Africa, contains a greenish pulp when ripe, which if eaten causes headache, madness, and death. *S. quitense* yields a wholesome fruit resembling an orange in appearance and somewhat also in flavour. The fruit of *S. muricatum* is eaten in Peru and has the flavour of a melon. The Kangaroo-apple of Australia is the fruit of *S. nemorense*, which is wholesome

when ripe, but poisonous when unripe. The berries of *S. incanum* are employed in Egypt to curdle milk.

Solar Microscope is an apparatus for projecting upon a screen by means of sunlight an enlarged view of any object. It is essentially the same as the combination of lenses used in the Magic Lantern (q.v.) taken in conjunction with a heliostat. A heliostat is a plane reflecting mirror which by means of clockwork follows the sun's apparent motion so as always to throw its rays in the direction in which they are first adjusted. By this instrument the rays are thrown horizontally into the solar microscope, and are concentrated first by a large lens and then by a small lens upon the small object that is to be projected. As they diverge the rays are collected by an adjustable system of lenses and focused sharply on a screen. Uncertainty of sunlight very much circumscribes the usefulness of the apparatus.

Solar Myth, a myth allegorising the course

of the sun; by some mythologists constantly invoked to explain the problems of Mythology (q.v.).

Solar System, the name given to the Sun with the planets and comets which revolve round it. The most important members are the large planets given in the following table. All rotate about axes, and consequently the equatorial diameters are greater than the polar diameters. The difference is not great for the Sun and the four nearer planets, but is considerable for the larger ones, amounting to as much as one-ninth part for Saturn. The most important feature in the Solar System is that the planets move in nearly the same plane (the Ecliptic) and in the same sense. To this circumstance and the relatively great mass of the Sun is due the important fact that the mutual attractions of the planets make only periodic and not permanent changes in the system. See PLANETS, COMETS, SUN, MOON, SATELLITES, METEORS, GRAVITATION.

Name.	Diameter in miles.	Reciprocal of Mass. (Sun=1.)	Density. (Earth=1.)	Gravity at Surface. (Earth=1.)	Period of Rotation.	Distance from Sun (millions of miles).	Period of Revolution (in days).	Velocity in Orbit (miles per sec.).
Sun.....	865,000	1	.25	27	27 days	—	—	—
Mercury.....	2,950	9,700,000	.60	.24	Unknown	36	88	30
Venus.....	7,700	408,000	.94	.90	"	67	225	22
Earth.....	7,926	333,432	1.00	1.00	24h 0m	93	365	19
Mars.....	4,200	3,093,500	.72	.38	24 37	142	687	15
Jupiter.....	88,700	1,047	.25	2.64	9 50	483	4,333	8
Saturn.....	75,100	3,502	.13	1.14	10 38	886	10,759	6
Uranus.....	31,000	22,869	.25	.96	10 45	1800	30,688	4
Neptune.....	33,000	19,314	.24	1.00	Unknown	2800	60,181	3

Solder, a fusible alloy used for joining metals. For some of these there are two classes of solders, called hard and soft. Under the head BRAZING the composition of hard solders for brass and copper is given. Common brass makes a solder for iron. 'Silver solders,' which melt at a lower temperature than ordinary hard solders, are used for brass, copper, and sometimes even for iron. One kind is composed of equal parts of silver and brass; another variety consists of these two metals and zinc in equal proportions. These solders are a little costly, but when they can be used they give much satisfaction. The solder used by silver-smiths is usually made of two of silver and one of brass. Goldsmith's solder varies with the fineness of gold to be joined, the coarsest kind being formed of three of gold, two of silver, and nearly two of copper; but the proportion of gold is much higher for fine work. Soft solders for brass consist of two of tin and one of antimony, and of lead and tin in equal or nearly equal proportions. The latter is also used for lead, but plumbers use besides a mixture of one of tin to two of lead. For pewter a little bismuth is added to these two metals. A solder of two of tin and one of lead does for zinc. Suitable solders for the above metals can be purchased already prepared. The fluxes usually employed are borax or sal ammoniac for hard solders, and resin, muriatic acid, or Baker's mixture for soft solders.

Soldier. See ARMY, ENLISTMENT, MARTIAL LAW, TACTICS, WAR.—**SOLDIER BEETLE** is a name given to coleopterous insects of the genus Telephorus, from their red colour and combativeness.—**SOLDIER BIRD** is an Australian Honey-Eater (*Meliphaga sanguinolenta*), named from the male's crimson plumage. For Soldier-crab, see HERMIT-CRAB.

Soldo. See SOLIDUS.

Sole (*Solea*), a genus of flat-fishes (Pleuronectidæ), distinguished by the following characters: mouth rather small and not terminal, its lips curved on

each side towards the ventral edge of the head; teeth present only on the lower or left side, where also the jaws are larger and stronger than on the right; eyes small and not prominent, on the right side, the dorsal anterior to the ventral; scales small, ctenoid—i.e. fringed with spines posteriorly; lateral line straight on the body, but with an anterior dorsal curve on the head; tactile filaments on the lower side of the snout. Paired fins may be rudimentary or absent. The dorsal fin commences on the snout, and is not continuous with the caudal. The shape of the fish is oval, the outline of the snout being semicircular, and projecting somewhat beyond the mouth. The common sole (*S. vulgaris*) is a fish



Common Sole (*Solea vulgaris*).

of high value in the market. It is captured in the North Sea from Yorkshire southwards, in the English Channel and Irish Channel, and off the south coast of Ireland. Off the Scottish coasts it occurs only in small numbers. Beyond Britain it ranges along the west coast of Europe and throughout the Mediterranean. The largest supply of soles comes from the North Sea, nearly four times as many being landed on the east coast as on the south coast of England, while the west coast produces about the same quantity as the south, the produce of the Irish grounds being included in the former. The Common Sole is the largest of the British species; it is distinguished by the

following characters: pectoral fins well developed on both sides, nostrils on the two sides similar, filaments of the lower side of the snout crowded without arrangement. The colour of the upper side consists of longitudinal series of black blotches on a yellowish-brown ground. The sole has been known to reach a length of 26 inches and a weight of 9 lb., but its usual size varies between 10 and 20 inches and its weight from $\frac{1}{2}$ to 2 lb. It spawns in March and April chiefly, but some individuals may shed their ova in May. It breeds on the grounds where it lives, and its ova are small and buoyant. The young, at a very early stage after they have metamorphosed, are occasionally found in tidal pools, but after about 1 inch in length they are probably to be found in deep water. The adults are frequently taken in estuaries in summer time, and have been said to thrive in fresh water, though that is doubtful: they certainly do not breed in fresh water.

The Sand Sole, sometimes called Lemon Sole (*S. tascaris*), is distinguished from the common sole by having specks instead of blotches on its coloured side, and a dilated nostril on the lower side. Its habits are similar to those of the common sole, and it is sent to market with it without distinction, but it is very scarce. The Thickback (*S. variegata*) is found only on the south coasts of England and Ireland, extending thence to the Mediterranean. It is smaller than the two previous species, seldom exceeding 9 inches in length. It is distinguished by its rudimentary pectoral fins, and its markings of dark transverse bands on a reddish ground. The Solenette (*S. Eutea*) is the smallest British species; it has rudimentary pectorals, and markings like the common sole, with the addition of a black line along every fourth or fifth fin-ray in the dorsal and ventral fins. It is common both in the North Sea and on the south coasts; it does not exceed 5 inches in length. There are a large number of species of Solea in temperate and tropical seas all over the world, but no others are of value as food. There are no soles of any value on the Atlantic coast of the United States. There are numerous closely allied genera. *Synaptura* is distinguished by the continuity of the longitudinal fins with the caudal; it includes the curiously marked East Indian *Synaptura zebra* mentioned by Cuvier, which is reddish olive, with twelve pairs of transverse brown bands. In some species of Solea and allied genera the pectorals are absent altogether. See *A. Treatise on the Common Sole*, by J. T. Cunningham (1890).

Solebay. See SOUTHWOLD.

Solecism. A solecism is the term applied to any violation of the grammar or idiom of a language, or of the usages of society. The word (Gr. *Solokismos*) is derived from the city of Soli in Cilicia, whose inhabitants spoke very bad Greek, in consequence of their intercourse with the Cilician natives, and provoked the fastidious Athenians to coin the epithet.

Solen. See RAZOR-FISH.

Solenhofen Stone. See ARCHÆOPTERYX, LITHOGRAPHY.

Solenoid. See MAGNETISM.

Solent, the western portion of the strait that intervenes between the Isle of Wight and the mainland of England, 17 miles long, and about 3 in average breadth, but contracting to $\frac{1}{2}$ mile at Hurst Castle (1535).

Solesmes, (1) a village in the French department of Sarthe, 18 miles NW. of La Flèche, seat of a Benedictine abbey famous in connection with Gregorian music, but suppressed in 1901. The church contains some good sculpture.—(2) A linen-

manufacturing town of Nord, 12 miles E. of Cambrai; pop. 5300.

Soleure (Ger. *Solothurn*), a canton in the north of Switzerland; area, 305 sq. m.; pop. (1920) 130,617, mostly Roman Catholics and speakers of German. The greater portion of the canton is very fertile and well cultivated, especially in the valley of the Aar, but it also embraces outlying ranges of the Alpine and Jura systems. Besides grain, the principal products are fruit, timber, cherry-brandy, cheese, cotton, paper, iron, hose, clocks, &c. The canton consists of the territories acquired by the town of Soleure. The legislative council is elected by the people, and that body chooses the executive (5 members), both for four years. But both bodies are subject to the immediate control of the people, as well as every act they do, by means of the referendum.—The town of Soleure, the capital of the canton, is situated on both sides of the Aar, 18 miles NNE. of Bern by rail. The most notable building is the cathedral of St Ursus (late 18th century), on the site of an older church (10th century), with a cupola and façade of Corinthian columns. There are also a curious old clock tower, an arsenal with a museum of ancient trophies of war, collections of antiquities, and many mediæval houses, &c. There are manufactories of watches and motor-parts. Pop. 13,000. Soleure (*Salodurum*) was a place of some consequence in Roman times, was made a free city of the empire (1218), joined the Swiss Confederation in 1481, and in 1828 was chosen the bishops's see for the diocese of Basel.

Sol-fa System. Attempts have been made at various times to introduce a musical notation in which the staff with its lines and spaces is dispensed with. Jean Jacques Rousseau suggested, but afterwards discarded, a notation where the notes of the scale were indicated by the Arabic numerals—a principle now the chief feature of the French Chèvé system. A system similar to Rousseau's in its leading features, called the Tonic Sol-fa, has been brought into use in many singing-schools in Britain and America—its chief promoter being the Rev. John Curwen (q.v.), who obtained his main principles about 1840 from Miss Glover, a teacher at Norwich. The system proceeds on the principle of giving the chief prominence to the fact that there is in reality but one scale in music, which is raised or lowered according to the pitch of the key. The seven notes of the diatonic scale are represented by the Solfeggio (q.v.) syllables, or rather Miss Glover's English modification of them—*Doh, Ray, Me, Fah, Soh, Lah, Te*; *Doh* standing for the keynote in whatever key the music is written. In the early exercises the pupils are accustomed to a scale or diagram, called the Modulator, representing pictorially the exact intervals of a key, with the semitones in their proper places. In written music only the initial letters of the solfeggio syllables are used—*d, r, m, f, s, l, t*; the higher octaves of a given note being distinguished by a ¹ above, as *d¹, r¹*; and the lower by a ₁ or ₂ below, *m₁, m₂*. The name of the key is prefixed to a tune as its signature, as 'Key A,' 'Key B flat'—the keynote being, in all the major keys, *doh*. To indicate

f ¹
m ¹
r ¹
d ¹
te
ta
lah
se
soh
fe
fah
me
ray
doh
t ₁
l ₁
s ₁
f ₁
m ₁

Modulator.

rhythm a perpendicular line | precedes the stronger or louder accent, a colon : the softer accent, and, where necessary, a shorter perpendicular line | the accent of medium force. A note immediately following an accent mark is supposed to occupy the time from that accent to the next. A horizontal line indicates the continuance of the previous note through another pulse or beat. A dot divides a pulse into equal subdivisions. A dot after a mark of continuance indicates that the previous note is to be continued through half that pulse. A comma

indicates that the note preceding it fills a quarter of the time from one accent to the next; a dot and comma together three-quarters. An inverted comma ' is used to denote that the note preceding it fills one-third of the time from one accent to the next. An unfilled space indicates a rest or pause of the voice. A line below two or more notes signifies that they are to be sung to the same syllable. We subjoin an example of the tonic sol-fa shown alongside of the ordinary notation, and illustrating most of the features named :

KEY A.

GOD SAVE THE KING.

The image shows two staves of music for 'God Save the King' in Key A (three sharps: F#, C#, G#). The first staff is in standard notation (treble clef, 3/4 time). The second staff is in tonic sol-fa notation, with notes represented by letters and rhythmic values indicated by numbers and dots. Below the sol-fa staff, the rhythmic values are written out: | d : d : r | t₁ : - d : r | m : m : f | m : - r : d | r : d : t₁ | d : - : - || s : s : s | s : - f : m | f : f : f | f : - m : r | m : f . m : r . d | m : - f : s | l s f : m : r | d : - : - ||

In modulating into a new key the note through which the transition is taken is indicated by a combination of the syllabic name which it has in the old key with that which it has in the new—*me lah*, for example, being conjoined into *m'lah*; and in writing this note (termed a bridge note) the initial letter of its syllable, as a member of the old key, is placed in small size before and above the initial of the syllable of the new, as ^ml, ^ds. In the case, however, of an accidental, where the transition is but momentary, a sharpened note changes its syllabic vowel into *e*, and a flattened note into *aw*, spelled *a*, as *fah*, *fe*; *soh*, *se*; *te*, *ta*. In the minor mode *lah* is the keynote; the sharp sixth is called *bay*, and the sharp seventh *se*. The signature of the key of A minor is 'Key C'; *lah* is A. The time-names of the French Chev  system have been adopted. The method of teaching, based on a wide experience, is of equal importance with the notation itself.

For a full explanation of this system, see Curwen's *Course of Lessons and Exercises in Tonic Sol-fa*. Its advocates maintain that it possesses advantages over the common system in the facility of its acquisition; the distinctness with which it indicates the keynote and the position of the semitones; the cheapness with which it is printed; and the manner in which, they say, it explains the proper mental effects of notes in harmony and key-relationship, and employs them in teaching. It has, however, been objected to by others, from its withdrawal of the direct indication of both absolute and relative pitch to the eye which exists in the common notation, from its limited applicability to instrumental music, and from its acquirement not being, like that of the ordinary notation, an introduction to the world of musical literature. It presents, however, no barrier, but rather a road to the acquisition of the older notation; and its widespread use and the testimony of the general body of practical teachers are eloquent arguments in its favour. This system practically ousted the 'Fixed Do' system of Hullah, its rival in earlier days.

Solfatara. Volcanoes which are dormant or decadent usually emit steam and various gases, and are then said to be in a *Solfatara stage* in their history. The term is derived from the name of a decadent crater known as the Solfatara in the Phlegræan Fields, near Naples. Sainte-Claire Deville has distinguished the following types: (a) Dry fumaroles, without steam, emitting chiefly anhydrous chlorides at a temperature above 300° C.; (b) acid fumaroles, hydrochloric acid and sulphur

dioxide, with some steam at over 100° C.; (c) alkaline fumaroles, steam and ammonium chloride at about 100° C.; (d) cold fumaroles, nearly pure steam below 100° C.; (e) mofettes, carbon dioxide, nitrogen and oxygen at atmospheric temperatures. *Solfatara*, in a more restricted sense, is applied to decadent vents emitting mainly acid gases, those in which steam is the chief product being called *Fumaroles*, and those giving off principally carbon dioxide, *Mofettes*. Boric acid is extracted in large quantities from some of the fumaroles, known as *Soffoni*, in Tuscany.

Solfeggio, in Music, a vocal exercise, in which the syllables Ut (or Do), Re, Mi, Fa, Sol, La, Si—corresponding to C, D, E, F, G, A, B—are employed in lieu of words. Their use as a method of nomenclature originated, as far as the first six are concerned, in the 11th century with Guido Aretinus (q.v.), who substituted his hexachord system for the old Greek tetrachords. Observing in the melody of an ancient hymn for the festival of St John the Baptist, beginning

Ut queant laxis Resonare fibris
Mira gestorum Famuli tuorum
Solve polluti Labii reatum
Sancte Ioannes,

that the notes on which the successive phrases began were identical in order with the sounds of the hexachord, he adopted the syllables to which they were allied in the above stanza as names to represent the degrees of his new scale. When, early in the 17th century, the octave was completed by the seventh or 'leading note,' the syllable Si, formed of the initials of 'Sancte Ioannes,' was added; while Do generally took the place of Ut, as being more easily sung. The art of thus illustrating the construction of the musical scale by the use of syllables is called *solmisation*.

Solferino, a village of Northern Italy, 19 miles NW. of Mantua, stands on a hill, and has a tower, built by the Scaligers and converted into a museum of the battle, called the Spy of Italy, from which the whole plain of Lombardy may be seen. There, on June 24, 1859, the Austrians were defeated by the allied French and Piedmontese—the first-named losing 21,500 men, and the allies 13,500.

Soli. See SOLEICISM.

Solicitor-general, the name given to one of the law-officers of the crown appointed by patent. The Solicitor-general of England has powers similar to those of the Attorney-general (q.v.), after whom he ranks and to whom he gives aid in discharging

his functions. His tenure of office in practice terminates with the fall of the ministry of which he is a member. He receives on appointment the honour of knighthood.

The Solicitor-general for Scotland is one of the crown counsel, next in dignity to the Lord Advocate (see *ADVOCATE, LORD*), and exercising all his functions along with him, but he does so as his deputy and not of original right. An act, however, of 1887 provides that, if the office of Lord Advocate be vacant, indictments may be raised in the name of the Solicitor-general. Like the Lord Advocate, he has the privilege of pleading within the bar. This right was recognised by the court as early as 1662, though it was afterwards lost for some time.

Solicitors are lawyers, who prepare deeds, manage cases, instruct counsel in the superior courts, and act as advocates in the inferior courts. Their full title is Solicitors of the Supreme Court, and since 1st November 1875 the class includes attorneys, solicitors, and proctors at law. They are deemed officers of court, and the court exercises special jurisdiction over them, committing to prison such of their number as are guilty of misconduct, and in extreme cases 'striking them off the roll'—i.e. erasing their name from the official list of solicitors and so preventing them from practising. By the Solicitors Act, 1919, an application and order for striking a solicitor off the rolls, &c., is made to and heard by a committee of certain members of the council of the Incorporated Law Society appointed by the Master of the Rolls. The committee has power to make any such order as to striking a solicitor off the rolls, or suspending him from practice, as the court or Master of the Rolls formerly had. Before a person is admitted a solicitor he must be articulated to a practising solicitor for a term of five years (reduced to three years in certain cases). The Solicitors (Articled Clerks) Acts of 1918 and 1919 make provision for the reckoning of the time of service with the forces, &c., in the Great War, as service of articles. A woman is no longer debarred from being admitted and enrolled as a solicitor. The candidate must pass one general (preliminary) and two legal (intermediate and final) examinations. About £120 in stamp fees must also be paid by the intrans. Solicitors in good practice also require a premium (often as much as £600) from each of their articled clerks. After admission a solicitor must take out an annual certificate enabling him to practise. A solicitor must pay for this from £3 to £9 annually. A solicitor of five years' standing may become a barrister on giving one year's notice, passing two legal examinations, and paying certain fees. Penalties are provided for unqualified persons acting as solicitors, and for qualified persons allowing them the use of their name.

Retainer and Authority.—A solicitor is employed by a Retainer (q.v.), which ought to be in writing to avoid after disputes. The exact authority differs in each cause, but includes power to compromise the dispute. If once employed in an action he has authority to manage it to the end. A solicitor is liable to his client for gross negligence or gross ignorance; he may often, but not always, protect himself by taking (and following) the advice of counsel. A solicitor is not allowed to make a gain for himself (save the ordinary profits of his profession) at his client's expense, so transactions between them, as sales of property, &c., are very narrowly looked into, nor can he generally take a gift from his client. He cannot be a justice of peace in the county where he practises. He has no right of audience in the supreme court save in bankruptcy matters, and that only before the judge in bankruptcy or a divisional court of King's Bench.

He has certain privileges. Thus, he cannot be made liable for statements honestly made by him as an advocate, and he cannot be forced to reveal written or oral communications made to him by his clients. He is privileged from arrest whilst attending the courts, but this is now of little importance, for it does not extend to punitive attachment.

Remuneration.—The remuneration of solicitors is carefully provided for by various statutes, but often in practice much less than the allowed rate is accepted and much more is exacted. The Attorneys and Solicitors Act, 1870, allows a solicitor to make an agreement in writing for a lump sum or otherwise in lieu of the regular fees. The agreement must be in writing signed by both parties to be binding on the client, but a verbal agreement is binding on the solicitor. The amount agreed on is not payable till the agreement has been examined and approved of by the taxing-master, nor can any action be brought on it. It is enforced by motion before or petition to the proper court. These provisions apply to contentious business. The Solicitors' Remuneration Act, 1881, provides, as regards non-contentious matters, that solicitor and client may agree as to any mode of remuneration. The agreement must be in writing and signed by the party bound by it; it may be enforced or set aside by action, and reviewed under any order for taxation. A solicitor winning a case is entitled to two sets of costs—(a) those between party and party; and (b) those between solicitor and client (extra-judicial expenses in the terminology of Scots law). The first are usually taxed as a matter of course; the other may be taxed on application of either party. A solicitor cannot sue (but may counter-claim) for his costs till one month after he has delivered a signed bill, and except under special circumstances taxation will not be ordered twelve months after delivery of bill. The costs of taxation are paid by the solicitor when more than one-sixth is struck off his charges; if less, the expense falls on the client (see *FEES*).

Solicitors' Lien.—A solicitor has at common law a twofold lien: (1) a general lien on all deeds and papers which have come to him in his professional capacity—but this merely gives him a right of retention till his claims are satisfied; (2) a particular lien (made more effectual by the Solicitors Act, 1860) on property recovered or preserved by his exertions. It may be actively enforced by means of a charging order, which the court will grant him on such property. Collusive agreements between the parties to deprive him of his rights will be set aside. He is not, however, allowed to retain papers so as to prejudice the trial of an action. He must give them up to be held subject to his lien. In Ireland the law is practically the same on this subject as in England.

Scots Law.—In Scotland the term solicitor is so extensively used as almost to have superseded the old designation of writer. The legal expression is Law-agent. This includes Writers to the Signet, Solicitors before the Supreme Courts, and Procurators in the sheriff courts. They must have served five years as indentured apprentices to a law-agent (reduced to three years in certain cases), have passed examinations in law and general knowledge, and been admitted by the Court of Session. By the Law-Agents Apprenticeship (War Service) (Scotland) Acts, 1914 and 1919, periods of service with the forces, &c., in the Great War may be reckoned towards law-agents' apprenticeship. Writers to the Signet, &c., have still certain privileges not here necessary to be discussed. In all cases stamp-duties are paid on admission. Law-agents have a preference, in the nature of hypothec, over expenses of process, and also a

right, similar to solicitors' lien, to retain property in their hands.

See Cordery's *Law Relating to Solicitors*; Begg, *On Law Agents*; Bowstead, *On Agency* (7th ed. 1924); and E. B. V. Christian, *Solicitors, An Outline of their History* (1925).

Solidity. See MATTER.

Solidus, a Roman gold coin (see NUMISMATICS). The 'solidus aureus' was adopted by the Franks (at 87 to the Roman pound) till the time of Pepin, who suppressed it; but another solidus of silver, or 'solidus argenteus'—the $\frac{1}{20}$ th of the libra or pound—which had been used only as a money of account, was soon after made a coin. In later times this 'sol' or 'sou,' like all other coins, underwent an infinity of variations in fineness and value (see LIVRE). On the introduction of the decimal system (1793) into France the sou was abolished, and a piece of five centimes ($\frac{1}{20}$ th of a franc) substituted; but the name continued in common use, and the old sou was retained in circulation. The solidus also appears in the *soldo* of some parts of Italy, which was substantially the same as the sou. A trace survives in the s. of £ s. d.

Soliman. See SOLYMAN.

Solingen, a town of Prussia, situated 13 miles E. of Düsseldorf and not far from the river Wupper. Ever since the 12th or 13th century it has been famous for its steel and iron ware, especially for sword-blades, helmets, cuirasses, knives, scissors, surgical instruments, &c., which are exported to all parts of the world. Solingen has also iron-foundries, cigar-factories, &c. Pop. (1925) 52,002.

Solipsism (Lat. *solus*, 'alone'; *ipse*, 'self'), a philosophical term denoting in *ethics*, according to its first usage, by Kant, moral egoism, self-seeking, making one's own self the end of all one's actions; in *metaphysics* the doctrine that the self and the self's ideas are all that exists; in *epistemology* the theory that knowing being a subjective process, what is known must always be either the self or some modification of the self; negatively that nothing can be known except the self and its modifications or states; in *methodology* such principles as that in an inquiry a distinction must be drawn (a) between the individual's own experience and that of others, the testimony of others being excluded, and for each individual his own sense-data being the only evidence admitted (see Bertrand Russell, 'Sense-data and Physics' in his *Mysticism and Logic*, 1918); or (b) between actual phenomena and hypothetical entities assumed as causes or grounds for phenomena (see Hans Driesch in his *History and Theory of Vitalism*, 1914). The ethical Kantian use is not now current. In its metaphysical and epistemological senses the word really signifies an extreme form of subjective idealism. And properly the term cannot be applied to theories like Berkeley's, which, while denying the independent existence of an external material world, yet allow that some reality in addition to the individual subject exists. See s.v. 'Solipsism' in *Dictionary of Philosophy and Psychology* (ed. Baldwin), and in *Encyclopædia of Religion and Ethics* (ed. Hastings).

Solis, JUAN DIAZ DE, Spanish navigator, was born at Lebrija, between Cádiz and Seville, near the middle of the 15th century. He was sailing along with Pinzon when the latter discovered (1499) the mouth of the Amazon. In 1515 he himself was sent out, in command of three ships, to find a sea-passage through the American continent that should lead to the East Indies. This led to his discovery of the Paraná (i.e. the Río de la Plata). But he suffered himself to be drawn into an ambushade by the warlike Charruas, who dwelt on its banks, and was killed by them (1516).

Solitaire (*Pezophaps solitarius*), a bird allied to the dodo, and like it now exterminated. It lived on the island of Rodriguez, and was described by Leguat, a Huguenot refugee, who in 1691 settled with a small colony on the island. In his *Voyages et Aventures* Leguat describes the solitaire as a large bird, the male sometimes weighing 45 lb.; taller than a turkey, the neck a little longer in proportion, and carried erect; the head of the male without comb or crest, that of the female with something like a widow's peak above the bill; the wings small, and the bird incapable of flying, but using the wings to flap itself or to flutter when calling for its mate, or as a weapon of offence or defence; the bone of the male's wing thickened at the end so as to form a round mass about the size of a musket-bullet; a roundish mass of feathers instead of a tail; the plumage very full and beautiful. On open ground it could be outrun by a man; and its flesh was very good to eat. In 1865 Newton visited Rodriguez and discovered abundant remains of the solitaire; since then more skeletons have been discovered, and the osteology of the bird is now well known. The figure here given is derived from a rude cut in Leguat's work.



Solitaire
(*Pezophaps solitarius*).

See Strickland and Melville, *The Dodo and its Kindred* (1848); also Newton's *Dictionary of Birds* (1897).

Sollum, a small town on a gulf of the same name in the north coast of Africa, in the north-west corner of Egypt towards Tripoli. It was occupied by an Anglo-Egyptian force on the Italian occupation of Tripoli in 1911.

Solmisation. See SOLFEGGIO.

Solmona. See SULMONA.

Solo, in music a voice or instrument that is to perform alone or in a more prominent manner, as *soprano solo*, *violin solo*; also a composition for a single instrument accompanied.

Sologne, a sandy, unfertile, rye-growing region (*secalaunia*, from Lat. *secale*, rye) in north-central France, on the upper basin of the Loire (Loiret, Loir-et-Cher, Cher); see FRANCE.

Sologub, FEDOR, pseudonym of Fedor Kuzmich Teternikov, Russian writer, born in 1863, and educated at St Petersburg. He wrote many tales, fables, fairy-tales, and poems, some of which (*The Created Legend*, *The Little Demon*, *The Old House*, &c.) have been translated into English.

Solomon (Salomon, Salomo, Suleimán, Solyman; Heb. Shēlōmō, from *shalōm*, 'peace,' and so meaning 'the Peaceful,' like Ger. Friedrich), the second son of David and Bathsheba, successor of the former on the throne of the Israelitish kingdom for forty years (c. 970-933 B.C.). See JEWS, Vol. VI. p. 331. In later Jewish and Mohammedan literature Solomon appears not only as the wisest of men, but as gifted with power to control the spirits of the invisible world. As the builder of the Temple his name is much quoted in the literature of Freemasonry (see FREEMASONS). For the so-called Song of Solomon, see CANTICLES; for the other biblical works long attributable to Solomon, see BIBLE, ECCLESIASTES, PROVERBS. The *Wisdom of Solomon*, one of the books of the Apocrypha (q.v.) makes a claim, real or hypo-

thetical, to have been written by Solomon, but from internal evidence it is obviously the work of an Alexandrian Jew, written in the period 150–50 B.C. The book is a hymn in praise of Wisdom—the Wisdom of Proverbs (q.v.), but containing approximations to the doctrine of the Logos (q.v.), and combines the ethical doctrine and speculation of the Hebrews with Platonic and Stoic philosophy. There are commentaries on it by Gregg (1909) and Goodrick (1913). The *Psalms of Solomon*, also called the Psalms of the Pharisees, were apparently written in Hebrew by a Pharisaic Jew in Jerusalem about 70–40 B.C., and are a protest against modern corruptions. They are an imitation of the canonical psalms, and of interest for their Messianic passages (see Gray in Charles, *Apocrypha*, vol. ii., 1913). Later still are the *Odes of Solomon* (edited by Rendel Harris), consisting of forty-two mystical hymns, part Christian and, possibly, part Jewish; they were known to the Gnostic book *Pistis Sophia*. See Moncre D. Conway, *Solomon and the Solomonian Literature* (1900).

Solomon Islands, an archipelago 500 miles E. of New Guinea, stretching SE. in two parallel chains for 600 miles towards the Santa Cruz group. The north-eastern chain embraces Bougainville, Choiseul, Ysabel, and Malaita; the south-western Vella Lavella, Kulambangra, New Georgia, Guadalcanar, and San Cristoval. Besides these, which vary between 70 and 110 miles in length, and are 20 to 30 in width, there are a number of smaller ones. They have a total estimated area of 15,000 sq. m.; are nearly all of volcanic formation, there being two active volcanoes and several quiescent and extinct volcanoes; and are covered from the seashores to the summits of the highest mountains (10,000 feet in Bougainville, 8000 in Guadalcanar, 4100 in San Cristoval) with dense tropical vegetation. There is an extraordinarily heavy annual rainfall, estimated by Dr Guppy at 400 and even 500 inches on the mountains, and 150 on the coasts. The atmosphere is consequently very moist; and the temperature ranges from 75° to 95° F. The people, believed to number about 200,000, show decidedly Papuan or Melanesian characteristics; they are divided into a great number of tribes, constantly at war with one another, and are very suspicious towards strangers. Cruel and savage, they indulge in cannibalism, wear little or no clothing, and tattoo their bodies. Their religion is a kind of ancestor-worship, with attendant mysteries. Totem castes exist on Guadalcanar and some others of the islands. Yams, vegetables, and the coconut are the principal productions used for food. The fauna of the islands includes a phalanger (cuscus or flying-fox), bats, gigantic rats and frogs, very large and very brilliant butterflies. This group was discovered by the Spaniard Mendaña in 1567. Then for two hundred years it was never visited by Europeans, and was virtually rediscovered (1767–88) by Carteret, Bougainville, Surville, Shortland, and other navigators. Bougainville and Buka (formerly German) are under Australian mandate; the rest form a British protectorate.

Solomon's Seal (*Polygonatum*), a genus of Liliaceæ, differing from *Convallaria* or *Lily of the Valley* (q.v.) chiefly in the cylindrical tubular perianth, and in having the flowers jointed to their flower-stalks. There are three British species. The Common Solomon's Seal (*P. multiflorum*) is found in woods and copses in many parts of England and in a few places in Scotland. It has a stem about two feet high, the upper part of which bears a number of large, ovate-elliptical, alternate leaves in two rows. The flower-stalks are generally unbranched; the flowers not large, white,

and drooping. The roots are knotty, and a transverse section of them reveals characters which the fanciful have imagined represent the impress of the famous seal of Solomon, to which very ancient legends attributed magical properties; the appearances on the cut root being variously described as looking like the 'marke of a seale,' like the magical Pentacle (q.v.), or like

Hebrew letters. The Narrow-leaved Solomon's Seal (*P. verticillatum*) is a rare British plant, only found in a few places in Scotland and England. The leaves are whorled. The Angular or Sweet-smelling Solomon's Seal (*P. anceps* or *officinale*) is also rare in Britain, and is found only in England. It more nearly resembles the Common Solomon's Seal, but is smaller, and has greenish, fragrant flowers. All these species are com-



Angular-stemmed Solomon's Seal (*Polygonatum officinale*).

mon in many parts of Europe. They are very similar in their properties. In America there are *P. giganteum*, 2 to 7 feet high, and a smaller *P. biflorum*. The young shoots of *P. officinale* are eaten by the Turks like asparagus. The root is white, fleshy, inodorous, with a sweetish, mucilaginous, acrid taste. It contains *Asparagin*. It is a popular application to bruises, to prevent or remove discoloration, and its use is well known to those who are too apt to get a black eye now and then. A kind of bread has been made of it in times of scarcity. The berries are emetic and purgative.

Solon, the famous lawgiver of ancient Athens, was born probably about 640 or 638 B.C., and died about 558 or 559. His father, Execestides, who traced his descent from the royal family of Attica, had squandered an ample fortune. His son became a trader, an occupation which at once brought him wealth and opened up rich stores of observation and experience to his inquiring mind. Doubtless to the wide extent of his travels must be ascribed that unprejudiced political genius by which he was to create a constitution such as had never existed in the world before. He was known also as a writer of graceful and amatory verses, but later his muse soared to a higher strain and sang the triumphs of his legislation and the blessing of the gods on his reforms. One of the finest of his elegies owes its preservation to its being quoted by Demosthenes in his *De Falsa Legatione* (sects. 286–289), 'to show (as he says) how Solon hated fellows like Æschines;' several quotations—one of twenty lines otherwise unknown—occur in Aristotle's *Constitution of Athens* (first edited from a papyrus acquired by the British Museum, by F. G. Kenyon, 1891). The Megarian war (610–600) saw the occasion of Solon's first political achievements. The sarcasms of his stirring Tyrtaean verse induced the desponding Athenians to continue the struggle, and Solon was placed at the head of an expedition to Salamis. Suddenly landing there, he drove out the Megarian garrison, and won the 'lovely island' for Athens; finally the dispute was settled by the arbitration of Sparta in favour of Athens. No story of antiquity is better known than that which tells how Solon attempted to

influence the award by the insertion of a line in the *Iliad* (ii. 558), which speaks of the Salaminian Ajax ranging his ships with the Athenians. Solon's influence, already wide, was increased by the strong position he took up a little later in behalf of the Delphic oracle against its oppressors. But the unholy murder of Cylon still rested as a stain upon Athens; Nisæa and Salamis were again lost; and superstitious fears took hold of the people.

But the distress of Attica was not so much religious as economic. The particular grievance which brought matters to a head was the law of debt. The want of a middle class made the contrast between the opulence of the nobility and the indigence of the poor more glaring. A desperate conflict was imminent, when in 594 both parties concurred in inviting the poet and devoted patriot, Solon, to assume the archonship and pacify his distracted country. 'It is not the will of the gods that our city should perish,' sang the poet in noble numbers; 'it is the desire of gain which will bring us to ruin; the thoughts of our leaders are not honest, and their greed will bring great evils upon them. Many of the poor go into foreign lands, sold as slaves, and burdened with shameful bonds.' His first measure was the famous *Seisachtheia*, and the remedy was severe. A limit was placed on vast accumulation of lands, the person of the debtor was safe whatever his obligations, mortgaged land was restored, debts were cancelled. The reform of the money-standard was made, not to assist debtors by reducing their debts (73 of the old drachmas were recoined into 100 of the new), but to simplify trade with Asia Minor and open up new fields for Athenian enterprise. Then the poet sang the end of his labours: 'Many citizens who had been sold into slavery I brought back to Athens their home; some of them spoke Attic no longer, their speech being changed in their many wanderings. Others who had learned the habits of slaves at home, and trembled before a master, I made to be free men. All this I accomplished by authority, uniting force with justice, and I fulfilled my promise.' On laying down office at the end of the year he was requested to reform the entire political constitution of Athens. Solon's object was to destroy the power of the *Gentes*, and give the poorest class some control over the officers and the law. On the division of the people into four classes, rated according to income, a division which our latest authority, the *Constitution of Athens*, assigns to Draco, his reforms were based. The first class (*Pentakosiomedimnoi*) were such as possessed an annual income of not less than 500 *medimni* of corn, the second class (*Hippeis*) were rated at 300, the third (*Zeugitai*) at 200, the fourth (*Thêtes*) consisted of all below the *Zeugitai*.

On each of the four certain duties were imposed. The three highest provided the land army of Attica, while the *Thêtes*, as rowers in the triremes, formed the most important part of the navy, one day to prove the salvation of Greece and the mainstay of the Athenian empire. The chief offices of state were restricted to the *Pentakosiomedimnoi*; the second and third classes were eligible for minor functions. If the *Thêtes* were not admitted to office, their inclusion in the Attic tribes or *phylæ*, their new right of sitting in the Assembly, electing the public magistrates and passing sentence on their conduct at the end of their year of office, made them practically the sovereign power in the state; and Aristotle traces the swift development of Athenian democracy to the judicial powers received from Solon. The *Boulê* of 400, another of the great lawgiver's creations, was formed by the election of 100 members from each tribe, and took the place of Draco's council of 401, of which we first learn also in the *Aristotelian papyrus*. The democratic tendency of Solon's Council proved by

its subsequent history was perhaps accidental. The Areopagus continued as before to be the guardian of the laws and public morals; it decided also on all grave criminal cases. If he did not originate it, Solon saw the wisdom of preserving and strengthening a body which, by its nature, comprised the best representatives of the highest class of citizens. 'It was,' says *Æschylus*, 'the bulwark of the land and city, the like of which no man had seen either in Scythia or in the island of Pelops; a council incorrupt, awful, and severe; a watchful guardian over those who slept.' The last of his political reforms was the institution of the *Heliea* or popular court of law, the members of which were men of more than thirty years of age chosen annually by lot from every class. The object of its creation was to serve as a balance to the Areopagus, whose judicial supremacy might go too far in the interests of the aristocracy who composed it.

The laws of Draco were not suited to a more civilised age; not only was the severity of punishment for infringement out of all proportion to the offence, but Draco's conception of law appeared inadequate to the comprehensive views of Solon, to whom the function of law was contained not less in directing the citizen's most intimate relations and arrangements than in the guidance of his political and public conduct. Solon's regulations ranged over every province of life. All Draco's laws were repealed except those relating to murder. A limit was placed on the quantity of land that might be held in Attica; no citizen could be enslaved for debt, and absolute freedom in bequeathing property was ensured to any citizen who died childless. Arbitrary power of fathers over their children was restrained and arbitrary disinheritance forbidden. Any citizen who maintained neutrality in a sedition lost his civic status. The Areopagus was empowered to deal severely with luxury in food and dress. No woman might leave home with more than three changes of clothing, or with a basket of more than a cubit's length, and excessive wailing at funerals was forbidden. The laws, inscribed on wood, were placed in the Acropolis, whence they were removed to Salamis during the Persian wars.

The later years of Solon belong more to legend than to history. We are told that he left Athens for ten years, after binding the Athenians by oath to observe his laws till his return. His travels took him far afield. Cyprus, Asia Minor, and Egypt, probably the scenes of his early career, were revisited. Historical investigation may deny the possibility of a dialogue between Solon and Cræsus, but cannot spoil the charm of a story which Herodotus has rendered immortal. The king, then at the height of his prosperity, was said to have asked him who was the happiest man in the world, expecting to hear himself named. Solon first mentioned Tellos, an Athenian who had died for his country at Eleusis. Nor could Cræsus obtain the second mention in the ranks of the happy; that place was assigned to two Argive youths, Cleobis and Biton, to whom the gods had given to die in their sleep as the reward of an act of filial piety. The wrath of Cræsus at the moment was unrestrained, but bitter experience taught him to appreciate the wisdom of Solon, and 'to account a prosperous man happy only when he ended his life as he began it.' Solon's meetings with Anacharsis and with Thales, one of the seven wise men like himself, were among the moral apologues of the ancients. The last years of Solon were passed at Athens, where the wild conflict of parties disturbed the application of the new constitution. He saw the failure of his plans with the deepest distress. His suspicion of his kinsman Pisistratus was justified by the issue. Again he

entrusted his warnings to elegiac verse: 'Fools, ye are treading in the footsteps of the fox; can ye not read the hidden meaning of these winning words?' The protest was in vain; Pisistratus seized the government. The opposition of Solon continued; undeterred he laid down his arms before his door, and called heaven to witness that he had stood by his country. Retiring into private life he died soon after the usurpation of Pisistratus, with the last injunction that his ashes should be scattered over the island of Salamis, the 'lovely island' which had been the scene of his earliest exploit.

Solon died the subject of a despotic monarch. His labour might seem wasted, but its eclipse lasted only for a season, and even during the years of the tyranny of Pisistratus its influence was strong. Morally and politically a power among his countrymen, Solon saw that to imprison men in a relentless political machine like Lycurgus, and to humble a refined aristocracy beneath a proletariat without political training, were policies equally dangerous. His constitution was a graceful compromise between democracy and oligarchy. 'He would have men equal before the Goddess of Justice, though not in the councils of the state,' says Mr Adcock. As it happened, his reforms proved a stepping-stone towards democracy. In poetry he represents a high Ionian type; as a traveller and a soldier his experience of men was large. In the higher realms of constructive statesmanship he rivals the greatest legislators not only of Greece but of the world.

See Lehnman-Haupt, *Solon of Athens* (1912); Linforth, *Solon the Athenian* (with poems and commentary, 1919); Adcock in *The Cambridge Ancient History*, vol. iv. (1926), chaps. ii., iii.; the standard histories of Greece; and the various editions and translations of Aristotle's *Constitution of Athens*, and of Plutarch.

Solor Islands. See TIMOR.

Solothurn. See SOLEURE.

Soloviev, VLADIMIR (1853-1900), the 'first Russian philosopher,' was born at Moscow, son of Sergei Soloviev (1820-79), historian of Russia. He wrote *Justification of Good* (trans. 1918), &c. See study by Séverac (1912).

Solstice (Lat. *solstitium*, from *sol*, 'sun,' and *sto*, 'I stand'), that point in the ecliptic at which the sun is farthest removed from the equator, and where it is consequently at the turning point of its apparent course. There are two such points in the ecliptic, one where it touches the tropic of Cancer, the other where it touches that of Capricorn. The former is the summer, and the latter is the winter solstice to those who inhabit northern latitudes, and *vice versa*.—The term is also employed to signify the time at which the sun attains these two points in its orbit, the 21st of June and about the 21st December.

Solution, a homogeneous mixture of two or more substances, which are not separated into constituents by mechanical means without altering the state of one of the substances, and whose properties vary with the properties of the constituents. According to this definition it is possible to have a solution of a solid in a liquid, a solid in a solid, or a liquid in a liquid. The substance dissolved is termed the solute and the substance in which it is dissolved is termed the solvent. The solubility of different substances in various solvents differs within wide limits, but it is usually increased by rise of temperature and by increase of pressure. In the case of crystalline bodies there is a limit of solubility for a given temperature, and when that limit is reached the solution is said to be saturated at that temperature. In the case of liquids there are many examples of mutual solubility—e.g. if water and ether are shaken together and allowed to stand, they separate into two layers, the upper one con-

sisting of ether with dissolved water, and the lower one of water with dissolved ether. When a solid is dissolved in a liquid, heat is absorbed as a rule, the exception being in those cases where chemical action takes place between the solvent and the solute, when heat is given out. The freezing-point of a solution is always lower than that of the solvent, whilst the boiling-point is higher, the differences in both cases being directly proportional to the concentration of the solution. If the molecular weight in grams of any non-electrolyte is dissolved in a litre of water the depression of the freezing-point is a constant; if, however, the solute is an electrolyte, then the depression is always greater than theory demands; a similar difference is noted in the boiling-points. The explanation generally accepted by chemists of this anomalous behaviour of electrolytes, is that an electrolyte on solution in water splits up into separate particles termed ions, and that up to a point the ionisation increases with dilution—for example, if salt is dissolved in water it is no longer salt but ions of sodium and chlorine. This theory is known as the ionic theory, and whilst it explains most of the phenomena of solution there are cases where it fails.

Solutrean. See STONE AGE.

Solway Firth—in its upper part best regarded as the estuary of the river Esk, in its lower as an inlet of the Irish Sea—separates the north-west of Cumberland from the south of Scotland. Its entire length, until lost off Balcarry Point in the Irish Sea, is 36 miles; its breadth for the first 13 varies from $1\frac{1}{2}$ to $8\frac{1}{2}$ miles, but afterwards it gradually, although irregularly, increases to 22. The principal rivers flowing into it, besides the Esk, are the Annan, Nith, Dee, and Urr from the north or Scottish side, and the Eden and Derwent from the south or English side. The most striking feature of the Solway Firth is the rapidity with which its tides ebb and flow. The spring-tides are peculiarly swift and strong—the bore rushing in from 3 to 6 feet high, and at the rate of 8 to 10 miles an hour, occasionally inflicting serious damage on the shipping; while after it has retreated great stretches of the bed of the firth are left bare, and in some places one can even cross over from the English to the Scottish shore. The salmon-fisheries of the Solway are valuable. Near Annan the Solway is spanned by a railway viaduct, 1960 yards long, which, originally constructed in 1866-69 at a cost of £100,000, was almost destroyed by floating ice in January 1881, but was reopened to traffic in 1884. Scott paints the scenery of the Solway Firth in both *Guy Mannering* and *Redgauntlet*.

Solway Moss, a district of Cumberland about 7 miles in circumference, lying west of Longtown, and immediately adjoining Scotland. As its name implies, it was once a bog, but it is now drained and cultivated. It is historically notable as the scene in November 1542 of the rout of a Scottish host under Oliver Sinclair by a handful of English borderers under Thomas Dacre, the 'Bastard of Lanercost,' and Jack Musgrave of Bewcastle. Here, too, on 13th November 1771, an extraordinary disaster occurred. The boggy ground, surcharged with moisture—the effect of heavy rains—rose, swelled, and burst like a torrent, sweeping along with it trees and houses, and destroying some thirty small villages.

Solyman, or SULEIMAN II. (or I.), called 'The Magnificent,' the greatest of the Ottoman sultans, was born in 1496, and at twenty-four succeeded his father Selim I. His first care was to refund a large amount of property that had been unjustly confiscated, his next to remove incompetent and corrupt officials, and to begin a comprehensive scheme of

internal reform. But before this task was completed he led an army into Hungary, to extort the tribute that its king refused to pay him at his accession. He took Schabatz (Sabac), Semlin (Zemun), and Belgrade (1521), and left Turkish garrisons in them. Then he carried a very formidable army to attack the Knights of St John at Rhodes; they had beaten off a Turkish army with a loss of 25,000 forty years previously. On this occasion they inflicted a loss of nearly four times that number upon the Turks before surrendering (1523) after a six months' siege. The following three years were devoted by Solymán to the internal government of his domains. But in 1526 he again led a force of 100,000 men into Hungary, slew King Louis at Mohacs (29th August) and all but annihilated his army, and pushing on farther captured both Buda and Pesth. He was recalled by tidings of an outbreak in Asia Minor. By 1529, however, he was back again in Hungary, ostensibly as the supporter of John Zápolya, who claimed the crown of Hungary against Ferdinand of Austria. Ferdinand was turned out of Buda and driven back into Vienna, which city the sultan besieged (September to October). After delivering a desperate assault, which cost him 40,000 soldiers, he was obliged to retreat without taking it. Returning home he directed his arms against Persia, and conquered (1534) large portions of Armenia and Persia proper, including the strong cities of Tabriz and Bagdad. At the same time he sent out his fleets against the Christian powers of the Mediterranean, and his lieutenants (Barbarossa, Piyala, and others) conquered the whole of the north of Africa except Morocco—Egypt was his already. But Tunis was recovered by Charles V. in 1535. In 1542 the widow of John Zápolya appealed to Solymán to aid her son against Ferdinand. Solymán allowed the young prince to retain Transylvania, but Hungary he kept for himself. Six years later a truce was made between the Turks and imperialists, Solymán being left in possession of the greater part of Hungary and Transylvania, and being granted a yearly tribute of 50,000 ducats. In 1565 the fleet and army of Solymán sustained a severe reverse in an unsuccessful attempt to reduce Valetta, the headquarters of the Knights of St John in Malta. And in the following year, whilst besieging the small fortress of Szigeth in Hungary, the great sultan died (4th September). Solymán is equally renowned as a lawgiver and just ruler, as a patron of learning and an encourager of the fine arts.

Soma in Indian literature, Haoma in the *Avesta*, is the name of a drink, pressed (*su*, 'press out'; cf. *śu*) from a plant, and mixed with milk. The intoxicating qualities of the drink won it great popularity in Indo-Iranian times, but the Zoroastrian reform was hostile to this as to other aspects of nature-worship. In India, on the other hand, the Soma cult became of the highest importance; the effect of the drink on its votaries is effectively described in one hymn of the *Rigveda*: 'We have drunk the Soma; we have become immortal; we have won the light; we have won the gods. What can enmity do to us now? What the malice of mortals, o immortal?' Naturally the exhilaration caused by the drink led to its being treated as divine, and the god Soma appears already in the *Rigveda* as a most potent power, mighty to heal the sick, make the blind see, the lame walk. As Indra drinks deep draughts of Soma to strengthen him to win the rains from the demons who hold them back, so Soma as a god is a mighty warrior, who wins for his votaries cows, chariots, horses, gold, heaven, countless boons. Moreover, he is a guardian of natural order, supporter or creator of heaven and earth, and he inspires the poet to new songs. Nonetheless he is present and identified

with the drink or the plant; he grows on the mountains, but also he is brought down to earth by an eagle, perhaps the lightning. In the later Vedic period he is constantly identified with the moon, which is conceived as the heavenly receptacle of the Soma which the gods drink, an idea suggested in part by the waxing and waning of the luminary; the effort to show that this is an early idea may now be regarded as disproved. The theologians of the Brāhmanas allude to the drinking of Soma and the pounding of the stalks to obtain the juice as the eating and killing of the god; but this conception appears with them to be little more than a priestly fancy, not a vital popular belief. The use of substitutes for the real Soma is in this period frequently mentioned, whence it is probable that the true Soma grew only in the mountainous regions once inhabited by the Indo-Iranians. This may help to explain the fact that the cult, evidently extremely popular in Vedic times, plays no serious part in mediæval or modern Hinduism, though even now it is not entirely extinct. The plants now used by Brahmans of the Deccan, as also by Parsees of Kerman and Yezd and of Bombay, are species of Asclepiads, akin to the common milk-weed, but identity of any of these with the Vedic Soma is most improbable. As practised in later Vedic times, the Soma sacrifice is accompanied by an elaborate ceremonial, and an animal sacrifice forms an essential preliminary. Sixteen priests, with assistants, officiate; Soma shoots are purchased for a cow from a low-class vendor, who is then beaten from the place of sacrifice with sticks, doubtless a primitive dramatic ritual symbolising the acquisition of the plant from the demons who seek to hold it back. The shoots then are treated as embodying Soma the King; he is taken in state to the sacrificial hut, placed on a throne, offered the usual guest-meal of honour. The juice is obtained by pounding or pressing, and libations are made in the morning, at midday, and in the evening. The rite may be carried on for prolonged periods, and an essential feature is the drinking of the liquor, mixed with various ingredients, by the priests. The hymns used at the rite are in large part found in Book ix. of the *Rigveda*, which consists of hymns composed for the purpose of honouring Soma *pavamāna*, i.e. the Soma as it becomes clear.

See Eggeeling's trans. of the *Satapatha Brāhmana* (S.B.E., xii. and xxvi.); Macdonell, *Vedic Mythology*; Keith, *Religion and Philosophy of the Veda*.

Somaliland, an eastern projection of Africa, washed by the Gulf of Aden on the north and by the Indian Ocean on the south-east; the western boundary may be defined by a line drawn south from the Strait of Bab-el-Mandeb, through Harar to the river Jub or Juba. Besides this river the only considerable stream is the Webi-Shebeyli, which, however, does not reach the Indian Ocean, its waters being lost in the sands near the southern extremity of the region. The country is an undulating plateau, in very many parts parched and barren; though in the rainy seasons (two of two or three months' duration each) numerous swamps are formed. Game and wild animals—elephant, hippopotamus, lion, leopard, antelopes, water-buck, monkeys, ostriches, vultures, marabout storks, crocodile, &c.—are generally plentiful. The vegetation is on the whole arid. The nomad Somal, found also in the British colony of Kenya, have herds of camels, sheep, and oxen, and keep horses and goats. They are Mohammedans of Hamitic stock, closely akin to the Galla and the Abyssinians; but they are not a pure race, for there is a strong blending of Arab blood in them, with easily discernible traces of Negro. What trade there is in the natural products of Somaliland (myrrh

and frankincense, hides, ostrich-feathers, coffee, salt, &c.) finds an outlet through Berbera, Zeyla, and Jibuti.—**FRENCH SOMALILAND** (Côte des Somalis) has a population of 200,000. From the capital, Jibuti, which has superseded Obok, a railway runs to Dire Dawa and Addis Ababa in Abyssinia.—**THE SOMALI COAST PROTECTORATE** of Britain, which involved a troublesome military expedition into the interior against the Mullah Abdulla in 1902-4, extends from Ras (Cape) Jibuti, west of Zeyla, to long. 49° E., and includes the towns of Zeyla, Berbera, Bulhar, and Karam. Annexed by Egypt in 1875, this territory has been under British protection since 1884. An arrangement with Italy in 1894, and with Abyssinia in 1897, delimited the British protectorate (68,000 sq. m.; pop. 300,000). British posts were withdrawn from the interior in 1910. The Mullah held half of the protectorate in the Great War, but was overcome in 1920.—**The colony and protectorates of ITALIAN SOMALILAND** (140,000 sq. m.; pop. 400,000) consist of the coast region from near Bandar Ziyada to Cape Guardafui, and then to the Jub, with a hinterland acquired (1897-1908) by agreements with Abyssinia, and a strip beyond the Jub ceded by Britain in 1925. With British Somaliland it shared the troubles of the Mullah movement.

See F. L. James, *The Unknown Horn of Africa* (1888); Wolverton, *Five Months' Sport in Somali-land* (1894); Swayne, *Seventeen Trips Through Somaliland* (1895); Donaldson Smith, *Through Unknown African Countries* (1897); E. N. Buxton, *Short Stalks* (1898); F. B. Pearce, *Rambles in Lion-Land* (1898); Drake-Brockman, *British Somaliland* (1912); Jardine, *The Mad Mullah* (1923); and for the Somali (non-Bantu) language, the grammar and English-Somali dictionary of the Franciscans Larajasse and Sampont (1898); and Kirk's *Grammar* (1905).

Sombor. See ZOMBOR.

Sombrerete, a town of Mexico, 105 miles NW. of Zacatecas, famous for rich silver-mines; pop. 10,000.

Sombrero (Span. *sombra*, 'shade'), a broad-brimmed felt hat common in parts of America.—For Sombrerite, see APATITE.

Somers, SIR GEORGE (1554-1611), an English navigator, born at Lyme Regis, whose shipwreck on the Bermudas (q.v.) led to their colonisation from Virginia by him in 1611.

Somers, JOHN, LORD, Whig statesman, was born at Worcester, an attorney's son, on 4th March 1652, and in 1667 entered Trinity College, Oxford, in 1669 the Middle Temple, being called to the bar in 1676. Associated with the 'Country party,' he was one of the counsel for the Seven Bishops (1688), and from the Revolution onwards took a prominent part in politics, being returned for Worcester to the Convention parliament, and successively made Solicitor-general, Attorney-general, and Lord Keeper of the Great Seal, until in 1697 he became Lord Chancellor, and was raised to the peerage as Baron Somers of Evesham. He was William's most trusted minister, and as such was the object of frequent attacks, one of which in 1700 resulted in his being deprived of the seal, and another in 1701 in an impeachment by the Commons, rejected, however, by the House of Lords. He returned for two years to power as President of the Council (1708-10), and died of apoplexy, 26th April 1716. The *Somers Tracts* (16 vols. 1748), a valuable collection of state papers from his library, were re-edited by Sir Walter Scott (13 vols. 1809-15).

Somersby, a pretty village of Lincolnshire, stands on the Wolds, about 7 miles E. by N. of Horncastle and the same distance NW. of Spilsby, and is celebrated as the birthplace of Tennyson.

The rectory, in which he was born, is an ordinary country parsonage, not without touches of picturesque-ness.

Somerset, DUKES OF. See SEYMOUR. For Robert Carr, Earl of Somerset, see OVERBURY.

Somerset House, London, fronting both on the Strand and on the Thames Embankment, stands on the site of a palace built by the Protector Somerset about 1549, which fell to the crown on Somerset's execution. The original edifice was pulled down and rebuilt in 1776-86 after designs by Sir William Chambers, in the Palladian or Italian style. The building accommodates the offices of the Inland Revenue, Wills and Probate, the Registry-general of Births, Deaths, and Marriages for England and Wales, and other departments.

Somersetshire, an important maritime county in the south-west of England, is bounded on the N. and W. by the Bristol Channel (the ancient 'Severn Sea'); by Gloucestershire, Wiltshire, and Dorsetshire on the NE. and E.; and by Devonshire on the S. and SW. In form oblong, with a length of some 80 miles and a breadth of 36, it has an area of 1620 sq. m. Pop. (1801) 273,577; (1891) 430,050; (1911) 458,025; (1921) 465,682. The surface is exceedingly diversified, with every variation from lofty hills and barren moors to rich vales and wide marshy levels, whence the sea is banked out by an elaborate system of dykes and sluices. The frontier between Somerset and the adjacent counties consists for the most part of a broken and picturesque hilly district. Sundry ranges of hills, running east and west, give to the county its leading physical characters. Chief of these is the Mendips (q.v.), which stretch from near the city of Wells to the coast at Brean Down, with a seaward continuation in the islets of the Steep and Flat Holms. South of the Mendips lies the great alluvial plain of central Somerset, broken by the line of the Polden Hills, which rise from the marshy levels like a long low island some 300 feet. Still farther south, beyond Taunton, are the Black-down Hills, about twice this elevation, and continuing eastward into the broken upland which once formed part of the ancient forest of Selwood, where Somerset, Wilts, and Dorset meet. To the north-west of Taunton, bordering Bridgwater Bay, are the Quantock Hills, rising at Will's Neck to 1262 feet; and west, again, is the wild district of Exmoor Fores (q.v.), partly in Devon, but mainly in Somerset. At several points on the inland borders heights of between 800 and 1000 feet are attained. The only two rivers of commercial importance in Somerset originate elsewhere. The Bristol Avon, which forms the boundary of the county for many miles, rises near Badminton in Wilts, and enters Somerset near Bath. The Parret rises near South Perrot in Dorset, and drains the middle of the county: it is tidal to beyond Bridgwater, and is one of the streams possessing a tidal 'bore.' These two rivers with their feeders discharge the bulk of the waters of the county. Between them the chief independent streams are the Axe and the Brue, south of the Mendips, and the Yeo, north. The Exmoor district is drained by the Exe, which falls into the sea at Exmouth, and by the Devonshire Axe, which rises, however, in Dorset.

The geological features of the county are singularly varied, ranging from Devonian upwards. Carboniferous strata occupy a wide area in the north, east, and centre, and are worked for coal in the Radstock and Nailsea basins of the Bristol coal-field; while the mountain-limestone is largely developed in the Mendips and near Bristol, where it is traversed by the magnificent gorge of the Avon. Oolitic rocks stretch along the east of the

county from Yeovil to Bath, and in the neighbourhood of the latter city are extensively worked for the production of the well-known Bath building-stone; while other beds are wrought at Doulting and Ham Hill. Liassic rocks are well developed, chiefly in the central region, though in somewhat scattered fashion. Triassic rocks occupy a very wide area in the west of the county, ranging with breaks from Wellington to Bristol; and there is Greensand on the extreme south-west. Extensive caverns in the limestone of the Mendips have yielded abundant remains of prehistoric mammalia, with relics of their human contemporaries. The Mendip mining area is one of the oldest in the kingdom, for lead was raised there before the advent of the Romans, and the iron ores of the Brendon Hills, on the eastern flank of Exmoor, were also worked at a very early date.

The agriculture is mainly pastoral, the proportion of tillage to grazing and dairy-farming being small, though the low lands generally are exceedingly fertile—the fertility of the valley of the Tone, near Taunton, having passed into a proverb. Even this is exceeded by the luxuriance of the marshy meadows of the Bridgwater Level, which are, however, liable to be flooded, and are maintained against the sea at considerable expense. The orchards of Somerset are second only to those of Devon in area and importance, and cider is largely made; while Cheddar cheese has a national reputation. Manufactures maintain considerable importance, particularly in textiles (chiefly woollens), potteries, paper-making, and gloving; and though the city lies mainly on the Gloucestershire side of the Avon, and is a county to itself, Somerset may fairly claim a share also in the commercial importance of Bristol (q.v.).

The bone-caves of the Mendips have supplied evidence of the presence in Somerset of neolithic as well as palæolithic man; and there is abundant evidence of the occupation by strong and comparatively civilised tribes prior to the Roman invasion in the remains of important hill fortresses (Hamdon, Castle Neroche, Dolbury, Maesbury, Worlebury, Cadbury), while the megalithic circles and other remains at Stanton Drew are among the most interesting in the kingdom. Immediately prior to the Roman invasion under Claudius the north of the county was inhabited by the Belgæ, while the territory of the Dumnonii seems to have extended over the Devon border to the marshy and central district, which probably formed a strong natural frontier, though there is evidence that part of this area had been embanked against the sea in pre-Roman times. The Mendips must, however, have formed part of the earliest Roman conquest, as pigs of lead have been found there bearing the names of Claudius, Britannicus, and Vespasian. Somerset became one of the chief seats of Roman civilisation in Britain. Bath (q.v.), as the city of *Aquæ Sulis*, was a centre of refinement and luxury. The remains of the baths built by the Romans for the reception of the famous mineral waters are among the most important relics of the Roman period in England. But the impress of the Roman has been left in nearly every part of the county—in villas, roads, pottery kilns, interments, and coins; while Ilchester, like Bath, was a Roman city. Tradition claims for Glastonbury (q.v.) the honour of being the first seat of Christianity in Britain. Under the Saxons the district became known as the home of the Somersætan, and took its present name, the origin of which is disputed. Part first came under Saxon sway in 658, but its inclusion in Wessex was not complete until 710, when Gerente was defeated by Ine, who made Taunton (q.v.) his chief fortress, and founded the cathedral of Wells (q.v.), which became the seat

of the bishopric of the Somersætas (since Bath and Wells) in 909. Somerset was the last home of Saxon freedom when Alfred took refuge at Athelney, defended by trackless marshes. It was at Wedmore that Alfred made his treaty with Guthrum, though the claims of Edington to be the Æthandune where he won his most memorable victory are doubtful. In the wars of the Roses Somerset was in the main Lancastrian; in the wars of the Commonwealth it was chiefly parliamentarian, and the stout defence of Taunton first made famous the name of Admiral Blake. The county was also the centre of Monmouth's operations; and it was chiefly Somersetshire men who fell at Sedgemoor (1685). The county has two cities—Bath and Wells; a parliamentary borough in Bath (Taunton also till 1918); an important manufacturing port in Bridgwater; one of the finest watering-places on the western coast in Weston-super-Mare; manufacturing towns in Frome, Yeovil, Shepton Mallet, and Wellington; and six county parliamentary divisions.

See Collinson, *Somerset*; Phelps, *Somerset*; Rutter, *Delineation of the N.W. Division of Somerset*; *Proceedings of Somersetshire Archaeological and Natural History Society*, and of Bristol University Spelæological Society; Jeboult, *W. Somerset*; Pulman, *Book of the Ace*; Eytton, *Somerset Domesday*; Hugo, *Medieval Nunneries of Somerset*; Martin, *Somerset*; F. J. Snell, *Memorials of Old Somerset* (1906); the 'Victoria History' (1906 et seq.); E. J. Burrow, *Ancient Earthworks and Camps of Somerset* (1924); and books cited in the articles on Bristol, Bath, Taunton, Wells, Glastonbury, and other towns.

Somers' Islands. See BERMUDAS.

Somerville, a city of Massachusetts, a suburb of Boston, 2 miles from the central station. It has many handsome residences, contains tube-works, bleaching-works, and large slaughter-houses, and manufactures also flour, leather, iron, oil, bricks, &c. Pop. 93,000.

Somerville, MRS MARY, a lady famed for her mastery of mathematics and physical science, was the daughter of Admiral Sir William Fairfax, and was born on 26th December 1780 at Jedburgh in the manse of her uncle and future father-in-law, Thomas Somerville, D.D. (1741–1830), the author of *My own Life and Times*. She was brought up at Burntisland and Edinburgh, amid somewhat narrow family circumstances. It was in an algebraic sum in a magazine of fashions that she first made acquaintance with the subject that most engrossed her attention in after-life. In 1804 she married a cousin, Captain Greig, of the Russian navy, Russian consul in London. He died in 1806, and it was not till her return north as a widow that she was free to buy the books she wanted, and to study the subject that most interested her. In 1812 she married another cousin, Dr William Somerville, inspector of the army medical board, who entered warmly into all her ideas. They removed to London in 1816, where Mrs Somerville went much into society, and became known as possessed of scientific interests and gifts. In 1823 she was invited by Lord Brougham to try to popularise for the English public Laplace's great work, the *Mécanique Céleste*; and the *Celestial Mechanism of the Heavens* (1830) was received with the greatest admiration. Mrs Somerville was awarded a royal pension of £300 in 1835. Other works by her were *The Connection of the Physical Sciences* (1835), *Physical Geography* (1848), and *Molecular and Microscopic Science* (1866). Mrs Somerville, who for many years resided in Italy, died at Naples, 29th November 1872. An autobiography, edited and supplemented by her daughter, was published in 1873. After her is named Somerville College for women at Oxford (1894; founded as Somerville Hall 1835).

Somme, a river of northern France, rises not far from St Quentin in the dept. of Aisne, flows in a south-west, then north-west direction, and after a course of 150 miles falls into the English Channel not far from St Valery. It is navigable for vessels of 300 tons up to Abbeville (q.v.), and its upper course is canalised. See WAR (GREAT).—The department of Somme, in the north of France, formerly part of the province of Picardy, touches the English Channel on the north-west. Area, 2443 sq. m. The dept. is level, very fertile, and amongst the best cultivated districts of France. Much cider is made and poultry reared. The textile industries (wool, cotton, linen, hemp, silk spinning, and the weaving of mixed stuffs, cloth, velvet, carpets) give the principal mechanical employments; but there are also large iron-foundries, lock, soap, candle, chemical, paper, and beet-root sugar factories, distilleries, and breweries. There are the five arrondissements of Abbeville, Amiens, Doullens, Montdidier, and Péronne; chief town, Amiens. Pop. (1872) 557,015; (1921) 452,624.

Somnambulism (Lat. *somnus*, 'sleep,' *ambulo*, 'I walk') is a disorder of sleep. It is symptomatic of more or less activity in some of the psychical and motor areas of the brain, while the centres that preside over consciousness are slumbering soundly. There are different forms, as sleep-crying, sleep-talking (somniloquy), and sleep-walking. These all involve sensori-motor acts.

Sleep-walking is closely related to hysteria, and it occasionally alternates with this and allied diseases. It occurs mostly in youth, affecting males and females in almost equal proportion; commonly, although not invariably, it disappears when adult age is attained. It is met with chiefly in persons of nervous temperament, and in those who have an inherited proclivity to neurotic disease. The exciting causes embrace mental excitement, overwork, fright, bodily fatigue, hepatic and digestive disorders, worms, and an overloaded bladder, and in females uterine and ovarian troubles. Sleep-walking is one of the neuroses of deep sleep. It occasionally presages graver maladies; generally these may be prevented by suitable treatment. It is important to recognise that it is a pathological state, and that no one who is in perfect health walks in his sleep. Sleep-walking is an acted dream, which generally supervenes when sleep is deepest—often during the first deep sleep. The dreamer usually stages it so precisely that he is able to act it with admirable exactness. In the first visitation the dream may be simple, and merely impel the sleeper to rise from bed to walk round the room and then return to bed. Eventually the dreams become more elaborate, and may embrace many complex operations, in which the individual has to elude articles of furniture, unlock doors, open windows, walk along dangerous roofs, or beside the edge of precipices—in short, perform feats he could not possibly execute in his waking moments. Sleep-walkers have achieved the most diverse exploits without awaking. They have swum across rivers, thrashed corn, ridden on horseback, and even transacted their usual daily work. They are oblivious to danger, and untrammelled by fear; this, combined with an exaltation of muscular sense, enables them to effect their movements precisely and quickly. Their feats, however, are sub-conscious, and not, as is popularly supposed, superhuman. Their senses, which are not connected with the dream, slumber; they do not see, hear, or smell, so they perform with their eyes shut as well as open, and they may be shaken, and may themselves cough and sneeze without being awakened. A certain degree of anaesthesia appears to render them insensitive to

pain. After the dream-act is ended the sleeper returns to bed, to sleep until the usual hour for rising, and when he awakes he either does not recollect anything about his escapade, or remembers it only as a dream. Most frequently he recollects it in a subsequent sleep-walk, just as some dreams are only remembered in recurring dreams. Sleep-walking leads the actor into situations which endanger life, and deaths are frequently recorded from fatalities arising thus. If the sleep-walker be awakened at a critical moment, coolness and precision are replaced by agitation and fright, movements become halting and clumsy, and accident usually follows. Many tragedies have been enacted in this state, and these are of great forensic interest. From every point of view sleep-walking is a source of much anxiety to the afflicted and his relatives.

A sleep-walker found in his wanderings ought not to be awakened, but led back to bed as gently as possible. Abrupt awakening may give rise to shock, and may mark the onset of grave nervous disorders. Whilst it is always advisable to seek medical advice, it may be indicated that the general health should be attended to, so that it may be improved; and all exciting causes should be remedied or avoided, as, for example, all undue excitement and fatigue of mind and body. The sleeping conditions require consideration; in some cases it is advisable that some one should sleep in the same room. Occasionally, it is advantageous to awaken the sleeper at the end of the first hour of sleep, when it is deepest, to prevent it becoming too profound. Hypnotism is sometimes called artificial somnambulism. See the works and articles cited at SLEEP.

Somnath (Pattan), an ancient town of Gujarat, in India, is situated on the south-west coast of the peninsula of Kathiawar, with a population of 8427 (1921), mostly Mohammedans. The town is defended by a strong fort and by a trench cut in the solid rock. It contains many ruins and memorials of Krishna, who died and was buried close by. Not far from the town stand the ruins of the celebrated Hindu temple of Somnath. Its great sanctity and the fame of its enormous wealth attracted the imagination and avarice of the sultan Mahmud of Ghazni (1024). He took the temple after a desperate defence by its guardians, destroyed the sacred image, and carried off its stores of jewels and (according to the tradition) the wonderful temple gates. It is, however, more than doubtful whether the 'gates of Somnath' which Lord Ellenborough brought back from Afghanistan in 1842, and purposed to have restored to Somnath after having carried them in solemn procession through great part of Northern India, really are the gates of the ancient temple beside the Arabian Sea in Kathiawar. The gates that were brought from Afghanistan, and eventually placed in the arsenal of Agra, are made of cedar and richly carved, and measure 11 feet in height by 9 feet 6 inches in width.

Sonata, a musical composition usually of three or four movements, designed chiefly for a solo instrument. Before the 17th century the overwhelming tendency of musical development had been to increase by every possible device the vocal resources of the art, a culminating point being reached in the works of Palestrina and the school of madrigal writers. Instrumental music had been represented for the most part by dance tunes which had no great formal development, whilst the early attempts at opera relied almost entirely on the vocal element for their effect. In fact, abstract music, independent of external impressions, and deriving all its interest from intrinsic qualities, was up to this time unknown. Some very early sonatas,

published at Venice in 1624, consisted of a single movement; but the principle of a succession of contrasted movements, as in the case of the suite, was eventually established, all existing musical forms being pressed into service to secure its fulfilment. Thus, the 'first movement' consisted of a kind of canzona, imitated from a choral form kindred to the madrigal; the declamatory recitative of the opera was the source of the 'second movement'; and the remaining portions of the sonata were founded on dance-rhythms. Its progress tended towards emancipation from originating influences, whereas the suite adhered closely to dance forms. To secure for each movement structural balance and diversity of material additional 'subjects' were introduced, and the several portions were divided into 'sections,' balanced and contrasted both as to melody and key; whilst, as to time, the alternation of quick and slow movements became a recognised principle. Corelli and other writers of his school wrote sonatas chiefly for the violin, the genius of Handel and Bach being also employed in the same field. The improvements effected in the construction of the harpsichord and clavicord at length obtained for them a due measure of attention from Domenico Scarlatti and C. P. Emanuel Bach, whose complete mastery of these instruments enabled them to write clavier-sonatas with the happiest effect. The subsequent efforts of Haydn and Mozart brought the form of the sonata to great perfection of elegance and symmetry, a result to which Clementi and Dussek also contributed. But the acme of development was reached by Beethoven, who infused into the somewhat mechanical forms of his predecessors the spirit of human emotion. Under him the different parts of the sonata, instead of being mere adjacent sections, became items of one complete organic whole. The progression of his thoughts constituted a work of art, a poem in sound, in which, while the idea was paramount, the form was more or less veiled, the perfection of the whole resulting from a true and just balance between the two. Weber and Schubert continued to employ the old model, but with them its rules and restraints gradually gave way before the growing importance of the idea. At a later period Schumann attempted a compromise by means of ingenious devices, and Brahms in two early pianoforte-sonatas had worked along similar lines; while notable composers of the present day are still trying to extend the limits of sonata-form in conformity with modern tendencies. See the article by Sir C. Hubert H. Parry in Grove's *Dictionary of Music*.

Sonderbund, a union of the Catholic cantons of Switzerland (q.v.), which led to civil war in 1845.

Sonderburg. See **ALSEN**.

Sondershausen, a town of Thuringia, formerly capital of Schwarzburg-Sondershausen (q.v.), pleasantly situated on the Wipper, 34 miles by rail N. of Erfurt. It has a large castle. Pop. 10,000.

Sondrio, an Italian town, capital of a province, on the Adda, 25 miles E. of the Lake of Como. It is the capital of the Valtellina, which produces much red wine. Pop. (1921) 9572. Sixteen miles E. by rail is Tirano, from which diverge the roads to the Bernina (q.v.) and the Stelvio Pass (q.v.). The former route is now followed by a railway, which at Samaden, in the Upper Engadine, connects with the Rhetian railway from Chur (Coire).

Song, a short poem, adapted for singing, or set to music. A song generally turns on some single thought or feeling simply expressed in a number of stanzas or strophes (see **LYRIC**, **BALLAD**, **POETRY**, and the articles on the great song-writers). The music to which it is allied should serve to add force and clearness to its meaning with or without

the assistance of an instrumental accompaniment. The vast stores of simple ballads, of which various nations in time became possessed, are known as 'folk-songs' (*volkslieder*), as being the unstudied outcome of their popular tastes, feelings, and aspirations. In the modern 'art-song' (*kunstlied*) the cultivated instincts of the musician are brought to bear upon the utterances of the poet. The range of this class of song is extremely wide, and includes examples resembling the folk-song in simplicity, as well as those of a more ambitious character, which for adequate interpretation often depend very largely on the accompaniment, the voice part sometimes consisting of little more than declamation of words whose meaning is further conveyed by instrumental devices. Between these two extremes every variety and combination of treatment is displayed, some songs being strophic in form, the same melody serving for each stanza, whilst others are 'composed throughout,' both melody and accompaniment changing in sympathy with the narrative and sentiments expressed by the words. The pinnacle of perfection in song-writing has been reached by German composers, and pre-eminently by Schubert, Schumann, Brahms, and Loewe. Among celebrated English composers of song music may be named Henry Lawes, who very early excelled in the art of setting words with due regard for accent and emphasis; Henry Purcell, the greatest among English song-writers; with Carey, Arne, and Boyce. To these must be added Dibdin, famous for his 'Tom Bowling'; Davy, whose memory is kept green by his 'Bay of Biscay'; John Braham, who wrote the 'Death of Nelson'; and Charles Horn, composer of 'Cherry Ripe.' Sir Henry Bishop also enjoyed a lengthened popularity. The growth of national taste in respect of song has not kept pace with its advance in other branches of music, many excellent writers belonging to the later part of the 19th century being as yet for the most part unappreciated, while publishers find a large sale for rapid compositions in the so-called 'drawing-room' style. Songs written for several voices are known as part-songs, glees, madrigals, &c. See **CATCH**, **GLEE**, **MADRIGAL**, **ROUND**; and the article 'Song' in Grove's *Dictionary of Music*. For the song of birds, see **BIRD**; and for the Song of Songs, or Song of Solomon, see **CANTICLES**.

Songhay, or **SONRHAI**, a former kingdom of Africa, extended on both sides of the Niger below its great bend. In the 15th century the empire extended from Lake Tsad almost to the Atlantic, but early in the 17th century it was overthrown by the sultan of Morocco.

Song-ka, the chief river of Tong-king (q.v.).

Sonnblick, a height 10,277 feet high amongst the Salzburg Mountains, on whose summit is a meteorological observatory, with a shelter built in 1886 by the Austrian and German Alpine Clubs.

Sonnet (Ital. *sonetto*, dim. of *suono*; Fr. *sonnet*). In poetic art the sonnet—a stanza mostly iambic in movement, properly decasyllabic or hendecasyllabic in metre, always in fourteen lines arranged properly according to some law that is recognised at once as having universal acceptance—belongs entirely to the rhymed poetry of the modern world. Sonnets are divided into regular and irregular. All regular sonnets are divisible into: (1) The sonnet of simple stanza in which the staves follow each other in three quatrains of alternate rhymes clinched at last by a couplet. This form is for obvious reasons called the Shakespearian sonnet. (2) The sonnet of compound stanza divided generally, but not always, both as regards sense-rhythm and metre-rhythm, into two parts—an octave consisting of eight lines (the first line of which rhymes with the fourth, the fifth, and the

eighth lines, the second line with the third, the sixth, and the seventh), and a sestet consisting of six lines running on two or else three rhymes in an arrangement which, though free from prescription, must always act as a response by way of either ebb or flow to the metrical billow embodied in the octave. This form is for equally obvious reasons called Petrarchan. Within the space at our command it is impossible even to glance at the history of the sonnet here, save as it now and then discloses itself in our remarks upon the general principles governing the sonnet's matter and its form.

Though poetic art has many functions and many methods, the two following among its functions seem specially to concern us in treating of the sonnet: The function of giving spontaneous voice to the emotions and passions of the poet's soul; and the function of poetising didactic matter and bringing it into poetic art. With regard to the first of these functions, although the sonnet is a good medium for expressing passion and emotion, it cannot be said to take precedence in this respect of other and less inherently monumental forms. The ode of Sappho, the bird-like song of Catullus, and the free-moving rhymed lyric of modern times are probably better adapted to give expression to simple passion at white heat—while on the other hand they are certainly better adapted to give voice to that less intense form of passion which can pause to deck itself with the flowers of a beautiful fancy—than is the sonnet—even the sonnet of simple stanza of Shakespeare and Drayton. With regard, however, to the second of the above-mentioned functions of the poet—that of poetising didactic matter—a function which of course can only be exercised by passing the didactic matter through a laboratory as creative and as recreative as nature's own, the laboratory of a true poet's imagination, the pure lyric must of course yield to the sonnet. Indeed, it is an open question whether since the Romantic revival the sonnet has not been gradually taking precedence of most other forms as an embodiment of poetised didactics. And should this on inquiry be found to be the case, the importance of this form will be made manifest. For as the mind of man widens in mere knowledge and intelligence fresh prose material is being furnished for the poetic laboratory every day. And the question, What is the poetic form best suited to embody and secure this ever-increasing and ever-varying wealth?—a question which has to be answered by each literature, and indeed by each period of each literature, for itself—goes to the root of poetic criticism. Of course, before didactic matter can become anything more than versified prose, it has to be excarnated from the prose tissue in which all such matter takes birth, and then incarnated anew in the spiritualised tissue of which the poetic body is and must always be composed. Hence it is not enough for the poet to use the sieve, 'as Dante would say,' in selecting 'noble words.' The best prose writers from Plato downwards have been in the habit of doing this. When Waller said:

Things of deep sense we may in prose unfold,
But they move more in lofty numbers told,

he meant by 'lofty numbers' those semi-poetic 'numbers' of the English couplet in which poetised didactics were in his time embodied—as in the time of Shakespeare such poetised secretions of the mere *intellectus cogitabundus* were put into the mouths of dramatic characters after the approved old fashion of the classical dramatists.

Since the Romantic revival, however, poetic art has undergone an entire change. Acted drama cannot now receive poetised didactics, which would in these days slacken the movement and disturb the illusion required, while as to the kind of epigram-in-solution or half-poetised quintessential

prose which is embodied in the 18th-century couplet the criticism of the Romantic revival is apt to consider this not so much as poetry as an intermediate form—and an extremely rich and precious one—between poetry and prose. Epigrammatic matter must, to exist at all, be knowing, and as knowingness and romanticism are mutually destructive, it is evident that some form other than the couplet, which is so associated with epigram, must in our time be used for the poetising of didactic matter of the unworldly and lofty kind. And the sonnet of octave and sestet is a form less epigrammatic than any other—a form moreover which can never, as certain other stanzaic forms can do, embody mere quintessential prose without proclaiming its poverty, but must always be poetic in its very texture—a form indeed which will not bear one line that is not either in essence or in method poetic or else 'rhetorical' in Dante's sense when he defined poetry to be 'a rhetorical composition set to music.' So absolutely poetic a form is this that if it should happen that the diction will not on account of the subject bear elevation, it has to be at once poetised by one of those skilful disturbances of the prose order of the words of which Wordsworth was so great a master.

The fact of the word sonnet being connected with *suonare*, to play upon an instrument, shows that a knowledge of music, though perhaps not essential, is of great value to a sonnet-writer. Indeed, owing to the consonantal character of our language a knowledge of music is really of more importance to the English than to the Italian sonnet-writer. Although the 'singing words' essential to a good song for music need not perhaps be greatly sought in the sonnet (save in the special and somewhat rare form mentioned further on), still vowel-composition and that attention to sibilants which Pindar is constantly showing in his odes—that attention which Dionysius of Halicarnassus extolled—and also the softening of consonantal feet by liquids are extremely important in the sonnet even although it is no longer written to be set to music. After much practice in the art of rhymed poetry—when every feasible rhyme leaps into the brain of the poet the moment that a line-ending has suggested itself to his mind—this attention to structural demands becomes instinctive, and is exercised in that half unconscious and rapid evolution of the mental processes which the witty conversationist shows in repartee, and which the pianist exhibits when touching the keyboard—supposing of course that the poet is a born rhymist. It is, however, a curious and interesting fact that ever since the time of Piers Plowman (when alliterative measures gave way to rhymed measures) English poets have been clearly divisible into two classes—those to whom rhyme is an aid and those to whom rhyme is more or less a check. And still more curious and interesting is it, that while three of the greatest poets, Shakespeare, Marlowe, and Milton, belong to the one class, Coleridge (who by endowment perhaps stands next to them) belongs to the other. This is why some of the strongest English poets have not been successful in the sonnet, where the rhyme-demands are very great. For some reason or another the rhythmic impulse within them has not been stimulated but crippled and tortured by the spur of rhyme.

With regard to prescription in the number of the lines and the arrangement of the rhymes of the sonnet, metrical art offers the reader two opposite kinds of pleasure; the pleasure derived from a sense of prescribed form, as in the sonnet, the ballade, the *rispetto*, the *stornello*, &c., and the pleasure derived from a sense of freedom from prescribed form as afforded by those pure lyrics, in which the form is, or at least should be, governed by the emotion.

Now every poetical composition should show at once which of these kinds of pleasure is being offered to the reader and should also satisfy the expectation raised, for he will experience a sense of disappointment on being proffered one kind of poetic pleasure when he has been led, by the stanzaic arrangement or otherwise, to expect another. Nevertheless a certain few of our great sonnets are irregular, for a great poet can do anything.

With reference to regular sonnets it is self-evident, as regards the sonnet of compound stanza, that there are four different forms into which may fall a metrical structure consisting of an octave of a prescriptive arrangement of rhymes and a sestet consisting of another set of rhymes that are free in arrangement from prescription. And some years ago the present writer exemplified these in 'four sonnets on the sonnet,' one only of which, under the name of 'The Sonnet's Voice,' originally printed in the *Athenæum*, was widely circulated in sonnet-anthologies. These varieties of the sonnet of octave and sestet are: (1) The sonnet in which the stronger portion both in rhythm and in substance is embodied in the sestet. (2) The sonnet in which the stronger portion both in rhythm and in substance is embodied in the octave. (3) The sonnet in which the sestet is not separated from the octave, but seems to be merely a portion of the octave's movement rising to a close more or less climacteric. (4) The sonnet in which the sestet seems to be added to the octave's movement, added after its apparent termination in a kind of tailpiece, answering to what in music we call the 'coda.'

With regard to the second of these varieties—the one exemplified in 'The Sonnet's Voice'—perhaps the ideal form has the octave in double rhymes and the sestet in single rhymes. But it has to be remembered by the poet that between the effect of Italian rhymes and the effect of English double rhymes there is a great difference. Save in the hands of a sonnet-writer of great practice in the art of vowel-composition, in the art of using singing words, and in the art of softening our consonantal language, by the proper use of liquids and subtle and concealed alliterations, the English rhyme-beat in the double-rhyme octave of this variety is apt to become too heavy for the single-rhyme rhyme-beat in the sestet. By attention to these requirements, however, the rhyme-beat may be so lightened that this variety may become the most brilliant of all.

With regard to the sonnet of simple stanza, it has two special glories: it was the form adopted by Shakespeare, and in it is written Drayton's famous love-sonnet. Hartley Coleridge wrote some fine sonnets in this form; so did Keats; but on the whole it has been neglected in recent times.

Sonora, a frontier state in the north-west of Mexico, on the Gulf of California. It is the second largest in the republic. Area, 76,900 sq. m.; pop. 270,000. The coast is flat and sandy, the interior filled with wooded mountains and fertile valleys. Malaria is mostly confined to one part of the coast. Here the climate is hot, but in the mountains there is frost for five months in the year. The chief rivers are the Sonora, Yaqui, and Mayo. The principal wealth of the state is in its minerals, especially gold, silver, mercury, and iron. Agriculture, wine-growing, and cattle-rearing are also successful, and cottons, hats, shoes, and soaps are manufactured. Capital, Hermosillo; chief port, Guaymas.

Sonsonate, a town of Salvador, on the Rio Grande, 15 miles by rail N. of Acajutla. It was founded by Alvarado in 1524. Pop. 16,000.

Sontag, HENRIETTA, COUNTESS ROSSI, a German singer, was born at Coblenz on 3d January 1806, and was educated by her parents to their own profession of the stage. She learned singing at Prague, and made her début there when only fifteen. After a brilliant operatic career at Vienna, Berlin, and Paris, she married Count Rossi in 1828, and shortly afterwards left the stage. Compelled by money difficulties to reappear in 1849, she met with renewed success both in Europe and in America, but died in Mexico on 17th June 1854.

Sonthals. See SANTALS.

Soochoo, or SUCHAU, previous to the Taiping rebellion one of the largest cities in China, is situated on the Grand Canal, 50 miles WNW. of Shanghai, in the province of Kiang-su. It stands on numerous islands separated by canals, and since 1896 has been accessible as a treaty-port. The city walls have a circuit of 10 miles. Soochoo has for generations been a noted centre of the silk manufacture and of the printing of cheap Chinese classics. It was captured by the Taipings, but recovered by 'Chinese' Gordon in 1863, on which occasion the city with its many handsome buildings was almost wholly destroyed. Pop. 500,000.

Sooloo Islands. See SULU ISLANDS.

Soot. The soot both of wood and of coal is serviceable as Manure (q.v.) on account of the sulphate of ammonia it contains, especially for young cereals, for grasses, and for carrots. See SMOKE.

Sophia. See SOFIA.

Sophia, Electress of Hanover, born on 13th October 1630, was the youngest of the thirteen children of Elizabeth (q.v.), queen of Bohemia. In 1658 she married Ernest Augustus, Duke of Brunswick-Luneburg, and afterwards Elector of Hanover, and by him she was the mother of George I. She died 8th June 1714. See A. W. Ward's *Electress Sophia and the Hanoverian Succession* (1903). For Sophia Dorothea, the wife of George I., see KÖNIGSMARK.

Sophia, St (Greek *Hagia Sophia*, 'Holy Wisdom')—i.e. the eternal wisdom of God or the Logos, and not a human saint), to whom Greek churches were often dedicated; especially the great church of Constantinople (q.v.), erected by Justinian in 538–568 A.D. Its dimensions and a sectional plan are given at BYZANTINE ARCHITECTURE.

Sophists. The Greek word *sophistēs* (from *sophos* = 'skilled,' 'wise') meant originally any one of acknowledged or professed skill; thus, the term was applied to the seven sages (whether philosophers, like Thales, or statesmen, like Solon), to poets, musicians, &c. In the 5th and 4th centuries B.C. it came to be applied specially to those who made a profession of teaching all or any of the higher branches of learning. The great intellectual awakening of Athens after the Persian war, and the growth of democracy in Sicily and elsewhere, as well as at Athens, which gave skill in public speaking a new importance, led to the demand for an education which should go beyond the old training in 'gymnastic' and 'music' (i.e. reading, writing, singing, and reciting from the poets). To meet this demand there arose a class of professional teachers, wandering scholars, who undertook to provide what we should call 'higher education.' This new movement presents certain resemblances to the rise of the universities in the 13th century, to the popularising of learning and science in the 18th and 19th centuries, to the 'University Extension' movement of to-day. Some of these 'Sophists' were more specially teachers of rhetoric—i.e. they gave particular attention to the *form* of public speaking, and as

such they are the beginners of Greek prose style. Originally *artistic* expression takes the form of verse. The poet is the 'maker,' the artist in language: prose is simply 'ordinary speech.' But from the time of the rhetoricians, such as Gorgias (q.v.) of Leontini, prose also becomes an art. The first effect of the deliberate pursuit of artistic form in prose was to produce a pedantic and artificial style. (We can trace the evil influence of Gorgias in the 'speeches' in Thucydides.) But this attention to language was the preparatory training for the simple beauty of the best Attic prose. Other Sophists gave more attention to the *matter* of public speech—the questions of right and wrong which come before law-courts and political assemblies—and in this way they were the beginners of moral and political philosophy. The earlier Greek philosophers, with the partial exception of the Pythagoreans, had hardly treated of human matters: they had been ontologists and cosmologists. Protagoras (q.v.) of Abdera and Prodicus of Ceos may be taken as famous and favourable examples of the professors of 'virtue.' It must be remembered that the teacher of conduct and the moral philosopher were not distinguished even by Plato and Aristotle. Other Sophists, like Hippias of Elis, professed to teach universal knowledge—what we call 'general culture.' Others again, like Euthydemus and Dionysiodorus (who appear in Plato's dialogue named after the first of them), devoted themselves specially to the art of disputation, and thus prepared the way for the science of logic.

The ambitious youth of Athens flocked to a fashionable Sophist from intellectual interest in the new learning and in order to acquire an education which would fit them to obtain success in the law-courts and in the popular assembly, or to acquit themselves with distinction in a discussion on any subject whatever. The various Sophists naturally differed much from each other in ability, in character, and in the degree of seriousness with which they regarded their function as teachers; and some may very well have deserved the censure expressed in Aristotle's definition of the Sophist as 'a man who makes money by sham wisdom' (in *Soph. Elench.* i). In the eyes of old-fashioned persons the whole class was regarded with suspicion: the skill of the clever orator or disputant seemed to have something immoral about it, because it might enable the worse cause to appear the better. And to discuss the nature of right and wrong, or to theorise about the foundations of society, was then, as in other ages, regarded as dangerous. In the eyes of such persons Socrates and Plato were 'Sophists' just as much as the rest, although Socrates and Plato, conscious of their own intellectual honesty and earnestness, and not teaching for 'pay,' disowned the title. When the various branches of the new learning came to be differentiated, we find the rhetorician Isocrates (q.v.), to whom the term would certainly be applied by the average Athenian and by Plato, applying the term to Plato, but not to himself. Again, whereas Plato applies it to Protagoras, Gorgias, Hippias, &c., we find that Aristotle in a passage (*Eth. Nic.* ix. 1) where he speaks disparagingly of the Sophists contrasts Protagoras with them. The word had come to acquire an evil connotation, such as survives in our use of the term 'sophistry.' But it is quite a delusion, as was conclusively shown by Grote (*History of Greece*, pt. ii. chap. 67), to suppose that the Sophists were a *sect* of philosophers, with pernicious principles, who systematically undermined the morality of the Hellenic world. They were not a sect, but a profession: and on the whole they were neither better nor worse than their age. Like the journalist or

litterateur of our own time, they succeeded by supplying what the public wanted. The Platonic Socrates, their adversary, himself says, 'Our youth are corrupted, not by the individual Sophists, but by the public, which is the great Sophist, against whose influence any private teacher wages an unequal contest' (*Republic*, vi. 492).

There is no common 'Sophistic' doctrine. Different Sophists were influenced by different schools of philosophy. They were the popularisers of older doctrines. Thus, Protagoras was influenced by Heraclitus (q.v.), whose doctrine of universal flux gives a basis for Protagoras' assertion of the absolute relativity of knowledge ('man is the measure of all things; nothing is true but the sensation of the moment'). The alleged influence of his fellow-townsmen, Democritus (q.v.), seems less likely; for Democritus was about twenty years younger. Still the Atomist resolution of all things into mere *arrangements* of the only *real* existences (the atoms and the void) very likely helped to supply a basis for the distinction between 'convention' and 'nature,' which was much used by some Sophists and became a commonplace of the period. Gorgias is said to have been a disciple of Empedocles (q.v.), and was certainly influenced by the Eleatics (q.v.). His paradoxical treatise on 'Nature or the non-existent' is clearly a sceptical working out of the Eleatic principle of the unreality of the manifold. We have no sufficient knowledge to justify the attempts made by some German scholars to classify the Sophists according to different philosophical schools; and it is, moreover, unlikely that *popular* philosophers should admit of any very precise affiliation. We can only group them in a very rough way, such as has been attempted above. Some historians of philosophy (e.g. Zeller and Ueberweg) lay stress on the distinction between the earlier and later Sophists, considering the 'later Sophists' (such as Polus of Agrigentum, a pupil of Gorgias, Thrasyarchus of Chalcedon, Euthydemus, &c.) to represent a distinct degeneracy in the class. This, however, seems doubtful, except in the sense that, as time went on, 'rhetoricians' and 'philosophers' came to be more clearly differentiated from among the mass of the profession; and the *name* Sophist degenerated as we have seen. Professor Sidgwick argued that the 'Eristic' or disputatious Sophists were really a degenerate offshoot of the Socratic school; but against this hypothesis there are many objections.

While Grote is perfectly correct in holding that the Sophists are not a sect and have no common doctrine, he errs in ignoring the fact that they represent a common tendency, the new spirit of the age. The awakening of reflection on political and social institutions, on morals and religion, and the wider diffusion of enlightenment produced in Hellas the same spirit of 'freethinking,' individualism, and sceptical criticism which we find among the 'Humanists' of the Renaissance, and still more among the English 'Deists' and French 'Encyclopædists' of the 18th century. Of this intellectual movement the Sophists were at once the outcome and the leaders. The differences between the Sophists might be paralleled by the differences between Voltaire, Diderot, Rousseau, &c., and yet all these writers share a common tendency. The very opinions maintained by certain Sophists reappear in more fully developed forms among English and French writers of the 17th and 18th centuries. Thus, Thrasyarchus, in Plato's *Republic*, bases right simply on the command of the stronger, by which he means the sovereign power in the state—the theory of Hobbes, developed afterwards in its legal aspects by Bentham and Austin. From the second book of Plato's

Republic it appears that the Social Contract theory had already been propounded, almost certainly by some Sophist. Aristotle (*Politics*, iii. 9) quotes Lycophron the Sophist as holding that government was only concerned with the protection of individual rights. Alcidas, the rhetorician, maintained that 'God made all men free; Nature has made none a slave.' This and similar sentiments, which we may call 'Sophistic,' in the sense that they belong to the new Rationalism, are to be found frequently expressed in the extant plays and fragments of Euripides. Even Herodotus, though his style is unaffected by the rhetorical schools, has also imbibed a certain tolerant scepticism, which appears in his treatment of the diversity of customs and religious beliefs; and the debate about the best form of government (iii. 80-82), which he unhistorically puts into the mouth of Persians, is probably due to a 'Sophistic' source, and may indeed be called the earliest piece of Greek political philosophy that has come down to us. Much of the teaching of the Sophists was undoubtedly destructive of the old fabric of Greek belief and of Greek society, which rested on the narrow basis of an exclusive citizen caste with a substructure of slavery. The modern student will not necessarily think the worse of the Sophists on that account; though the majority of them were probably by no means conscious of the significance of the critical weapons they handled. By raising problems in almost every department of thought, for which they could find no satisfactory answers, they prepared the way for the great period of Athenian philosophy (see SOCRATES). Later the term 'Sophist' came into reputation again; some Greek professors of rhetoric under the Roman empire were described as Sophists on their tombs.

The significance of the Sophists in the development of Greek thought was first put in a true light by Hegel in his *History of Philosophy*. Besides the histories of Greek philosophy (see PHILOSOPHY, PLATO) and Grote, see two articles by Sidgwick, defending Grote's view, in the *Journal of Philosophy*, vols. iv. and v.; Bann's *Greek Philosophers* (1883); Mahaffy's books on Greek thought before and after the Roman Conquest (1887-96); Walden's *Universities of Ancient Greece* (1912).

Sophocles, the Athenian tragic poet, was born c. 496 B.C., and died c. 405 at the age of ninety-one. His father's name was Sophilus, and his native district was Colonus, a suburban quarter on the banks of the Cephissus, much frequented by the knights and wealthy citizens of Athens. He partook in full measure of the highest education of his time, and was especially distinguished in music, which he learned from Lamprocles. At sixteen he was chosen to lead the chorus of youths who celebrated the naval victory of Salamis (480). At the age of twenty-eight he came to the front by entering into competition with Æschylus, his elder by thirty years, whose pre-eminence as a tragic poet had long been undisputed. The judges on this occasion, according to an oft-repeated tradition, were Cimon and his fellow-generals, just returned from Scyros. The younger poet was preferred; and his triumph had a decisive influence on the future of the tragic art. For not only are the mature works of Sophocles and those of Euripides, his younger brother in poetry, the fulfilment of the promise then given, but the Oresteian trilogy of Æschylus, in which Greek tragedy attained its highest limit, was brought out ten years after this, and bears unmistakable proofs of the impression which the art of Sophocles had made upon his elder and greater rival. Sophocles never forsook Athens as both Æschylus and Euripides did, but he was repeatedly employed on embassies to other Grecian states, and in the Samian war of 440 he was appointed general in a

joint command with Pericles. This choice is said to have been due to the success of the *Antigone*, one of the earliest of the poet's seven extant plays, as the *Edipus Coloneus* and *Philoctetes* are certainly the latest. The probable order is *Ajax*, *Antigone*, *Electra*, *Edipus Tyrannus*, *Trachiniae*, *Edipus Coloneus*, *Philoctetes*. Less than a tithe of the work of Sophocles remains to us; but of the seven plays each one has superlative excellences, and stands prominently forth amongst the master-works of the human spirit. The characteristics of Sophocles are a dramatic structure all but faultless, the combination of wonderful subtlety with intense fire, and of a noble ideal with truth and naturalness. His subjects were necessarily drawn from Hellenic legend. His motives in selecting them were mainly artistic, but to some extent also religious or patriotic. In his treatment of them he never loses sight of the main principles of tragic art. His method turns largely on pathetic contrasts (1) of situation, (2) of character.

(1) The change of fortune which forms the crisis of each play is often rendered more impressive through the profound unconsciousness, at the beginning of the action, of the persons who are to be affected by it. The case of *Edipus* is the capital illustration of this remark; but it applies also to Creon in the *Antigone*, to Electra, Deianira, *Philoctetes*, and to the chorus in the *Ajax* and *Edipus Coloneus*. Sometimes the chief agent, *Antigone* for example, is fully conscious of the real position of things, but in every case appearance and reality are strongly opposed.

(2) The persons in Sophocles are most skilfully adapted to the main situation and action of each play. The addition of a third actor to the two that had formerly sufficed enabled the poet not only to contrast opposed natures, such as *Antigone* and Creon, but to introduce finer shades of difference, as between *Antigone* and Ismene, or Agamemnon and Odysseus. Perhaps the most notable instance of such delicate portraiture occurs in the *Philoctetes*, where Neoptolemus, the ingenuous youth, is contrasted equally with the politic Odysseus and with the hero of the play, in whom a generous nature has been embittered by ill-treatment and solitude.

The *Ajax* may be described as the tragedy of wounded honour. *Ajax* and Odysseus had recovered the dead body of Achilles, whose armour, the miraculous work of Hephestus, was then awarded not to *Ajax*, the most valiant of the surviving Greeks, but to Odysseus, the wisest. Half-maddened by repulse, *Ajax* would have assassinated the generals; but, to defend Odysseus, Athena made the Telamonian warrior wholly mad, and turned his violence against the flocks and herds belonging to the army. On awaking from his delirium, finding his honour lost, he resolves on death. Agamemnon would have refused him burial; but Teucer vindicates him, and Odysseus, with becoming magnanimity, ends the strife. Tecmessa, the captive bride, who in her helplessness defies the Argives and protects the hero's child, is one of those female characters which Sophocles portrays with so much skill.

In the *Antigone* the claims of piety and natural affection are seemingly overborne by the exaggerated assertion of state-authority in the person of the ruler, but in the end it is the ruler who succumbs. The virgin martyr is vindicated.

In the *Electra*, in place of the fiery Theban maiden, the poet represents the faithful endurance of the Argive princess, who in the *Oresteia* of Æschylus had played a subordinate part, but here rises to the height of female heroism.

The *Edipus Tyrannus* was regarded by Aristotle as the *chef d'œuvre* of tragedy, and nowhere else

is there to be found an equal combination of constructive ingenuity with tragic power. The hero is represented as the most loyal and affectionate, but also the most passionate, and, partly for that reason, the most unfortunate of men. Doomed to misery in his very birth, he appears to himself and others at the opening of the play to be at the height of prosperity. A stranger, he has earned the affection of Thebes, and lightly he undertakes the quest imposed by the god. In the sequel he discovers that he is the forbidden child of the king—whom he has slain—and of the queen—whom he has married! The poignancy and pathetic interest which Sophocles extracts from this unnatural story is a triumph of poetic skill. In the construction of the piece the employment of the Theban slave, who had been charged with the exposure of the child, and had also witnessed the death of Laius, is especially noteworthy.

The subject of the *Trachiniae* is the death of Heracles, but the fatal act of Deianira in sending the poisoned robe (which she believes to be a charm for recovering the affection of her lord) forms the central motive. She is one of the most charming of poetic creations, 'the rival of Imogen in purity, of Katharine of Aragon in her great patience, and of both in wifely spirit.'

There was an interval probably of at least ten years between the *Œdipus Tyrannus* and the composition of the *Œdipus at Colonus*, which indeed is said to have been exhibited for the first time only after the death of the poet. Meanwhile the genius of Sophocles had mellowed, and the spirit of the age had undergone some change. What in Euripides becomes a sort of moral casuistry appears in Sophocles at this period as a serenely contemplative mood immersed in ethical reflection. He has adorned the legend of his birthplace with undying beauty. But the moral dignity of the *Coloneus* is different in kind from the tragic fire of the *Tyrannus*.

The *Philoctetes* was produced in 409. It is a marvellous work for one in his eighty-seventh year to have composed. The characters are powerfully distinguished, and their mutual interaction is a new thing in dramatic poetry. Philoctetes, like the *Œdipus of the Coloneus*, is rejected by man, but accepted by the gods. Ill-usage and solitary musing have fixed in him the resolution never to return. The policy of Odysseus and the affectionate pleading of Neoptolemus are alike in vain, until the hard knot is loosed by the apparition of Heracles (in Euripidean style), who had been the hero's master and patron in the world of men. The interest of the action, which would else be stationary for so long, is sustained by the conflict in the soul of Neoptolemus, in whom ambition and public duty are struggling with pity for Philoctetes, and with the love of truth which the young chief inherits from his father Achilles. The victory of his better nature forms the culminating point in the action of the play.

Of other subjects known to have been treated by Sophocles those most suggestive of tragic interest are Alcæmon, Atreus, Danaë, Hermione, Thamyrras, Thyestes in Sicyon, Iphigenia, Clytemnestra, Creusa, Laocoön, Meleager, Niobe, Enomais, Peleus, Telephus, Tereus, Troilus, Phædra, Phineus. The remaining fragments of these and other plays are on the whole disappointing. Sophocles even less than other poets can be fairly represented by isolated passages.

Amidst much variety, the dramatic work of Sophocles presents some constant features. Each play has a preliminary scene in which the main situation is set forth. This is followed by the entrance of the chorus, consisting of persons who stand in some well-considered relation to the chief agent. Then

fresh complications supervene, and the action rises in steady climax to the turning-point. The reverse of fortune is generally announced by a messenger, after whose speech the *commos* or interchange of lamentation between the stage and orchestra naturally comes in. Between the scenes choice odes or *stasima* are interposed. But the lyric numbers are not confined to these. At suitable moments the chorus, and sometimes the actors themselves, break out into song, which on the part of the chorus is sometimes accompanied with dancing of a more or less animated description. This takes effect particularly in the *hyporchema*, or dancing-ode, which Sophocles is fond of employing at some conjuncture where the *dramatis personæ* have been deceived for the moment into a false and short-lived joy. This relieves the monotony of gloom while ultimately rather heightening tragic effect, by emphasising the contrast above noticed between appearance and reality.

Sophocles has not impressed the world with superhuman grandeur, as Æschylus has done. Nor has he charmed mankind by the witchery of style in particular scenes and descriptive passages, as appears to have been the case with Euripides. But to some of the greatest critics—e.g. Lessing—his merits as a dramatic artist have appeared to be supreme. The purely human note in tragedy is dominant for the first time in him. Matthew Arnold in an early sonnet described him well:

Be his
My special thanks, whose even-balanced soul,
From first youth tested up to extreme old age,
Business could not make dull, nor passion wild;
Who saw life steadily and saw it whole;
The mellow glory of the Attic stage,
Singer of sweet Colonus and its child.

If not quite holding the first rank with Homer, Æschylus, Dante, and Shakespeare, Sophocles is at least one of the immortals.

Sophocles was known to have written a satyric drama or farce called *Ichnæutæ* (*The Trackers*), based on the story how the infant Hermes stole Apollo's cows. Dr Hunt published in 1911, from a papyrus found at Oxyrhynchus, a fragment (400 lines) of a comedy on this theme, which, with other fragments found, is believed to be by Sophocles.

The *editio princeps* was printed at Venice in 1502. The long list of editors of the whole or part of the seven plays includes Brunnck, Gotfried Hermann, Wunder, Dindorf, Schneidewin, Nauck, Bergk, Lobeck (*Ajax*), Büchh, Meineke, Elmsley, Buttmann, Linwood, Kennedy, Wolff, O. Jahn, Blaydes and Paley (2 vols. 1859–80), Lewis Campbell (2 vols. 1873–81), Tyrrell (1 vol. 1897), Sir R. C. Jebb (7 vols. 1884–96), and Pearson (1924; fragments, 1917). English translators are Franklin, Potter, Dean Plumptre, Sir G. Young, R. Whitelaw (1883), Prof. Lewis Campbell (1883), Prof. Phillimore (1902), A. S. Way (1909–14), Storr (1912–13), in verse; and Jebb and E. P. Coleridge, in prose. There is an excellent *Lexicon Sophocleum* by F. Ellendt (2d ed. by H. Genthe, Berlin, 1867–72), supplemented by an 'Index Commentationum' (1874). See Hense, *Studien zu Sophocles* (1890); Patin, *Études sur les Tragiques Grecs*; Prof. Lewis Campbell, *Sophocles* (1879), and *A Guide to Greek Tragedy* (1891); Schlegel's *Lectures*; Bishop Thirlwall's *Remains* (for a famous essay on the Irony of Sophocles); Mackail's *Lectures on Greek Poetry* (1926).

Soprano (Ital.), the highest species of voice. Its average range extends from C below the treble stave to A above it; but the greatest variety in compass and quality is found. The highest compass on record is that of Agujari, which on the testimony of Mozart reached to C in *altissimo* (three octaves). Music for this voice is now written with the G or treble clef; but in German full scores the old soprano clef, C on the first line, is still used. The *mezzo-soprano* has a somewhat lower range, usually from A beneath the treble stave to F on the fifth line. See VOICE.

Sora, a city of Italy, on the Liris or Garigliano, 55 miles E. by S. of Rome. Its position, as guarding the river valley and the entrance to the Abruzzi, has always given it importance. Remains of polygonal walls and mediæval fortifications may be noted on the rock above the town. It was the birthplace of the Decii, Attilius Regulus, and Lucius Mummius, and of Cardinal Baronius, the historian of the church. Pop. (1921) 17,612.

Soracte, an isolated limestone ridge, 2267 feet above sea-level, 5 miles SE. of Civita Castellana. It is mentioned by Horace (Od. i. 9), and appears to have been sacred to Dis Pater, the god of the underworld, owing to the deep chasms existing in its sides. A monastery was founded on the summit in 748 A.D. by Carloman, son of Charles Martel. The modern village of S. Oreste lies on its southern slopes.

Sorata, a volcanic peak of the Bolivian Andes, to the east of Lake Titicaca, rising to 21,490 feet above the sea.

Sorau, a town of Prussia, 60 miles by rail SSE. of Frankfurt-on-the-Oder, has three castles (one dating from 1207), a textile experimental station, some good churches, and manufactures of cloth, linen, cigars, &c.; pop. 17,000.

Sorb. See SERVICE; SLAVS.

Sorbonne, the earliest, as it was by far the most famous, of all the colleges of the mediæval university of Paris. The system of colleges, of which the Sorbonne was the first example, dates only from the later part of the 13th century, more than a hundred years after the beginnings of the university itself. The system sprang out of the necessity for the adequate accommodation of the vast numbers of students who flocked to Paris from all the countries of Europe. Previous to the erection of colleges the students had mainly to content themselves with such lodging as they could find, and experience had shown that they had suffered both in their purse and their morals from this system.

It was the happy inspiration of Robert of Sorbon, in the diocese of Reims, to conceive and carry out the idea of combining a place of residence and a place of study. With the consent of St Louis, to whom he acted as chaplain, Robert founded the college of the Sorbonne in 1253, though it was not formally opened till 1256. By a bull of Clement IV. (1268) the new institution received the indispensable sanction of the pope as the head of all the mediæval universities. At the head of the college was the *provisor*, who was chosen by the whole university, though its business was mainly in the hands of the *prior*, elected every year from the members of the college itself. The members were divided into two classes, *Hospites* and *Socii*. The Hospites received the full benefit of the educational provisions of the college, but they had no part in its administration. On the attainment of the doctorate in theology at the age of thirty-five their residence came to an end. The Socii, who were restricted to the number of thirty-six, had the entire management of the college in their hands, and all, whatever their age or academic rank, were on a footing of absolute equality. The life of the college was according to the strictest monastic rule, and its inmates with proud humility styled themselves 'the poor masters of the Sorbonne.'

The Sorbonne was exclusively devoted to the study of theology, and no student could enter it till he had taken the diploma of Bachelor of Arts, and had sustained a thesis, known as the *Sorbonica* or *Robertina*, before all the members of the college. The discipline through which he had then to pass was the severest in all the Paris colleges. It was above all by the system of disputation that his

progress was stimulated and his proficiency tested. By its rigorous methods of conducting these disputations the Sorbonne gained the reputation of being the first theological school in Europe; and its opinion on disputed points of doctrine was universally accepted as the weightiest that could be obtained. In affiliation with his larger college Robert of Sorbon in 1271 also founded a smaller college—that of Calvi, or the Little Sorbonne—where students were prepared in subjects preliminary to their study of theology. It was the distinctive feature of the Sorbonne, however, and one which greatly helped to win for it its pre-dominance in the university, that its members were drawn from every country in Europe, and not confined to a particular 'nation.'

The history of the Sorbonne is a signal instance of a great institution admirably fulfilling its original intention, but incapable of making a new departure when such a departure was necessary for its continued vitality and efficiency. Till the close of the 15th century, when the scholastic theology was fast losing its hold on all the best minds, the Sorbonne filled a place of the first importance in the intellectual life of Europe. Throughout the middle ages the theological faculty of Paris was the main support on which the highest teaching had rested, claiming for itself the right, denied to the pope himself, of sovereign decree on the truth or falsity of all religious doctrine. But the Sorbonne virtually constituted the theological faculty, and in common speech was identified with it. Its voice therefore carried an authority that influenced the councils of the nation. Through its efforts France was saved from Peter's Pence and the Inquisition; and it was due to its encouragement that printing was introduced into Paris immediately subsequent to its invention.

From the beginning of the 16th century, when the new studies of the Revival of Learning found their way into France, the Sorbonne gradually ceased to represent the best thought of the country. To all reform alike in studies and religion it offered the most dogged resistance, and it was largely due to its action that Paris lost its place as the first school in Europe. Among the men of the new order the 'Sorbonnian bog' became a byword for bigotry and obscurantism. In the succeeding centuries the Sorbonne followed the same retrograde policy. In 1621 it actually obtained an edict, mainly directed against Descartes, forbidding all teaching that ran counter to accepted authorities. On the occasion of the erection of new buildings by Richelieu (1627), who was provisor of the college, a satirical Latin couplet declared that so long as its original home was in decay the Sorbonne was unassailable, but now that that home was renewed it would certainly go to ruin. The butt of the wits of successive generations, Boileau and Voltaire among the rest, the Sorbonne clung to its original traditions till at the Revolution (1792) its property was confiscated to other objects.

When in 1808 Napoleon reorganised the university of France, the Sorbonne was revived and became the seat of the *Académie* of Paris (see UNIVERSITY) and of the three faculties of theology, science, and literature. In 1884–1900 a new set of buildings was erected to take the place of the college erected by Richelieu. The theological faculty was removed in 1885.

See the various histories of the university of Paris by Du Boulay, Crevier, and Denifle; also Duvernât, *Histoire de la Sorbonne* (2 vols. Paris, 1790), and Franklin, *La Sorbonne* (Paris, 1875).

Sorcery. See MAGIC, WITCHCRAFT.

Sordello, an Italian troubadour named by Dante and exalted to a hero in Browning's poem,

wrote love songs, satires, and a didactic poem. In 1226, while in the service of Richard of Bonifazio at Verona, he abducted his master's wife, Cunizza, sister of Ezzelino da Romano (q.v.), fled to Provence, and died about 1270 in the service of Charles of Anjou. See the edition (with Life) in Italian of his works by Cesare de Lollis (Halle, 1896), and a book by Eugene Benson (1903).

Sorel, a town of Quebec, on the St Lawrence, 45 miles NE. of Montreal. The industries include shipbuilding, founding, engineering, pulp and saw milling, leather. Pop. 8000.

Sorel, AGNES, the mistress of the worthless dastard Charles VII. of France, born about 1422 in the village of Fromenteau in Touraine, early entered the service of the Duchess of Anjou. Her influence with Charles began in 1444, but she died suddenly in 1450. See Life by Duquesne (1909).

Sorel, ALBERT (1842-1906), born at Honfleur, served in the French foreign office and in the secretariat of the president of the senate, and wrote much on history, specially his great *L'Europe et la Révolution Française* (8 vols. 1885-1904).

Soresina, a town of Northern Italy, 16 miles by rail NW. of Cremona, with silk-mills and 11,000 inhabitants.

Sorghum. See DURRA, SUGAR.

Soricidæ. See SHREW.

Sorolla, JOAQUÍN (1863-1923), Spanish artist, was born of humble parents at Valencia, and after studying at the Academy of Art at Valencia, won scholarships to Rome and Paris. With sincerity, sympathy, and spontaneity he depicted nearly all aspects—aristocratic portraiture, scenes of rustic life, sunlit seascapes, &c.—of contemporary Spain. He developed the technique and methods of French Impressionism with great brilliance, his style being eminently swift, direct, and always natural.

Sorrel (*Rumex*), a genus of plants of Polygonaceæ (q.v.), divided into two sections, the first of which is noticed at DOCK. Sorrel, the second, is characterised by dioecious flowers and acidity of stems and leaves. Common Sorrel (*R. Acetosa*)



Common Sorrel
Rumex Acetosa).

is a perennial found in meadows and pastures throughout the whole of Europe, and is very plentiful in Britain. Its stem is from a foot to two feet high, its leaves arrow-shaped. It is an agreeable salad, and is used in soups and sauces and as an addition to dishes of greens. It is therefore sometimes cultivated in gardens. French Sorrel, or Roman Sorrel (*R. scutatus*), a native of South Germany, Switzerland, France, and Italy, has broader and blunter leaves, and is more frequently cultivated than Common Sorrel, being considered of finer flavour. Sheep's Sorrel (*R. acetosella*) is a very similar plant, but its roots run very much

under ground, so that it is a very troublesome weed in gardens and fields of poor dry soil, in which it is very common in all parts of Britain. *R. Patientia*

and *R. sanguinea* are both regarded on the Continent as good spinach plants. For Wood-sorrel, a totally different plant, see OXALIDACEÆ. For the Red Sorrel of the West Indies, see HIBISCUS.

Sorrel Tree (*Oxydendron arboreum*), a small tree of the family Ericaceæ, which grows chiefly on the Alleghany Mountains. The leaves are acid, and are sometimes used for dyeing wool black.

Sorrento (Lat. *Surrentum*), a city of Italy, on the south-east side of the Bay of Naples, on the promontory which separates it from the Gulf of Salerno, 10 miles SW. of Castellamare. It is an archiepiscopal see. The manufacture of silk and the inlaying of wood are extensively carried on. It is celebrated for the mildness and general salubrity of its climate, for its beautiful situation in the midst of orange-groves and fruit-gardens, and for the picturesqueness of the adjacent coast; on these accounts it is much resorted to by winter and summer visitors. In the time of Augustus it was noted for its fine buildings; but few traces of these now exist in the town itself, though there are extensive ruins of villas on the promontory, notably of that of Pollius Felix, the friend of Statius. Among the Romans the wine of Sorrento was held in high repute, as were its fish and its red Campanian vases. Torquato Tasso was born here in 1544. Pop. (1921) 9783.

Sortes Virgilianæ, a favourite mode of divination among the ancients, in which an oracular answer was found in a doubtful juncture by opening Virgil's *Æneid* at random, and pricking a pin into the book, or taking the first passage on which the eye chanced to rest. Another method was to take a number of his verses, shake them together in an urn, and draw out one, from whose contents to infer good or evil. The ancient Sibylline oracles naturally afforded a subject, and the strange magical reputation early attached to Virgil helped to make his great poem the book most frequently used for this purpose. The mediæval mind read Christianity into Virgil, and consequently found no difficulty in ascribing equal value to the *Æneid* and the Bible for purposes of divination. We are told that Severus fore-read his high destiny in the line, 'Tu regere imperio populos, Romane, memento'; and Gordianus, who was to reign for but a few days, read his doom in the words, 'Ostendunt terris hunc tantum fata, nec ultra esse sinunt.' Gundulf, afterwards bishop of Rochester, and two other monks one day at Caen turned over the pages of a book of the gospels to read their future fortunes, and the Abbot Lanfranc foretold from Gundulf's passage that he should yet become a bishop. Rabelais found his license to escape from the bondage of the convent in the line, 'Heu! fuge crudeles terras, fuge littus avarum'; and we may see all the weakness of this method in the perplexity of the answers it yielded in the great question of Panurge's marriage. Dr Welwood tells us that Charles I. and Lord Falkland once made experiment of their future fortunes at the Bodleian in Oxford, and found passages equally ominous to each. The lines which the king read (*Æn.* iv. 615-620) from Dido's imprecation against Æneas plainly foretold rebellion, defeat, and a shameful death; Falkland opened at Evander's lamentation over the untimely death of his son Pallas (*Æn.* xi. 152-181). Unfortunately for this beautiful story, Aubrey in his *Remains of Gentilisme and Judaisme* tells of Prince Charles and the poet Cowley at Paris just before the trial of the king. At any rate Cowley himself tells us that he found some light from Virgil about the Scottish treaty, when employed as a secretary in affairs of state; and we read

how the Lord Chamberlain used the passage in 2 Chron. xix. 5-8 during Charles I.'s miserable Sunday of hesitation about the execution of Strafford to convince the king that the responsibility really rested upon the judges. Sir Thomas Browne in his *Vulgar Errors* denounces the *Sortes* as an ancient fragment of pagan divination; and Dr Nathanael Home, in his *Dæmonologie* (1650), deplors the loss to the state and the sin to the church engendered through lots by sieves and books.

The early Christian writers denounced divination by lots as magical, and therefore a form of idolatry. Still the practice continued to be common—'per sortes sanctorum,' by the first passage found in the psalter or gospel, the lectionary or sacramentary. St Augustine condemned this as an abuse of the divine oracles, yet preferred to see men turn in this way to the gospels rather than to demons. And we find that an unsought omen from a psalm ended the opposition to the choice of St Martin as bishop of Tours. The *Sortes Apostolorum* was a collection of pious sentences much employed for divination, a bread and water fast of three days being prescribed before using it. A similar use of the Bible long survived amongst Protestants, and indeed is not to this day extinct among people of simple faith in corners of England and Germany. A characteristic instance is told of his own experience by the great Cambridge evangelical leader, Charles Simeon, when downcast about the opposition to his ministry in his earlier years. 'I prayed that God would comfort me with some cordial from His word, and that, on opening the book, I might find some text which should sustain me. It was not for direction I was looking, for I am no friend to such superstitions as the *Sortes Virgilianæ*, but only for support. The first text that caught my eye was Matt. xxvii. 32. . . . Simon was the same as Simeon. What a word of instruction was here, what a blessed hint for my encouragement!' The obstinate survival of this superstition depends upon the naturalness of the notion, where there is a strong conviction of the power and watchful care of an overruling Providence, and a belief in the Bible as the literally inspired hand-book of divine guidance to man. Bibliolatry makes the notion of such divination perfectly rational, and we may well believe that its disuse has been merely a consequence of the decaying respect for the mere letter of Scripture. See DIVINATION.

Sorus. See FERNS.

Sosnovice, a town of Poland, 160 miles SW. of Warsaw, with iron, textile, and chemical industries; pop. 86,000.

Sothi, a town of Georgia, in the Black Sea Riviera, with hot sulphur springs in the neighbourhood; pop. 13,000.

Soteriology, that part of theology which treats of salvation by a redeemer (Gr. *sōtēr*). See ATONEMENT, CHRIST, CHRISTIANITY, JESUS CHRIST.

Sothorn, EDWARD ASKEW, comedian, was born in Liverpool, 1st April 1826, and, declining the church, medicine, or the bar, in 1849 joined a company of players in Jersey, and soon afterwards passed into the stock company of the Theatre Royal, Birmingham. From 1852 he appeared in the United States, without much success, until in 1858 *Our American Cousin*, by Tom Taylor, was brought out in New York, with Sothorn cast for the small part (forty-seven lines) of Lord Dundreary. The piece was a poor thing, and the character of the English peer as playgoers knew it was Sothorn's own creation, bit by bit. In November 1861 the play was produced in London, at the Haymarket, and ran for over 400 nights;

and it was again and again revived in later years. Sothorn essayed many other characters, but he is remembered chiefly as Dundreary; his other most memorable parts were David Garrick in Robertson's comedy, and perhaps Fitzaltamont in *The Crushed Tragedian*; the latter failed utterly in England, but was always popular in America, whither Sothorn returned several times. He died in London, 21st January 1881. See the *Memoir* by T. E. Pemberton (1890).

Soto, FERDINANDO DE. See DE SOTO.

Sotheville-les-Rouen, a town of France, dept. of Seine-Inférieure, 4 miles by rail S. of Rouen, with railway workshops and cotton industries. Pop. (1921) 22,614.

Sou, or SOL. See SOLIDUS.

Souari. See CARYOCAR.

Soubise, an ancient French family, whose property and title came in 1575 into the house of Rohan by the marriage of their heiress, Catherine de Parthenay, with the Vicomte René II. de Rohan. Memorable as champions of the Huguenot cause were both sons of this marriage, the elder, Henri, Duc de Rohan (q.v.), and the younger son, Benjamin de Rohan, to whom the seignury of Soubise fell as heir of his mother. The latter was born about 1589, served under Prince Maurice in the Low Countries, and in the religious war commanded the Huguenots in Poitou, Brittany, and Anjou, and distinguished himself throughout by his reckless courage, especially in the bold attack on the royal fleet in the harbour of Blavet and the occupation of Oleron. When all hope was at an end he found a refuge in England, and died in London childless, 9th October 1642.—In the collateral line of descent was Charles de Rohan, Prince de Soubise, peer and marshal of France, who was born 16th July 1715. His grandmother had been a mistress of Louis XIV., and he himself became a favourite of Louis XV., and early in the Seven Years' War was given the command of an army of 24,000 men, which was utterly defeated by the great Frederick at Rossbach, 5th November 1757. His later exploits were less disastrous; he even won some small successes, and he kept the command until the peace in 1763. After the death of Madame de Pompadour he found a patroness in Dubarry. When Louis XV. died he was the only one among the courtiers who followed his body to the grave—a piece of loyalty which made the new king retain him in his place in the ministry. He died 4th July 1787, and with him ended the line of Soubise-Rohan.

Soudan. See SUDAN.

Soul, a term used with various significance both in philosophical terminology and in the language of everyday life. Soul is sometimes the immaterial and immortal part of man as opposed to his body; soul is sometimes distinguished from intelligence as the resolute, energetic, emotional from the calmly contemplative; and when soul and spirit are contrasted, the soul is the lower phase of conscious life (sometimes the animal soul) as contrasted with the highest, noblest, and godlike element. A like confusion obtains in other languages; the German *Seele* and *Geist* are opposed nearly as life principle to mind, and as the emotional to the intellectual and spiritual. The confusion dates from the early times of Greek philosophy. In general, *psychē* (usually translated 'soul') is opposed to *noûs*, 'intelligence,' and also, especially in religious philosophy, to *pneuma*, 'spirit,' the divine element in man. Plato (q.v.) divided the soul into (1) the rational, (2) the spirited or irascible, and (3) the appetitive elements. With Aristotle the *psychē* is practically the vital

principle in plants as well as animals. In Neoplatonism (q.v.); and see also PLOTINUS) the psychical side of man was treated with disrespect as the part to be mortified. The doctrine of a world-soul has its roots in early speculation (see ANIMA MUNDI), and connects with some types of Pantheism (q.v.); see also MICROCOSM. Opposing views as to the origin of the individual soul, creationism, and traducianism are explained in the article dealing with the belief in Pre-existence (q.v.). See also the articles PSYCHOLOGY, PERSONALITY, IMMORTALITY, REINCARNATION, APPARITIONS, SECOND-SIGHT, HELL, ANIMISM, and those on the great authors named at PHILOSOPHY.

Söul. See SEOUL.

Soulouque. See HAYTI.

Soult, NICOLAS-JEAN DE DIEU, Duke of Dalmatia, and Marshal of France, was born the son of a notary at Saint-Amans-la-Bastide, in the dept. of Tarn, March 29, 1769. In 1785 he enlisted as a private in the Royal Infantry regiment, and was only sergeant after six years' service. Thereafter, however, his rise was rapid; in 1792 he became adjutant-major, and his conduct at Fleurus gained for him (October 1794) the brevet of general of brigade. From 1794 to 1799 he was in constant service on the eastern frontier and in Germany, and in the retreat after the defeat of Stockach (March 25, 1799) it was his able handling of the rear-guard alone that prevented the annihilation of the French army. The new chief Masséna made him general of division (April 1799), and owed to his courage and capacity much of the glory of his Swiss and Italian campaigns. In 1802 Soult was appointed by Napoleon one of the four colonels of the consular guards; in 1804 a marshal of France. He led the emperor's right wing in the glorious campaign closed with the crowning victory of Austerlitz, which he decided by piercing the Russian centre. He also did good service in the Prussian campaign, and took an important though not a prominent part in the Russian campaign of 1806-7, and after the peace of Tilsit was created Duke of Dalmatia. Soult was next placed at the head of the second corps in Spain, pursued the retreating British, attacked them at Corunna, and, though repulsed, forced them to evacuate the country and leave their stores behind. He then conquered Portugal, and governed it till the sudden arrival of Wellesley at Coimbra made him retreat rapidly to Galicia. In September 1809 he became commander-in-chief in Spain, gained a brilliant victory at Ocaña (18th November), and at the commencement of the following year overran and subdued Andalusia, continuing to command in person the southern army. In attempting to succour Badajos, which he had captured and garrisoned (March 11), he was defeated by Beresford at Albuera (May 16, 1811). After the battle of Salamanca and the advance of the British on Madrid, Soult, mortified at the obstinacy of Joseph Bonaparte and the rejection of his admirable plans for transferring the theatre of war to Andalusia, demanded and obtained his recall; but Napoleon, as soon as the tidings of Vittoria reached him, sent him back to the command in Spain, as the only captain capable of turning the tide of ill-fortune. By brilliant tactics he neutralised the consummate strategy of Wellington, and reduced the seven months' campaign to a mere trial of strength, the defeats which he sustained at Orthez and Toulouse being due to the superiority of the British soldiers, not of their general. With his usual suppleness of character, he became an ardent royalist after the abdication of Napoleon; but on the return of the latter from Elba he threw over Louis XVIII. to become

major-general of the imperial army. After Waterloo he rallied the ruins of the army at Laon, and at the council of war (July 3) coincided with Carnot as to the uselessness of further resistance. He was banished and not recalled till May 1819, but within a few years he was restored to all his former honours. In 1838 he was sent as ambassador to England to the coronation of Victoria, and was received by Wellington with warmth and by the nation with enthusiasm. In 1845 he retired from active duty, and was honoured with the appointment of 'Marshal-general of France'—a rank held before him only by Turenne and Villars. He now retired to Soultberg, his château near his birthplace, where he died, November 26, 1851.

See Soult's *Mémoires*, written in 1816 at Düsseldorf (3 vols. 1854); also Napier's *History of the Peninsular War*; Thiers's *Histoire de la Révolution et de l'Empire*; Salle's *Vie Politique du Maréchal Soult* (1834); and Combes's *Histoire Anecdote* (1870).

Sound, in ordinary language, is that which appeals to us through our organs of hearing. Experience teaches us that almost every sound can be traced to a source outside of us, and that as a rule the sound is characteristic of the source from which it comes. Different voices are easily recognisable, and there is no difficulty in distinguishing a trumpet-call from a violin-note. Here we have brought out the *quality* or *timbre* or colour of a sound. Another very obvious characteristic is the *pitch* of a sound. On it the whole theory and practice of music is based. Even the most unmusical ear can distinguish between a deep-toned note and a shrill one, between, for example, the extreme notes on a piano or organ. Then there is the question of the *intensity* or loudness of a sound. In terms of these three fundamental characteristics all differences of sound can be expressed. It is the object of the science or theory of sound to investigate the physical or mechanical nature of whatever under suitable conditions can be heard by the ear, and to express in terms of motion of matter these three ever-present characteristics—quality, pitch, and intensity.

Generally speaking, the air is the medium through which sound travels towards us. Whatever be the sound-producing body, it must first transfer something to the air, which in its turn conveys a corresponding something to our ear. Within us the sensation produced is a purely subjective one, and must not be confused with the objective cause existing outside of us. There is, however, a distinct relation between the two; for when the external conditions are physically identical, so are the resulting sensations. The very fact that air can transmit to us such a variety of sounds shows that it is capable of responding more or less completely to the varied characteristics of the sound-producing body. The necessary condition for the production of sound is that the body must, by its own vibrations or in some other way, set the air into vibration. Bells, tuning-forks, violin-strings, and drums are familiar instances of vibrating bodies; but if these are made to vibrate *in vacuo* no sound will be heard. Vibrating in air they give forth their appropriate sounds. In the Siren (q.v.) we have an instrument which produces sound by breaking up a continuous blast of air into a succession of pulses. The instrument is valuable as proving that the pitch of a note depends on the number of pulses per second. The faster the siren spins, the more quickly the pulses follow each other, the greater is the *frequency* or number of pulses per second, and the higher is the pitch, as the ear at once tells us. The same fact can be proved by holding the edge of a card against the teeth of a revolving toothed wheel. If the

wheel is going fast enough, the successive noises of the card as it frees itself from each tooth and impinges itself on the next succeeding are no longer distinguishable, but coalesce to produce a note of definite pitch which rises as the wheel rotates faster. Now it may be shown that, when the ear is satisfied that the notes produced by a siren and a tuning-fork have the same pitch, the number of pulses given by the siren in one second is exactly equal to the number of vibrations of the tuning-fork in the same time. Thus the vibrating tuning-fork transfers to the air a series of pulses timing accurately with the vibrations. It is not difficult to see how this takes place. As the forks vibrate to and fro they push the air first on one side and then on the other; and just as a hand moved slightly to and fro in water starts a series of waves travelling outwards along the surface, so the tuning-fork starts in the air a series of waves of condensation and rarefaction which travel outwards through the air. In the case of the water-waves gravitation supplies the force which, by its tendency to keep the surface level, gives the power of recovery that is indispensable to all wave-motion. In the case of the sound-waves the air's own Elasticity (q.v.), or power of resisting change of bulk and of recovering completely its original density, is the essential factor in producing and sustaining the wave-motion (see WAVE).

The essential features of the wave-motion in the air may be indicated by the behaviour of a row of points, each of which oscillates to and fro about its mean position. The time or period of oscillation is the same for all; and we shall suppose the oscillations to be of the simplest type known as Simple Harmonic Motion (see WAVE). When at rest the points are all at equal intervals apart, as in fig. 1, *a*. When in motion so that each point moves through its mean position a little later than

a
b
c
d

Fig. 1.

does the immediately preceding point, then the points will be crowded together in some regions and widely distributed at others (fig. 1, *b*). As the points continue their oscillations the configuration will not remain steady, but will move along among the points (fig. 1, *c* and *d*). Any given region will become alternately more crowded and less crowded, a region now of condensation, now of rarefaction. This ever-changing condition, which we have supposed to be the characteristic of a row of points, may easily be imagined to be possessed by a swarm of space-filling particles; and, from the analogy of the circular ripples which expand outwards over the surface of a lake which has been disturbed by a stone being dropped into it, we can readily picture a succession of spherical waves of condensation and rarefaction radiating out through air from the source of disturbance, in the present instance the source of sound. The mode by which the condensation or rarefaction is passed on from one region of air to another may be explained as follows: Because of its elasticity air resists compression and will tend to recover its original density as soon as the compressing force is removed. But because of its inertia it will, if left perfectly free, overdo the recovery—just as a pendulum when drawn aside and let go swings to the other side of its natural position of rest. Now if any small region of air undergoes rarefaction it can only do so by itself expanding and thereby compressing the surrounding layer of air. But as it, so to speak, swings back through its condition of

normal density to a state of condensation, the surrounding layer will swing from its state of condensation to a state of rarefaction, that is, expansion, compressing thereby in its turn the next encompassing layer of air. This second layer, having thus acquired an oscillatory character, will in the same way impress the next layer with a like character, and so on indefinitely.

Returning to the case of the tuning-fork, we see how the energy of its vibrations is gradually transferred to the air and transmitted through it to the farthest limits at which the sound is heard, if not farther. Thus the motion of the tuning-fork gradually decays, and the intensity of the sound heard at any given distance simultaneously diminishes. Ultimately the sound dies away, and the tuning-fork comes to rest. What is called the intensity of a sound depends in some way upon the degree of agitation communicated to the air—in accurate language, upon the vibratory energy existing in the air at the place where the sound is heard. Now it is a familiar experience that with great variations of intensity the pitch of a sound remains unchanged. The pitch depends upon the number of vibrations per second, and the intensity upon the energy of vibration. We find then that within wide limits the extent or amplitude of the vibration, or (as in air) the range through which the density may vary, does not affect the periodic time of the vibration. The quantitative relation between the energy and the amplitude, and therefore between the intensity and the amplitude, is that the former varies as the square of the latter. With double the amplitude we have four times the intensity, with half the amplitude one-fourth the intensity. That the intensity falls off at a much quicker rate than the amplitude is at once evident to any one closely inspecting the diminishing range of motion of a tuning-fork and at the same time paying attention to the decreasing loudness of the tone. The ear is by no means so sensitive in comparing intensities as it is in comparing pitches. When two notes are of very different pitch it is often difficult to say which is the louder.

We now pass to the consideration of the quality of a musical sound. A tuning-fork gives a colourless inexpressive sound, whose one useful property is the constancy of the pitch. When sounding the same note the pianoforte, the violin, the trumpet, the clarinet, and the human voice all impart their own peculiar flavour, which is readily recognised by the ear. Not only so, but we can distinguish different pianofortes, different violins, different voices, and so on. These differences of quality cannot depend on the frequency or number of vibrations per second, for that determines the pitch; nor upon the energy of vibration, for that determines the intensity. Quality, in fact, can depend only on the internal nature of the vibration. This may be shown synthetically, as was done by König, by making siren disks, each perforated with its own peculiar shape of hole, but all identical as regards number of holes and rate of rotation. It is evident that if the blast of air is broken up into successive portions which have issued through, say, triangular instead of the usual circular holes, the form of the pulses which build up the note will be changed. And such a change is recognised at once by the ear.

Most instructive in this connection are the laws of vibration of stretched strings. If we fix one end of a pretty long rope to a wall, and, with the other end in the hand, keep it in a stretched condition free of the floor, we may observe any slight disturbance given to it running as a solitary wave along the rope and back again after reflection at the wall. The tighter the rope is stretched the quicker will this disturbance travel to and fro along it. It is

not difficult to show that the speed at which such a disturbance or wave will travel along a stretched cord depends on the tension (T) and on the mass (m) per unit-length of the cord, being given by the simple formula $v = \sqrt{T/m}$. Suppose we have such a stretched cord of indefinite length, and that a series of exactly equal waves are running along it from left to right, as shown in fig. 2, a , in which the straight line indicates the undisturbed position of the string. Now let there be propagated along the string from right to left an exactly equal series of waves, which, if existing alone, would throw the string into some such form as shown in b (fig. 2).

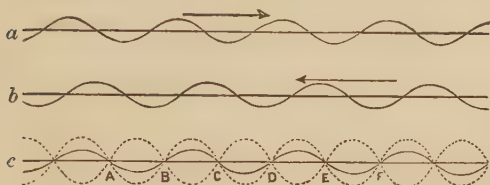


Fig. 2.

The superposition of these two exactly similar series of waves propagated in opposite directions gives rise to a resultant motion indicated in c (fig. 2). Here the points ABCDEF, being once at rest, are always at rest; since, whatever be the displacement due to the a waves, an exactly equal and opposite displacement is produced by the b waves, now and forever. Intermediate points, however, will move up and down between the limits indicated by the dotted loops in c (fig. 2). The string, in fact, will vibrate in segments whose ends are fixed at the points ABCDEF. The segments will be, at any instant, alternately above and below the undisturbed position of the string. The motionless points are called *nodes*; and it is evident that we may fix any two of them, and cut away all the string lying beyond these chosen nodes without in any way affecting the motion of the part lying between them. If we fix two contiguous nodes, for example A, B, we have a definite length of string vibrating as a whole. If A and C are fixed we get twice that first length of string vibrating in two segments; if A and D, we have three times the length vibrating in three segments; if A and E, four times the length vibrating in four segments; if A and F, five times the length vibrating in five segments; and so on. Now all these are simply different ways of producing exactly the same vibration, so that a note which is given by one length of stretched string vibrating as a whole may be given by L lengths of a similar string similarly stretched, vibrating in L segments. But we may have this string of length L itself vibrating as a whole. We have merely to suppose the oppositely directed series of waves to be L times longer than those shown in fig. 2 (a, b). If n is the frequency of any vibration, and l the wave-length or distance from crest to crest, it is easy to see that a given wave will travel over a distance nl in one second. That is, we have $nl = v = \sqrt{T/m}$, a quantity depending only on the tension and mass of the string. Consequently, if we double the wave-length we halve the frequency; if we halve the wave-length we double the frequency; and so on. Generally then the frequency of vibration of a string of given tension and density varies inversely as its length. This is the principle on which all instruments of the violin and guitar types are played. The player, by pressing the string down with the finger at different points, can shorten the string in the required ratio, thereby producing a correspondingly higher note.

From what precedes we see that a stretched string, which vibrates as a whole, say, 100 times per second, can also vibrate 200 times per second in two segments, 300 times per second in three segments, and, in general, n hundred times in n segments, if the segments are not too short. By lightly touching, without pressing, a violin-string at the proper point, so that that point is made a node, any of these higher notes (overtones) may be obtained. This is a very common practice in playing the violoncello. Not only, however, may a string be so made to utter any of the overtones, but it is practically impossible to prevent some of them sounding along with the fundamental note. It is, in fact, upon the presence of these overtones that the quality or character of the sound depends. They give the *form* to the vibration. In fig. 3 we see how the form of the wave is changed by superposing upon a given vibration the first and second overtones, having frequencies twice and three times the frequency of the fundamental tone. The musical relations of these overtones of stretched strings are discussed under HARMONICS (q.v.). The harmonics of a note are the simple harmonic vibrations

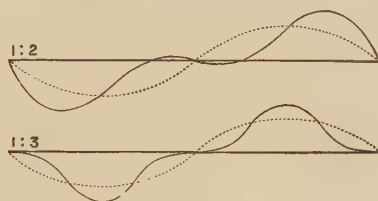


Fig. 3.

into which, according to Fourier's analysis, any steadily recurring periodic motion can be decomposed. The prime or fundamental tone is the first harmonic; and higher harmonics are all overtones. But, as we shall see hereafter, all overtones are not necessarily harmonics.

Air-columns, such as we have in organ-pipes (see ORGAN), vibrate according to laws very similar to those which rule the vibrations of strings. The frequency of the note is inversely as the distance between two successive nodes. One essential difference is that the ends of a stretched string must be nodes, whereas in pipes one or both ends may be *loops*, where the velocities experience their maximum change and the pressure is invariable. In the open organ-pipe both ends are loops, between which one node at least must exist if a sound is produced. This gives the fundamental vibration, and may be diagrammatically indicated, as in fig. 4, a . The wave-length is (approximately) double the length of the tube. The second harmonic is produced when two nodes intervene, as in b (fig. 4); the third when three nodes intervene, as in c (fig. 4); and so on. The wave-lengths of these are respectively the length of the tube and two-thirds the length of the tube. Hence, if the fundamental tone has frequency 100, the second has frequency 200, the third 300, and so on. In the closed or stopped organ-pipe, again, one end is a node and the other a loop. In fig. 5, a , we have a diagrammatic representation of the prime tone, whose wave-length is (approximately) four times the length of the tube. Thus by

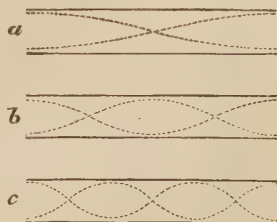


Fig. 4.

simply stopping the one end of an open organ-pipe we lower the prime tone a whole octave. The next possible mode of vibration is indicated in *b* (fig. 5), in which are two nodes. Here the wave-length is $1\frac{1}{2}$ times the length of the tube. In the next mode, with three nodes (fig. 5, *c*), the wave-length is $\frac{5}{3}$

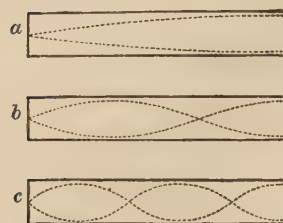


Fig. 5.

of the length of the tube; and so on to higher harmonics. If the fundamental tone of a closed pipe has frequency 100, the next possible harmonic will have frequency 300, the next 500, and so on. Thus in any note uttered by an open pipe all the harmonics may enter; but in a closed organ-pipe only those of odd number can be present. This lack of the even harmonics gives a curious nasal quality to the tone of the closed organ-pipe. By overblowing we may so accentuate the second harmonic in the open pipe as to make it sound a note appreciably an octave higher than the fundamental note. By overblowing the closed pipe the pitch of the note jumps up an octave and a fifth. With flutes and whistles similar effects may be produced.

A tuning-fork is a vibrating bar whose one end is a node. In producing its fundamental tone each prong vibrates so that there is no other node, as in fig. 6, *a*. The next possible mode of vibration is when a second node exists, as shown in fig. 6, *b*. This first overtone is not related to the fundamental tone according to the harmonic series already given for strings and air columns. For example, if the fundamental tone of the tuning-fork is C of the bass clef, the first overtone is two octaves and 7.7736 mean semitones higher—i.e. a little flatter than G $\sharp$ above the treble C. In the case of stretched membranes, vibrating plates, and bells similar complexities hold; and it is impossible to get from them overtones harmonically related to the fundamental tone and to one another. There is no

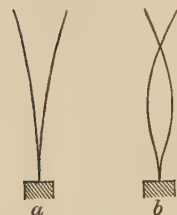


Fig. 6.

doubt, however, that the characteristic clang of a bell is due to the presence of these anharmonic overtones; and the art in bell-making is to prevent them having a pronounced discordant effect on the ear. By careful manipulation the first anharmonic overtone of a large-sized tuning-fork may be made to sound instead of the fundamental tone, and not infrequently it may be heard along with it. In this latter case it rapidly dies away, and the tuning-fork continues to utter a pure tone of the simplest harmonic type. When strings or columns of air are vibrating, the harmonic overtones may be picked out by the ear with tolerable ease after a little practice. Their presence may, however, be made evident to the most unmusical ear by the use of resonators.

The function of a resonator is to reinforce the intensity of a note produced by some vibrating body in its neighbourhood. The principle is made use of in all musical instruments. For instance, in the violin the greater part of the energy of vibration of the string does not pass directly to the air, but indirectly through the body of the violin, which vibrates with the string. The sounding-board of a piano plays the same rôle, being set into vibration by the impacts of the waves upon the terminal

fixed points of the strings. In these and similar cases a greater mass of air is influenced by the vibrations of the system, the energy originally given to the string is more quickly transferred to the air, and the result is increased intensity. The word resonator is, strictly speaking, applied to a body which resounds to one note only or to one of a definite harmonic series. If a tuning-fork be held in front of the lip of an organ-pipe, one of whose own harmonics has the same pitch as the note of the tuning-fork, the sound uttered by the tuning-fork will be distinctly reinforced. This reinforcement will not occur in the case of a tuning-fork having no harmonic relation to the pipe. The pipe in the above case acts as a resonator. Again, hold down any note on the piano so as to leave the corresponding strings free, and then strike the note an octave lower, or an octave and a fifth, or two octaves lower. Release this latter note, so that its strings become damped, and the former note will be heard distinctly as if it had itself been struck. Its intensity may be reinforced again and again by repeated striking of a lower note of which it is an harmonic. Here the strings of the note that is being held down act as resonators to the corresponding harmonic of the note that is struck. The same effect may be produced by singing a suitable note, or playing it on some other instrument. The boxes to which large tuning-forks are attached are so shaped that the mass of air within them vibrates naturally to the note of the tuning-fork. And just as a pendulum or ordinary swing may be made to describe larger and larger arcs by properly timed impulses, so a resonator responds to the timed pulses of the note to which it is tuned. Helmholtz's spherical resonators, tuned to the successive harmonics of a particular note, are an indispensable part of the equipment of a physical laboratory. Each is a hollow sphere provided with two apertures diametrically opposite each other. The smaller aperture is made in the form of a small projecting tube which can be fitted close into the ear. Through the other and larger aperture the outside disturbance sets the mass of air inside the sphere into vibration. As an example of their use, take the case when the note to which one of the resonators is tuned is sounded by (1) an open organ-pipe, (2) a closed organ-pipe. By placing in turn each resonator to the ear we readily convince ourselves that the successive harmonics are all present in the sound of the open organ-pipe, but that with the closed pipe the even harmonics are absent. When the proper resonator is placed behind a tuning-fork the sound becomes powerfully reinforced. By taking advantage of this principle Helmholtz proved synthetically that vowel-sounds of the same pitch have different harmonics present. By means of the Phonograph (q.v.) Jenkin and Ewing analysed the vibrations produced by vowel-sounds at various pitches; and their results show that the relative intensities of the principal harmonics present in any given vowel-sound vary with the pitch.

As with all forms of wave-motion, sound may be reflected (see ECHO) and refracted. When a string or air-column is thrown into a steady state of vibration with nodes occurring at regular intervals there is in reality a reflected wave, which, travelling backwards along the vibrating substance, interferes with the forward-travelling wave in the manner already described. Interference (q.v.) is also shown by the phenomenon of beats.

The existence of beats is determined by the coexistence of two notes differing very slightly in pitch; and the number of beats per second is simply the difference of the frequencies. Because of the absence of upper harmonics in the note given

by a tuning-fork, the phenomenon is produced in its purest form by means of two tuning-forks originally in unison but thrown slightly out of tune by weighting the one tuning-fork with a small piece of wax attached to it. If the tuning-forks, for example, have frequencies 300 and 302, there will be heard two beats per second—i.e. the intensity of the resultant sound will vary from zero to a maximum and back to zero again twice every second. The reason of this will be easily seen if we consider the resultant effect of the two sets of waves at different times. For, since the two sounds have the same velocity, it is clear that across any surface set in the path of the rays of sound the higher note will transmit two more waves per second than the lower note, or one more wave in half a second, or half a wave extra in a quarter of a second. Suppose that at the beginning of the second chosen the nearly equal waves combine crest to crest and trough to trough, so as to produce an increased intensity; then a quarter of a second later the slightly quicker vibration will have gained half a wave-length on the other, crest will fall with trough and trough with crest, and little or no vibratory motion will be the result. At the half second, crest and crest will again coincide, and the resultant sound once more reach a maximum; and so on indefinitely. The transition from maximum to minimum loudness is of course gradual. If notes in which higher harmonics exist are used the beating is not so simple. For example, with open organ-pipes tuned to frequencies 300 and 302, not only will the primes beat twice a second, but the second harmonics 600 and 604 will beat four times a second, the third harmonics six times a second, and so on. There is generally no difficulty getting beats from a piano-forte note, since the two or three strings that belong to the note are rarely in accurate tune.

In general if m and n are the vibration numbers of two notes sounding together which give beats, $(m - n)$ will be the number of beats per second. If this beating does not occur oftener than two or three times a second the ear is not distressed. Rapid beating, however, produces very unpleasant sensations even after it has reached a rapidity too high to be counted. When the difference of frequencies $(m - n)$ is greater than 25 or 30, the note of frequency $(m - n)$ is heard in addition to the two original notes. There is no difficulty in hearing this differential tone, as it is called, when the two notes are sufficiently loud. On instruments giving sustained sounds, such as the organ, harmonium, and concertina, very marked differential tones are produced; and to an ear trained to their perception they are recognisable on the piano. When the difference of the frequencies lies between 30 and 100 the rattling of the beats may often be distinguished from the low hum of the differential tone; so that we are not warranted in regarding these two phenomena as of the same nature. By bringing the two notes by different courses to the two ears we can hear the beats, but cannot hear the differential tone. Moreover, in addition to the differential tone $(m - n)$, there are other differential tones of frequencies $(2m - n)$, $(m - 2n)$, &c., and also at times a weak summational tone of frequency $(m + n)$. This last-named tone was discovered by Von Helmholtz, to whom we owe the complete discussion of the origin and significance of these Combinational Tones, as they are collectively termed. Two kinds are distinguished by him. If the vibrations transferred from the vibrating body to the air are very large the simple law of superposition may not hold. A simple pendular vibration, such as a tuning-fork may give, will when transferred to the air lose to some extent its simple harmonic char-

acter, and higher harmonics will enter in. If two simple pendular vibrations act powerfully on the air combinational tones will be produced in addition to the higher harmonics of the two original notes. These combinational tones existing in the powerfully disturbed air can be reinforced by use of resonators. Combinational tones of the second kind cannot be so reinforced, since they are produced in the ear itself. They are due to the asymmetric character of the drum of the ear, which cannot respond to two coexisting vibrations without producing combinational tones. The frequencies of these combinational tones, whether of the first or second kind, are all included under the general formula $Mm \mp Nn$, where m and n are the frequencies of the original notes, and M and N are integers from zero upwards. As experiment shows, only the first few integers are of any importance, and no summational tone of higher order than $m + n$ (M and N both unity) has ever been heard. As an example, take two notes having frequencies 200 and 315. Their principal combinational tones will have frequencies 115 ($315 - 200$) and 85 ($2 \times 200 - 315$). This latter may be regarded as the differential tone between the lower prime and the first combinational tone. These two tones can both be heard if the intensities of the sounds are sufficiently strong. Both theory and experiment show that the comparative intensity of combinational tones grows rapidly as the intensities of the real notes are increased, and also that combinational tones of low pitch are most prominent.

As first brought out clearly by Helmholtz, combinational tones are of peculiar interest when the two notes form a consonant interval. Thus, take any two notes a musical fourth apart. Their vibration numbers may be represented by $3n$ and $4n$. Their principal differential tone will have the frequency n ($= 4n - 3n$), and will therefore form the fundamental tone of which the given two are harmonic overtones. Again, take any perfect triad (*do, mi, sol*) having frequencies $4n$, $5n$, $6n$. Each successive pair gives the same differential tone n ; the first and last together give the differential tone $2n$. Thus we hear the low tone which is harmonically fundamental to all, and its octave. In some cases the differential tone becomes so loud that the real notes which are being sounded become merged in it as upper harmonics. If the notes of the triad are not in perfect tune the differential tones will not be harmonically related. On an organ tuned in equal Temperament (q.v.) the chord built upon the treble C consists of notes having frequencies 522, 657·7, 782·1 (see PITCH). The two lowest differential tones have frequencies 135·7 and 124·4—notes which, sounding together, produce 11·3 beats per second. The ear that has accustomed itself to the pure harmony of the perfect triad will easily recognise a certain dissonance in the triads given by pianos and organs.

Beats always mean the coexistence of two notes of nearly the same frequency. If on any organ or harmonium any note and its fifth are struck together beats are heard. It is indeed by getting rid of these beats that we finally effect a perfect tuning of say two contiguous violin-strings. These beats on the tempered instruments are due to the fact that the interval is not a true fifth, so that the higher harmonics which are present cause beating combinations. This is shown by comparing the first three harmonics of notes which form (1) a perfect fifth and (2) a tempered fifth.

PERFECT FIFTH.			TEMPERED FIFTH.		
C.	G.	Beats.	C.	G.	Beats.
522	783	..	522	782·1	..
1044	..	..	1044	..	..
1566	1566	0	1566	1564·2	1·8
&c.	&c.	..	&c.	&c.	..

Similar results may easily be obtained for all tempered intervals, if the higher harmonics exist in sufficient strength. We may, however, make use of the combinational tones in producing beats. For instance, by the rule given above, we get for the first combinational tones 260.1 and 261.9, which beat also 1.8 times a second. The second combinational tone is intensified by the actual presence of the second harmonic of C; and we can make the beating still stronger by sounding the octave along with C and G.

All vibrations in air of sufficient intensity and suitable frequency produce sound-sensations. The highest frequency which gives an audible sound is about 70,000. This is much higher in pitch than the highest notes used in music. For example, the frequency of the highest note on the pianoforte falls short of 4000. Very high pitched sounds near the limit of audibility are very disagreeable to the ear; and sounds which are heard by one person may be, because of their high pitch, quite inaudible to another. There are many noises of whose pitch it is impossible to say anything definite. They are no doubt confused mixtures of tones of fluctuating pitch. According to König the peculiar quality or timbre of trumpet notes and other notes of piercing quality is in great measure due to a fluctuating character in the vibration. The various overtones, both harmonic and anharmonic, do not combine with the prime in a steady periodic manner. Anharmonic overtones must of necessity produce fluctuations in the periodic character of the note; and the theory of quality cannot be complete without taking their existence into account. In this direction Helmholtz's theory requires extension.

Of great value and interest are Helmholtz's investigations on the forms of vibration of strings, especially of violin strings. If we can experimentally determine the form of the wave into which the string is thrown when bowed, we can by Fourier's mathematical process calculate the harmonics that enter in. Helmholtz solved the problem by viewing through a microscope the motion of a small white speck at different points of the string, the microscope itself being attached to the vibrating end of a tuning-fork, and being so made to execute a simple harmonic motion at right angles to the direction of vibration of the white speck. The principle of the method is identical with that introduced by Lissajoux in obtaining what are known as Lissajoux's Figures. Two tuning-forks, with bright reflecting surfaces fixed to their vibrating ends, are arranged so that while one vibrates to and fro vertically, the other vibrates to and fro horizontally. A beam of light is reflected from the one upon the other, and after a second reflection is focussed sharply upon a screen or viewed in a telescope. When either fork is vibrating alone the image on the screen will vibrate also along a straight line. But when both are vibrating together the light spot on the screen will execute the motion which is the resultant of the two mutually perpendicular vibrations. Definite figures are obtained only when the two forks are tuned accurately in unison, or by some simple interval apart. For example, if the two forks give the same note the figure on the screen will be an ellipse or one of its extreme forms, the circle or straight line. If the forks are *very slightly* out of tune—imperceptibly so to the ear—the ellipse will gradually change shape, passing from the circle to the straight line. The figures obtained when the ratio of the frequencies is as 1 : 2 (the octave), 2 : 3 (the fifth), 3 : 4 (the fourth), and so on, are very beautiful; and if the interval is just short of perfect tuning the gradual passing of the figure through a series of related but slightly differing forms is very in-

structive. The experiment is valuable as giving an optical demonstration of the laws of combination of vibratory motions in lines inclined to one another. Compare the explanation of elliptic and circular Polarisation (q.v.) of light.

Although sounds come to our ear through the air or other fluid as waves of compression and rarefaction, they may have their origin in vibrations of quite a different type. In solid substances there are distortional waves as well as compressional waves. In a pure distortional wave the substance changes form and does not change bulk. Its existence depends upon the Rigidity (q.v.) of the substance. In gases and liquids only compressional waves can exist, and these depend upon the compressibility (see COMPRESSION). When a bar, stretched string, or plate is set into vibrations a certain kind of elasticity is brought into play, and a certain strain produced, which in general involves both change of form and change of bulk. Corresponding to this there is an appropriate stress whose ratio to the strain is the coefficient or modulus of elasticity upon which the velocity of the wave depends. Calling this modulus E , we find for the velocity of a vibratory wave the expression $V = \sqrt{E/D}$, where D is the density of the substance set into vibration.

This formula was first applied by Newton to the case of air. Assuming Boyle's Law (see GAS AND GASES), he obtained the expression $\sqrt{P/D}$ for the velocity of sound, where P is the pressure. But when the proper numbers are put in the velocity is found to fall short of its true value by about 180 feet per second, or by one-sixth of the whole. Newton's assumption is in fact false. Boyle's Law holds only when, throughout the changes of pressure and density, the temperature remains constant. But in the rapid condensations and rarefactions which accompany audible sounds the temperature varies, increasing during condensation and decreasing during rarefaction. Now rise of temperature means increase of pressure and fall of temperature decrease; so that the result of these temperature changes is to increase the forces at work—i.e. to increase the elasticity. Laplace first made this necessary correction to Newton's calculation. We must in fact multiply the pressure by 1.41, which is the square of 1.2 nearly. The complete theory gives for the velocity of sound in dry air at a temperature of t° F. the value

$$V = 1122 + 1.09(t - 60) \text{ feet per sec.,}$$

which is as near as may be to the mean of experimentally determined values.

The quantity E is the same for all the true gases. Hence the velocity of sound in gases varies inversely as the square root of the density. In other words, a given wave-length will vibrate proportionately faster. Thus, if an organ-pipe be blown with hydrogen gas in it instead of air, the note will leap up nearly two octaves in pitch, since the density of air is 14.4 times that of hydrogen.

In the case of any liquid the quantity E is the reciprocal of the compressibility, which is not appreciably affected by slight changes of temperature. For water the density is unity, and E is 2.08×10^{10} . Hence $V = 144,000$ centimetres (4730 feet) per second. Colladon's value, determined by experiments on the Lake of Geneva, was 143,500. Thus sound travels four times faster in water than in air. In the case of solids, in the form of thin rods or wires, waves of compression will travel at still higher speeds. The quantity E is practically Young's modulus of elasticity. In steel $E = 2.14 \times 10^{12}$, and $D = 7.85$; hence $V = 522,000$ centimetres (17,130 feet) per second, or nearly sixteen times the velocity of sound in air.

The standard book on Sound is Lord Rayleigh's *Theory of Sound* (1873; 2d ed. 1894). Tyndall's *Sound* is a popular exposition of the subject, illustrated by well-chosen experiments. Helmholtz's *Tonempfindungen, or Sensations of Tone* (Eng. trans. 1875; 4th ed. 1912), discusses in a highly original manner the borderland between sound as a branch of physics and music as a branch of æsthetics. Sedley Taylor's *Sound and Music* (1873; 3d ed. 1896) is a simple exposition of the chief of Helmholtz's discoveries. König's *Expériences d'Acoustique* (1889) contains some valuable novelties. Lamb's *Dynamical Theory of Sound* (1910) is introductory to the study of Rayleigh and of Helmholtz. And useful text-books are those of Catchpool (1894; 5th ed. 1922), Barton (1908; 2d ed. 1919), Capstick (1913; 2d ed. 1922). See *Nature*, vol. xliii. 1890; also the articles ACOUSTICS, HARMONICS, MICROPHONE, TELEPHONE, VOICE.

Sound (O.E. and Ger. *Sund*), the strait which leads from the Kattegat into the Baltic Sea, having Sweden on the east and the Danish island of Sjælland on the west. It forms the usual passage from the North Sea to the Baltic, is 50 miles long and nearly 3 miles wide at its narrowest part, between the towns of Helsingborg and Elsinore. Its passage, defended by the strong Danish castle and fortress of Kronborg, was forced by Nelson in 1801 (see COPENHAGEN). From the 15th century all ships using this channel, except such as belonged to certain of the Hanseatic towns and one or two others in the Baltic, were charged toll for passing through. These Sound Dues were abolished on 14th March 1857 by a treaty between Denmark and the principal maritime powers. A pecuniary compensation of £3,386,260, of which Great Britain paid £1,125,206, was given to Denmark, which bound itself to maintain the lighthouses and superintend the pilotage of the Sound.

Sound, in fishes. See AIR-BLADDER.

Sounding. From the earliest times navigators have ascertained the depth of the sea in shallow waters by means of a hand-lead. This consists of a hempen rope, marked off into fathoms by worsted of different colours, to which is attached a leaden weight armed with tallow or having a valved cavity to bring up a sample of the deposit at the sea-bottom. In addition to the hand-line steamers are now often furnished with a machine to ascertain the depth while under way. This consists of a winch, wire rope, fair-lead, and a sinker provided with a glass tube, which, on being removed after a sounding, indicates by the action of sea-water on a chemical coating the hydrostatic pressure on the air in the tube and consequently the greatest depth reached by the sinker. One of the latest inventions to ascertain the depth of water while a ship is in motion is the 'submarine sentry.' This is a kind of submarine kite, which is trawled after the ship at a depth of 25 or even 40 fathoms, and as soon as the kite strikes the bottom the fact is indicated in the chart-room. Very many attempts were made to sound the deep sea before satisfactory results were obtained. Magellan during the first voyage round the world attempted to sound the open ocean in the Pacific. Not having reached bottom in 200 fathoms he naïvely concluded that he had crossed the deepest part of the ocean. Ellis in 1749 and Mulgrave in 1773 failed to sound the deep sea. Sir John Ross was more successful, for in 1818 he sounded in the Arctic seas in 1050 fathoms, bringing up a specimen of the bottom. Sir James Ross during his Antarctic expedition sounded in 2425 fathoms, and on two occasions no bottom was found with 4000 fathoms of line. There was a great uncertainty about these depths owing to there being no sure indication when the weight reached the bottom. Brooke, an officer of the United States navy, in 1854 gave a great impulse to deep-sea sounding by introducing a detaching

weight, the sinker being left at the bottom, and only a small tube with a sample of the bottom being hauled up with the line. A modification of this apparatus was used during the *Challenger* expedition, 3 or 4 cwt. of iron sinkers being left at the bottom in each sounding. A sudden decrease in the rate at which the rope was running out showed when the sinkers had struck the bottom. The sounding line was $\frac{3}{4}$ inch in circumference, and in addition to the sinkers and sounding tube there were attached to it several thermometers, a water-bottle, piezometers, and other instruments. Deep-sea sounding for telegraphic purposes is now carried on by means of wire rope, or steel wire, such as that used for the 'strings' of pianos: this was introduced by Sir William Thomson (Lord Kelvin). The friction of the wire in passing through the water is much less than that of the hemp rope. It runs out and can be hauled in much more rapidly; a smaller sinker can be used, and this often can be pulled up along with the wire. When only the depth is required a fine twine, or a wire, with a weight is now used in sounding in deep water, the whole being cut adrift when the depth is ascertained. The time employed in hauling in the line is thus saved, which well repays the loss of twine and weight. Quite recently very rapid soundings have been made by utilising the knowledge of the velocity of sound-waves in sea-water. An apparatus fixed outside the hull of the ship makes a small explosion. The sound-wave thus generated is reflected back from the sea-bottom as an 'echo,' and the time required for the double journey is observed instrumentally. From this time the depth is deduced. The deepest soundings and results are noted at SEA, PACIFIC OCEAN, &c.

See *Narrative of the Cruise of H.M.S. Challenger*, vol. i.; *Deep-sea Sounding and Dredging*, by Sigbee; and *Challenger Report on Deep-sea Deposits*, by Murray and Renard.

Soup. As a general rule a soup is made by boiling meat or vegetables in what is called 'stock.' To prepare the latter the cook obtains fresh meat, bones, and vegetables such as carrots or leeks, and after the addition of salt allows them to simmer for some hours in sufficient water. The stock is the infusion thus prepared, and contains small quantities of starch, if vegetables have been used, and in any case some gelatine, which will often cause it to solidify on cooling. Together with a small quantity of nourishment, the infusion has extracted from the meat and vegetables those pleasant flavoured extractives which give it taste. Taking this stock as a basis, the various soups are made by boiling with it the bones and flesh of the hare, ox-tails, &c., and vegetables such as carrots, potatoes, turnips, rice, sago, &c.

If we view the preparation of soups from the point of domestic economy, the following facts must be kept in mind. Bones, otherwise valueless to the householder, contain much nutritive gelatine, which is extracted from them in the preparation of stock; no bones should therefore be thrown away, for their use is a clear gain. It is to be remembered that meat on the other hand yields little of its nutritive matter to the stock, and if the meat be thrown away, as it generally is in England, the greater part of its value is lost. It is the greatest waste of nutritive material to prepare a stock from gravy beef, which yields hardly more to the water than its flavouring extractives; yet householders regularly buy meat for this wasteful purpose. If then it is an object to obtain the nutritive value from the food, the meat should as much as possible be retained and eaten. While the greatest extravagances may be thus committed by using meat, which might be eaten as such, in the

preparation of stocks and clear soups, it is certainly the case that equal waste is frequently committed by throwing away the water in which meat, fowls, fish, bacon, and pork have been boiled. This always contains some nutritive matter, and every capable cook should be able to make it the basis of an excellent soup. As to clear soups and Beef-tea (q.v.), numberless invalids are yearly starved out of existence by doctors and nurses, who imagine that by stewing a pound of gravy beef the nourishment goes to the water. Soups thickened by vegetables such as peas, potatoes, &c., are highly nutritious.

South, ROBERT, born at Hackney in 1633, from Westminster passed as a student to Christ Church, Oxford, in 1651. In 1658 he received orders from a deprived bishop, and in 1660 was appointed public orator. His vigorous sermons, full of mockery of the Puritans, delighted the restored royalists; and he became domestic chaplain to Clarendon, prebendary of Westminster in 1633, canon of Christ Church in 1670, rector of Islip in 1678. He 'acquiesced in' the Revolution, but blazed out against the proposed scheme of Comprehension. In 1693 began, with his anonymously published *Animadversions*, his great controversy with Sherlock, Dean of St Paul's, who had defended the Trinity against the Socinians. Sherlock published a *Defence*, to which South rejoined in his *Tritheism charged upon Dr Sherlock*. Before his death (8th July 1716) South is said to have refused the see of Rochester and deanery of Westminster (1713). His sermons are masterpieces of clear thought expressed in vigorous English, sometimes rising to splendid eloquence, and often seasoned with wit and sarcasm. He abhorred mysticism and extravagance, sneers at the new philosophy, and carried to a height unusual even among royalists the fatal Stuart theories of passive obedience and the divine right of kings.

His sermons fill 11 vols. (1692-1744); in 1717 appeared his *Posthumous Works*, with Memoir; also his *Opera Posthuma Latina* (all republished in 1823). See Dean Lake in *Classic Preachers* (1877).

South Africa, geographically, is that portion of the African continent south of latitude 15° S., i.e. south of a line drawn from Mossamedes in Portuguese West Africa to Mozambique in Portuguese East Africa. Politically, the term is applied to Africa south of the Zambezi, a broad tongue-shaped territory (roughly, 1200 miles long, and 1600 miles wide at its base), now entirely under the British flag, save the southern half of Portuguese East Africa.

British South Africa comprises:

	Area (sq. m.)	Pop. (1921).
Union of South Africa	472,347	6,928,580
South-West Africa	322,450	227,739
Basutoland	11,716	498,781
Bechuanaland Protectorate	275,000	152,983
Swaziland	6,678	106,961
Southern Rhodesia	149,000	899,187
British South Africa	1,237,191	8,814,231

The physical features and geological structure of the subcontinent are described in the articles on its component parts and on Africa. The coast-line describes a parabola, has few bays and indentations, and no islands of any size. The only big rivers are the Zambezi and the Limpopo, flowing east, the Orange River flowing west. There are no lakes, except Ngami and 'pans' of varying size. Forests are few. The whole of British South Africa, apart from a very narrow coastal belt, is over 600 feet above sea-level, the great mass of the interior consisting of plateau from 3000 to 6000 feet in elevation, behind an arc of mountain ranges that attain a maximum of 11,000 feet in the Drakensbergs.

Over so huge an area climate naturally varies, but the entire country abounds in bright sunshine, the average rainfall is low (c. 19 inches per annum for the Union), and most parts are well adapted for Europeans, being much more temperate than other lands of like latitudes. The summer coincides with the European winter. The official time of South Africa is two hours in advance of Greenwich time. Sparsely populated, the subcontinent has few large towns and has several vast desert areas (notably the Kalahari and the Namib in South-West Africa).

THE UNION OF SOUTH AFRICA (*Unie van Zuid Afrika*, or *Suidafrika*, to use the Afrikaans form) was formed in 1910 of four original provinces—Cape of Good Hope, Natal, Transvaal, and Orange Free State; and, as a mandatory of the League of Nations, administrators (since 1920) South-West Africa. The area and population of the Union and its provinces at the 1921 census are given in the following table:

	Area (sq. m.)	White Pop.	Total Pop.	Total, 1911.
Cape of Good Hope.....	276,966	650,609	2,782,719	2,564,965
Natal.....	35,284	136,838	1,429,398	1,194,043
Transvaal.....	110,450	543,485	2,087,636	1,686,212
Orange Free State.....	49,647	188,556	628,827	628,174

Union of South Africa.....	472,347	1,519,488	6,928,580	5,973,894
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The Union is nearly four times the size of the British Isles, about one-eighth the size of Canada, and one-sixth the size of Australia. There are 14.67 persons (3.22 white) to the square mile in the Union, as compared with 11.61 in New Zealand, 2.36 in Canada, and 1.82 in Australia. Of the white (or 'European') population over 55 per cent. live in urban areas. The twelve largest towns—Johannesburg, Cape Town, Durban, Pretoria, Port Elizabeth, East London, Bloemfontein, Kimberley, Pietermaritzburg, Germiston, Benoni, Krugersdorp—together account for one-third of the white population. Pretoria is the seat of government, Cape Town the seat of the legislature—inter-colonial jealousies having ruled out a single capital city. Five out of six European inhabitants are South-African-born (Africans). Males still outnumber females in the Union among both Europeans (782,035 to 737,453) and non-Europeans (2,754,957 to 2,654,125); but each year reduces the margin in the case of whites. The birth-rate among Europeans, though falling (31.11 in 1911-15; 28.56 in 1916-20; barely 27 in 1921-25), is higher than in the United Kingdom or the other dominions. The death-rate (European), under 10 in 1921-25, is below that of Europe and America, but slightly higher than in New Zealand and Australia. The natural increase of white population by excess of births over deaths averaged 26,000 per annum in 1911-25. Immigration is slow and fitful. More than half the European inhabitants belong to the Dutch Reformed Church; the Anglican, Wesleyan Methodist, Presbyterian, Jewish, and Roman Catholic churches come next in order. While the European population within the Union increased by only 400,000 between 1904 and 1921, that of the non-Europeans was augmented by 1,350,000. Of 5,409,092 non-Europeans enumerated at the 1921 census, 4,697,813 were natives (Bantu), 165,731 Asiatics (Indians, and a few Chinese), and 545,548 of mixed and other non-European race (half-castes, Cape Malays, &c.; all save 60,000 of these live in the Cape).

Constitution.—The Union of South Africa (as established by the South Africa Act, 1909, of the British Parliament) is a legislative Union with a written constitution of a flexible type, though certain of its provisions—such as equal language rights and the Cape native franchise—are specially

safeguarded, and can be amended or repealed only by exceptional procedure. South Africa deliberately chose a much closer form of union than that adopted by Canada, Australia, or the United States of America. Rejecting federation as a half-measure, likely to perpetuate rather than cure its peculiar internal troubles, South Africa preferred a highly centralised type of government. The legislatures of the four colonies were completely swept away, and one national parliament took their place. Four Provincial Councils were set up—at Cape Town, Pretoria, Maritzburg, and Bloemfontein—but these have nothing like the powers of the provincial councils of Canada, much less those of the state legislatures in Australia; their control is confined to purely local affairs (such as roads and bridges, hospitals, municipal institutions), primary and secondary education, their most important charge, being only temporarily entrusted to them.

Parliament consists of two houses—a Senate and a House of Assembly. The Senate is constituted normally for ten years, and numbers 40 members (who must be white, and aged not less than thirty); of these eight are nominated by the governor-general in council (four for special experience of native affairs) and eight elected by each of the four provinces, the electors being the members of the House of Assembly and provincial councillors for the province in question sitting together and voting according to the system of proportional representation (with the single transferable vote). In money matters the Senate is subordinate to the House of Assembly. This, at the 1924 election, contained 135 members (M.H.A.'s)—51 for the Cape, 17 Natal, 17 Orange Free State, and 50 for the Transvaal, which alone since 1910 has added to its representation (originally 36) in virtue of its increased European male adult population. The maximum membership provided for is 150, and no diminution of any province's representation is permitted till that total is reached. The maximum duration of each House of Assembly is five years. M.H.A.'s must be white. Each electoral division returns only one member. Manhood suffrage obtains in the Transvaal (141,000 registered votes in 1921) and O.F.S. (49,000), but voters must be of European descent. In the Cape and Natal males over twenty-one fulfilling certain easy property or income qualifications have a vote; there is no colour bar for the franchise in the Cape (41,000 non-Europeans out of 197,000 voters in 1921); and in Natal a few non-Europeans (400 out of 34,000 voters) are enfranchised. Women have no parliamentary vote as yet in South Africa. A joint sitting may be convened in the event of a deadlock between Senate and House of Assembly, and must be held to pass measures affecting certain clauses of the constitution. A majority consisting of not less than two-thirds of the total number of members of both houses is necessary to disqualify, on the ground of race or colour only, claimants for the franchise in the Cape; and in any case names of those already on the register may not be removed on solely colour grounds.

The executive government is administered by a governor-general, who represents the king and acts on the advice of the governor-general in council (the Union ministry). Ministers in charge of departments of state may not exceed eleven in number. The governor-general is commander-in-chief. He is also High Commissioner for the native territories outside the Union; subject to the imperial government, as such he is Governor of Basutoland, supervises the affairs of the Bechuanaland Protectorate and Swaziland, and has certain powers of control regarding native administration in Rhodesia. The Union is represented in the United Kingdom by a High Commissioner of its own.

Provincial Administration.—In each province, as chief executive officer, is an Administrator, appointed by the governor-general in council for five years. He acts as chairman of an executive committee of four persons, which carries on the administration of provincial affairs on behalf of the provincial council. These councils are elected (actually on party grounds) for three years by the parliamentary voters within the province; they pass ordinances dealing with matters under their control; and elect executive committee members by a system of proportional representation (with single transferable vote). To the Cape provincial council non-Europeans may be—and have been—elected. Provincial expenditure—of which education absorbs three-fourths—is met partly by provincial taxation (transfer duty; liquor, motor, and other licences; taxes on betting and entertainments; Cape property tax and companies tax; O.F.S. education tax; Transvaal poll-tax, employers' tax, and native pass fees, &c.), partly by a Union government subsidy and, in the case of Natal and the O.F.S., a special Union grant of £100,000.

Law is based on the Roman-Dutch system of jurisprudence. There is a Union ministry of justice and each province has an attorney-general. The supreme court of South Africa consists of an appellate division (with its seat in Bloemfontein: presided over by the chief-justice, it hears appeals also for Southern Rhodesia and South-West Africa), four provincial divisions, besides local divisions (Cape eastern districts; Griqualand West; Witwatersrand). Natal has a native high court. In every 'district' is a magistrate's court.

Defence.—Under the Defence Act of 1912 every white citizen, from seventeen to sixty, is liable to serve in South Africa in time of war, within or without the Union. Besides the permanent army (artillery, air service, &c.), there is the Citizen Force, consisting of (a) an active force, made up of volunteers undergoing peace training for four years—the ballot not yet having been needed; (b) citizen force reserve; (c) royal naval volunteer reserve; and (d) national reserve. In 1921 the Union Government took over the entire defence of South Africa; imperial troops were withdrawn; the Castle, Cape Town, was handed over to the nation; and the nucleus of a South African fleet formed. The naval headquarters are at Simonstown (q.v.); the military college is at Roberts Heights. The South African Police patrol the whole Union.

Education.—Higher (or university) education is controlled by the Union government; primary and secondary education by the respective provincial councils—until such time as the Union parliament decides to take these over. Meantime each province carries on its own school system, and uniformity has not been seriously attempted, although a central board of education to promote co-ordination was proposed in 1924. There are four universities in the Union—(1) University of Cape Town (till 1918 the South African College; richly endowed with Wernher-Beit bequests; boasting the biggest teaching staff and new buildings at Groote Schuur); (2) University of Stellenbosch (Victoria College till 1918; Dutch in atmosphere; specialising in agriculture, law, theology); (3) University of Witwatersrand (1922; once the South African School of Mines and Technology); (4) University of South Africa, an examining university, which superseded the University of the Cape of Good Hope in 1918, and has as constituent colleges (a) Grey University College, Bloemfontein; (b) Huguenot College, Wellington; (c) Natal University College, Maritzburg; (d) Rhodes University College, Grahamstown;

(e) Potchefstroom University College; (f) Transvaal University College, Pretoria. The South African Native College, founded at Fort Hare in 1914, was recognised as 'a place of higher education' in 1923, as were the Natal and Cape technical colleges.

The Union Observatory is near Johannesburg; the Royal Observatory (1820) at Cape Town is under admiralty control. The South African Public Library (1818) in Cape Town, a national institution, is the oldest and largest library in the Union. There are national zoological gardens at Pretoria and botanic gardens at Kirstenbosch, near Cape Town.

South African Literature is, like the nation, still in its infancy. Olive Schreiner (*Story of an African Farm*), Sir Percy Fitzpatrick (*Jack of the Bushveld*), and Roy Campbell (*The Flaming Terrapin*) are among the most noteworthy of those who have found inspiration in the land of their birth, as have Thomas Pringle and Lady Anne Barnard, Rudyard Kipling, and Rider Haggard—to mention no others—in their land of sojourn.

Languages.—The South African Act (§ 137) put English and Dutch on an equal footing as 'official languages of the Union.' Dutch includes Afrikaans. (This Cape Dutch—the Taal, i.e. 'the language'—is a highly expressive vernacular, and diverges not a little from High Dutch, having lost its inflexions and been affected in syntax, pronunciation, and vocabulary by long isolation from Holland and through contact with other races, white and coloured, in entirely different surroundings.) Both English and Dutch are used in parliament, in government publications, on postage-stamps, as mediums of instruction in schools, &c. For various reasons more Dutch speak English than conversely. Bilingualism is increasing. Fully half the European population now speak both languages (as against 42 per cent. in 1918). One-fourth speak only English, and rather less than a fourth only Dutch. It has been estimated that Dutch is to-day the mother tongue of about 60 per cent. of the white inhabitants of the Union. Many Afrianders can also speak 'kitchen Kaffir' or one of the common Bantu languages (Xosa, Zulu, Suto, &c.).

Racialism in South Africa is the clashing of the English-speaking and Dutch-speaking sections of the community. The Dutch outnumber and outvote the English, but the latter largely monopolise trade and commerce, finance (banking, insurance, &c.), and industry (mining and manufactures), the Dutch being mostly farmers (Boers). Natal is overwhelmingly English, Orange Free State equally Dutch; the Cape and Transvaal are more Dutch than English. The English congregate in the large towns; the Dutch are scattered throughout the country districts, in dorps and backveld. The Dutch cling to republican traditions, the English to imperial ties. Secessionism whets Jingoism and *vice versa*. The makers of the South African Union rose above racialism. Smuts dealt the 'two streams' policy a shrewd blow, but did not kill it, when he united the moderate Dutch and English in one political party. Rancorous racialism must die out if the white people of South Africa are to solve successfully the biggest problem of their country—the Native Question. Happily, *Eendracht maakt macht* ('Union is strength') is an old South African motto.

The *Native Question* overshadows all other problems in South Africa. The Europeans represent barely 22 per cent. of the total population of the Union, and only 18 per cent. of that of British South Africa. Out of every nine people in the Union six are black, two white, and one brown (Asiatic or of mixed race). Non-Europeans to-day outnumber Europeans by over four millions.

Between 1904 and 1921, while the European population of British South Africa added under half a million to its ranks, the non-Europeans added over two millions to theirs. Thanks to a high birth-rate and a low death-rate, and to immigration, the whites during the present century have just managed to maintain their relative proportion. But the birth-rate is falling and immigration is inconsiderable. Registration figures for non-Europeans are very incomplete; it is clear, however, that the native population, no longer depleted by tribal wars and famine, is multiplying as fast as the white population, and as time goes on, with improved conditions, is likely to increase still faster. South Africa is thus faced with a colossal colour problem such as confronts no other of the great Dominions, where the indigenous races form a trifling minority and are in most cases dying out. The task of raising the black man is the 'white man's burden.' The coexistence of Kaffir kraals and modern cities, tribal heathendom and European civilisation, presents endless baffling difficulties; but the one phase of the native question which dwarfs all others at present is the labour problem. In South Africa all unskilled labour is classed as 'Kaffir work,' and every white man or woman is in a sense an aristocrat. In the kitchen, in the fields, in the mines, on roads and railways and where not, natives do the rough work from which whites are debarred by dignity or delicacy. Thus excluded from the domain of unskilled labour, domestic and industrial, by economic circumstances (native labour is much cheaper and more plentiful), if not by choice, Europeans are prone to claim for themselves a monopoly in skilled labour and non-manual work, and resent any invasion of what they consider their own field. Hence the Colour Bar—exclusion from certain employments on the ground of colour, regardless of fitness. A hard and fast horizontal line is drawn in this way in the labour market between whites on top and blacks beneath. But such a condition of things cannot be perpetuated: education is bound to qualify more and more natives for the professions, commerce, and higher categories of industry, for posts hitherto monopolised by whites. A policy of Segregation is now advocated by many Afrianders, whereby a vertical line, instead of a horizontal line, would separate the two races, and within certain allocated areas (some already in existence) the black South African would be free to work out his own social salvation under some form of native administration. Hence a growing demand that the native territories of Bechuanaland, Basutoland, and Swaziland, still under imperial administration, be transferred to the Union, as anticipated in the South Africa Act.

Asiatic Problem.—Numerous as are the natives of South Africa, it has been found necessary to import labourers for the mines and plantations—and thereby the colour tangle has been further complicated. The South African native does not willingly absent himself from home for more than six months at a time. The Transvaal mines employ over 200,000 natives, and half of these are now brought from Portuguese East Africa—Chinese labour having been tried and abandoned. Owing to the demands of the mines Cape farmers cry out at the scarcity of native labour. Natal sugar and tea planters solved their labour difficulty by introducing thousands of indentured coolies from India. And so arose the acrimonious Asiatic question, which the Union government inherited from the former Colonies, especially Natal and the Transvaal. The door was closed on further male Asiatic immigration by an Act of 1913. Of 164,000 Asiatics in the Union (1921), 142,000 live in Natal, where they outnumber the Europeans; over 100,000 of

them were born in South Africa. Indian traders, with their low scale of living, undersell European rivals. The Class Areas Bill, which was introduced in 1924, to establish separate trading and residential areas for Asiatics, together with a Natal Ordinance to abolish the limited municipal franchise of Indians, inflamed anew feelings never harmonious in view of the Indians' claim to equal rights with Europeans as citizens of the British Empire. This Asiatic question to-day, as in Gandhi's day, is a constant source of trouble between South Africa, the imperial authorities, and the government of India.

Mining—For half a century and more its mineral resources have shaped the history of South Africa. The discovery of, first, diamonds, then gold, saved the land from neglect and ruin. In fifty years South Africa produced gold and diamonds to the value of one thousand millions sterling. The mines made South Africa famed the world over; they brought it capital and population; they gave it railways, hastened development of the land, employed a quarter of a million men, bore the bulk of taxation, provided the lion's share of exports. But the blessing was not unmixed. The mines ensured prosperity but endangered peace, intensifying the enmity of Boer and Briton. South Africa is easily the world's chief gold-producer, alone supplying as much as all other countries combined. The Union produced 9,597,592 fine oz. of gold in 1925, valued at £40,767,981—a record. In 1868–1925 the Transvaal mines yielded gold to the extent of £870,000,000. Gold is a necessity, with a standard value and a steadily growing production; diamonds are a luxury, whose production has to be restricted and whose price is liable to sudden violent fluctuation. Of the world's diamond output South Africa (if we include South-West Africa, Belgian Congo, and Angola) has a virtual monopoly. In 1870–1925 the Union's diamond production totalled over £265,000,000. The major share came from the Cape (Kimberley mines; Griqualand West and other alluvial diggings); but the Transvaal (Premier mine), and O.F.S. (Jagersfontein) contribute large quantities of cheaper stones. The output for 1907 was a record for quantity, viz. 5,170,812 carats = £9,985,926; that of 1920 for value, viz. 2,545,017 carats = £14,762,899. The Union is fortunate in possessing coal in every province. The Cape coal-mines are poor, and now little worked. Natal coal is excellent, and supplies cargo and bunkers. The Transvaal mines are most productive and are handy for the Rand. The Union's total coal output exceeded 16 million tons in 1925. Other valuable mining industries are copper (Namaqualand and N. Transvaal), tin (Transvaal and Cape), silver (Transvaal), lead (Transvaal), salt, asbestos (Cape and Transvaal). Iron ores are little worked as yet. Platinum discoveries have been reported in the Transvaal, and may yet enhance the extraordinary mineral wealth of South Africa.

Manufactures.—Compared with mining and farming the manufacturing industries of South Africa are unimportant, though developing. The industrial census of 1923 recorded 170,000 employees (60,000 whites), working in 7000 factories. Farmers, foresters, and fishers produce raw materials—for wine-making (the pioneer industry of South Africa), jam and fruit preserving, flour-milling, brewing, butter and cheese making, tobacco factories, leather-working and tanning, weaving, cotton ginneries, soap and candle-making, sawmilling and wood-working, fish preserving, crayfish canning; dynamite factories supply the mines; engineering works supply the railways, &c. But, foodstuffs apart, South Africa still goes abroad for the great mass of the manufactured articles she requires.

Farming was the industry of South Africa before the mines were discovered, and, as these exhaust themselves, it must become more and more the mainstay of the country, manufacturing industries being thus backward and restricted. In the few years since Union, great strides have been made by the agricultural and pastoral industries. National administration makes it easier to combat drought and plagues, such as locusts, east coast fever, and scab; conservatism among farmers, thanks to official experts of every kind, is yielding to modern scientific methods; government inspection ensures higher grades and uniformity of exported produce; and South Africa now exports numbers of foodstuffs (e.g. meat, eggs) which she imported in the first years of Union. A large percentage of the white population and an overwhelming majority of the natives are 'on the land.'

First in introduction and foremost in importance is the breeding of woolled sheep (merinos). As a wool-producing country South Africa ranks fourth, Australia, Argentine, and U.S.A. alone exceeding her contribution. In 1921–25 the average annual export of wool totalled 200,000,000 lb. The Cape accounts for half this amount, the O.F.S. for one-third. The Union live-stock census in 1921 showed: woolled sheep, 27,757,000; other sheep, nearly 4,000,000; Angora goats, 2,284,000 (over 2,000,000 in the Cape alone—the world's chief mohair producer); other goats, 5,552,000; pigs, 914,000; ostriches, 262,000 (almost all in the Cape: half a million less than in 1913); horses, 920,000; mules, 116,000; asses, 722,000; cattle, 8,557,000 (5,000,000 more than in 1904). Cattle-breeding is progressing rapidly, types being improved for both dairy and beef purposes. The chief cattle areas are in the eastern Transvaal, O.F.S. highveld, Natal, and Cape east coast; the northern Transvaal has great potentialities for cattle ranching.

By far the most important grain crop of South Africa is maize (mealies), which thrives remarkably in the eastern half, and especially in a triangular zone in northern O.F.S. and southern Transvaal. Maize is the staple food of the natives, and has an unlimited market overseas. Production increased over tenfold between 1903 and 1923, when 4,000,000,000 lb. were recorded. Over 2,000,000,000 lb. of maize and maize meal were exported in 1925, valued at nearly £6,500,000. Maize takes fourth place among South African exports, after gold, wool, and diamonds. The export trade has been built up with amazing rapidity since the war of 1899–1902, before which South Africa could not supply her own maize requirements. Huge grain elevators have been erected at Durban and Cape Town, and smaller ones in the country. What wheat is to Canada, mealies are to South Africa. The Union provides its own oats, rye, and barley, but only 70 per cent. of its own wheat demands. These crops are grown chiefly in the south-west coastal region of the Cape. Kaffir corns (grain sorghums) flourish in areas unsuited to maize, and supply food, drink (Kaffir beer), and forage. The main forage crop is lucerne, grown especially in the Cape ostrich districts and other irrigated areas.

Climate and configuration combine to make South Africa an ideal fruit-growing country. The western Cape Province produces and exports delicious grapes, and makes wine and brandy, raisins and currants. Citrus fruits (oranges, naartjes, &c.) are more and more extensively grown in the Cape, Transvaal, and Natal, and are exported in ever-increasing quantities, as are pears, peaches, plums, pine-apples, and other fruits (fresh, dried, or canned). In 1925,

2,330,000 lb. of fruit were exported, valued at £714,000. Natal and Zululand have 200,000 acres of sugar plantations, and export what is not consumed in the Union. (In 1925, 600,000 tons of sugar, worth £767,000, were sent overseas.) Tobacco is grown in all the provinces, particularly the Transvaal and Cape. Tea is produced on the Natal coast. Cotton-growing is progressing in the Transvaal and Natal. Next to maize the principal product of the soil figuring in the export tables is wattles. Natal has some 300,000 acres of wattle plantations, and the export of bark and extract (for tanning) mounts rapidly.

Forests.—The Union is scantily timbered. Fire and the axe have played havoc with such forests as there were. Deforestation is a cause of desiccation, from which South Africa suffers. Indigenous forests cover 777,000 acres, chiefly along the south and east coasts (Knysna, Transkei, Natal). There are 6,700,000 acres of scrub or dwarf forest, and 558,000 acres of plantations—mostly wattles, gums, and conifers. Together these represent less than 3 per cent. of the whole country. In the Cape forest areas are settled many so-called 'poor whites,' a class of unfortunates all too numerous in South Africa, thanks mainly to the patriarchal system of the old Boers, which bred armies of *by-woners*—landless squatters and feckless hangers-on.

Fisheries.—Both the Cape and Natal have valuable fisheries and whaling industries. Whale oil, dried and preserved fish, and in recent years canned crayfish (£235,000 worth in 1925) are exported.

Railways and Harbours are, with few exceptions, government property, the responsible minister being advised by a board of commissioners. Their administration must be on 'business principles, due regard being had to agricultural and industrial development within the Union.' The South African Railways (State) have (1925) a mileage of 11,500, as against 7000 miles in 1910. (Cape, 4520 miles; Transvaal, 2808; Natal, 1378; O.F.S., 1420; South-West Africa, 1352.) The standard gauge is 3 feet 6 inches. The main lines run from the chief ports to the Rand goldfields. Cape Town is 956 miles (30 hours), Durban, 482 miles (21 hours) from Johannesburg; Lourenço Marques being 394 miles (16 hours). Electrification of certain sections is in progress. The Union railway system is linked up with South-West Africa, and with Rhodesia and the Belgian Congo (Cape to Cairo line). About half the exports and quarter the imports pass through Cape Town; about a third of both through Durban, which easily ranks first if tonnage of cargo shipped and landed be reckoned, not value. Table Bay (Cape Town), Mossel Bay, Algoa Bay (Port Elizabeth), Buffalo Harbour (East London), and Durban (Port Natal) have each a Harbour Advisory Board. Walvis Bay—part of the Union before the War—is now administered as part of South-West Africa. A new harbour is projected in N. Zululand, about 100 miles south of Delagoa Bay.

Trade and Commerce.—Customs Union was a forerunner of legislative union in South Africa. Competition for the overland trade of the goldfields was an endless source of strife between the Cape, Natal, Portuguese East Africa, and the inland states, railway rates, shipping freights, and customs tariffs proving pliable weapons in the contest. In 1889 the Cape and O.F.S. formed the first Customs Union in South Africa. Rhodes (c. 1894) urged a fiscal union plan, but Natal and the Transvaal fought shy. The South African Customs Union dates from 1903 and now includes—besides the four provinces—Southern Rhodesia, Northern Rhodesia, (Zambezi basin), South-West Africa, Basutoland, Swaziland, and the Bechuanaland

Protectorate. The Transvaal-Mozambique agreement (*inter alia*, to assure to Lourenço Marques 50 to 55 per cent. of the railway traffic to the Transvaal competitive areas) lapsed in 1923; but its clauses establishing virtual free trade between the Union and Mozambique were left in force. Free trade within the Union of South Africa is embodied in the constitution. The customs tariff is designed partly for revenue purposes, partly by way of protection; special dumping duties are imposed; preferential rebates of duty are granted in favour of the United Kingdom and the chief British dominions.

In 1925 two and a half million tons of cargo were landed and five million tons shipped at Union ports. The average annual imports (excluding specie) and exports (South African produce) rose in value from £38,000,000 and £56,000,000 respectively in 1910-14 to £67,000,000 and £81,000,000 in 1920-24. Two-thirds of the imports came from, and four-fifths of the exports went to, the United Kingdom and British Empire in 1925. Foreign trade is chiefly with U.S.A., Germany, France, Holland, and Belgium. Mining products account for nearly two-thirds of the total value of Union exports, of which the principal items in 1925 were: Gold (8,081,819 fine oz. = £34,329,376; 9,463,734 fine oz. = £40,199,380 in 1924); wool (£15,096,000); diamonds (2,591,239 carats = £8,605,525); maize and maize meal (2,124,500,000 lb. = £6,489,000); sheepskins (£1,566,000); wattle bark and extract (£1,109,000); coal (cargo, 1,758,000 tons = £1,071,000; bunkers, 1,963,000 tons = £2,243,000); hides (£912,000); angora hair (£836,000); sugar (£767,000); fruit, whale-oil, copper, cotton, goatskins, tin, ostrich-feathers (sadly fallen from nearly £3,000,000 in 1913), silver, fish, crayfish.

A Cape hundredweight=100 lb.; Cape ton=2000 lb. Other common South African weights and measures are: muid or sack=4 schepels=3 bushels; anker=8 gallons (approx.); half aum=16 gallons (approx.); leaguer=127 gallons (approx.); 1000 Cape feet=1033 English feet; morgen=2½ acres.

Finance.—The Union Ordinary Revenue rose from £17,228,000 in 1911-12 to £25,335,000 in 1924-5; expenditure from £16,547,000 to £24,527,000 (including £4,500,000 for provincial subsidies, but excluding nearly £5,000,000 railway debt interest). Public debt, £114,237,000 in 1911, was £214,332,000 by 1925 (over one-third internal). The Great War had added £32,000,000. The main sources of revenue are customs and excise, income-tax (on incomes over £300), supertax (over £2500), and dividend tax, interest, posts and telegraphs, mines (income-tax, share of profits, diamond export duty, licences, &c.), native taxes (poll and hut), stamp duties, &c. Railway revenue (over £20,000,000) usually exceeds working expenses by several millions.

The Pretoria branch of the Royal Mint (opened in 1923), makes British sovereigns and half-sovereigns, and South African silver and bronze coins. The non-commercial South African Reserve Bank (started 1921) is now the only bank allowed to issue notes.

Archæology.—Darwin held that Africa was the home of man's evolution, and the discovery in 1924, at Taungs in Bechuanaland, of the skull of a man-ape (*Australopithecus africanus*) was hailed as evidence of a pre-human stock in South Africa much more primitive than Pithecanthropus, the ape-man of Java. From other skulls found at Broken Hill, Rhodesia (1921), and at Boskop, Transvaal (1913), it has been concluded that the Boskop race (to whom palæolithic implements have been ascribed) followed Rhodesian man and themselves went down before the smaller, less-advanced Bushmen, whose cave paintings are

among the archaeological treasures of South Africa. Kitchen-middens along the coast bear witness to early occupation by 'Strandloopers'—Bushmen or Hottentots. Other antiquities of rare interest are the Zimbabwe ruins in Mashonaland and ancient gold workings in the Transvaal, which tell of northern Semitic invaders, perhaps in pre-Koranic times, a thousand years before the first Europeans (the Portuguese) set foot in South Africa. The story of European settlement in the sub-continent is sketched in the articles dealing with Cape of Good Hope, Natal, Transvaal, Orange Free State, and Rhodesia. Below is given in résumé the history of the Union of South Africa.

History.—The road to Union was both long and rough; more than one false start was made; but obstacles that seemed insuperable were overcome at last. From the landing of Van Riebeeck (1652) to the accession of Queen Victoria (1837) there was but one government in South Africa, that of the Cape of Good Hope. The Great Trek led to the foundation of Natal and, ultimately, the Boer republics beyond the Orange River and Vaal. But no sooner were Orange Free State, Transvaal and Natal established as separate states than a reunion movement began. In 1858 Sir George Grey, the Cape governor, advocated confederation of the South African states as forming one nation. The O.F.S. Volksraad favoured federal union with the Cape Colony, but the imperial authorities turned a deaf ear. When next the question of union was raised the tables were turned. Lord Carnarvon, Secretary for the Colonies, proposed to follow up his success in Canada by South African Confederation, and in 1877 the Imperial Parliament passed an Act for the union under one government of 'such of the South African Colonies and States as may agree thereto.' Jealous of Downing Street interference, none of the governments concerned would have anything to do with the scheme as propounded by Sir Bartle Frere and J. A. Froude. Meantime the British annexation of the diamond fields had embittered the Free State. Then the goldfields and two Boer wars (1880–81 and 1899–1902) brought Anglo-Dutch animosities to a head, stained South Africa with blood—and made union under one flag not only possible but urgent. Post-war economic depression and inter-colonial wrangling stressed the extravagance and danger of four separate governments. Accordingly in 1906 the Cape Parliament asked Lord Selborne, the High Commissioner, to review the subject of Union. His historic memorandum appeared in 1907, and next year an Intercolonial Conference prepared the way for a National Convention, to which delegates (nominated by the governments) were appointed by the parliaments of the four colonies. Rhodesia was also represented. The Convention met in October, under the presidency of Sir Henry (afterwards Lord) de Villiers, Chief Justice, and by February 1909 prepared a Constitution in the form of a draft South Africa Act. In June, by referendum, Natal approved the draft Act, already accepted by the legislatures of the other colonies, and the South Africa Act (1909) was speedily passed by the Imperial Parliament. On May 31 (Union Day), 1910, the new dominion came into being.

In the first years of Union history was made apace. Before the South African nation was half-way through its 'teens, it had triumphantly surmounted a world war, a republican rebellion, a communist revolution, besides native outbreaks and Asiatic troubles. Viscount Gladstone, the first governor-general, called upon General Botha to form a ministry, and Botha's South African party (predominantly Dutch) defeated the

Unionists (under Dr Jameson) at the elections. In November 1910 the Union Parliament was formally opened by the Duke of Connaught. The public services were reorganised, and national substituted for divergent colonial administration in various state departments. A Defence Act was passed in 1912. In December of that year Botha eliminated from his ministry General Hertzog, minister for justice, leader of the ultra-Dutch wing of the S.A. party, whose followers seceded to form the National party, their strongholds being the Orange Free State and backveld areas. A 'General Strike' on the Rand was quelled by burgher forces in January 1914, and the leaders were deported. When the Great War broke out in August, South Africa released all imperial troops for service in Europe; carried out, under Botha in person, the conquest (1914–15) of German South-West Africa; suppressed a rebellion (October–December 1914) in the inland provinces, raised by De Wet, Beyers, ex-commandant-general of the Defence Force, and Maritz, commander of the Union troops on the German border; sent an expeditionary force (1916–18) under General Smuts, and—after his appointment to the Imperial War Cabinet—General Van Deventer, to German East Africa (now Tanganyika); and despatched overseas a volunteer brigade (which greatly distinguished itself in France at Delville Wood—'Devil's Wood'—July 1916), and a native labour contingent. The South African forces on war service numbered 146,515 Europeans, and 84,694 natives and coloured men (labour contingents); casualties totalled 18,642, including 6606 dead. These losses were aggravated by a terrible influenza epidemic which swept the Union (September–December 1918), killing 11,726 whites and 127,745 coloured people and natives.

The 1915 elections resulted as follows:—South African party, 54; Unionists, 40; Nationalists, 27; Labour, 3; Independents, 6. The government, however, could rely on Unionist support against the Nationalists, who openly preached republicanism. Soon after signing the Peace Treaty of Versailles that great patriot, Botha, died (August 1919), his right-hand man, Smuts, succeeding him as prime minister. The 1920 election produced a deadlock, giving the S.A. party only 40 seats; Unionists, 25; Nationalists, 45; Labour, 21; and Independents, 3. Republican aspirations preventing reunion of the two Dutch parties, the South African party was now amalgamated with the Unionists, the cabinet being reconstructed accordingly. The government triumphed at another general election in 1921, with 79 S.A. party members in the lower house, as against 45 Nationalists, 9 Labour, and 1 Independent. By referendum (1922) Southern Rhodesia decided against entering the Union. Economic depression had now set in; the Kimberley mines had closed down; strikes held up other mining industries; outbreaks at Lovedale, Queenstown, &c., betokened native unrest. A general strike, declared in March 1922, developed into a revolutionary movement on the Rand, and was only crushed after a week's fighting (with heavy casualties) between strikers' commandos and government forces. The white miners, resenting the displacement of European by coloured labourers, demanded the enforcement of regulations debarring non-Europeans from certain occupations; but the supreme court declared such a colour bar illegal in 1923. A pact between the National party and the Labour party enabled them, by a substantial majority (Nationalists, 63; Labour, 18; S.A. party, 53; Independent, 1), to defeat the government when Smuts suddenly went to the country in June 1924. Smuts had held cabinet rank without a break since 1907. A

coalition ministry came into office under General Hertzog, during whose régime, while the country began to recover from the post-war slump, racial feelings were roused and Labour sympathies strained by a proposal to eliminate the Union Jack from the South African flag, and by the prime minister's interpretation of dominion status within the commonwealth of British nations. At the same time the government's segregation policy inflamed Asiatic feeling in Natal and India; and a measure to legalise and extend the Colour Bar (rejected by the senate, where the S.A. party retained a majority, but forced through parliament at a joint session of the two houses in 1926) roused grave anxieties as the first instalment of a new native policy.

BIBLIOGRAPHY.—For the history of South Africa see works by Theal, Cory, and Edgar (1923); for geology, Du Toit (1926); for flora, Marloth (1913 *et seq.*); for natural history, F. W. Fitzsimons (1921 *et seq.*); for national resources, Prof. Lehfeldt (1922), and Lamont's *Economic Geography* (1925); for natives, books by Stow, Bleek, Maurice S. Evans, Dr Loram, Prof. E. H. Brookes, Rev. W. C. Willoughby. *The Official Year Book of the Union* is a mine of information. Other useful volumes are the *South and East African Year Book and Guide*, W. H. Dawson's *South Africa* (1925), Manfred Nathan's *South African Commonwealth* (1919) and *South Africa from Within* (1926), Walker's *Historical Atlas* (1922), Lucas's *Historical Geography* (1923-25), and Mendelssohn's *South African Bibliography* (1910).

See also the articles on AFRICA, CAPE OF GOOD HOPE, NATAL, ORANGE FREE STATE, TRANSVAAL, SOUTH-WEST AFRICA, RHODESIA, BECHUANALAND, BASUTOLAND, SWAZILAND; PRETORIA, CAPE TOWN, JOHANNESBURG; GOLD, DIAMOND; KAFFIR, ZULU, &c.

South America. See AMERICA.

Southampton, a municipal, parliamentary, and county borough and important seaport, in the south of Hampshire, 12½ miles SSW. of Winchester, 23½ NW. of Portsmouth, and 79 SW. of London by the Southern Railway. It occupies a peninsula at the head of Southampton Water, and between the estuary of the Test on the west and south and the mouth of the Itchen on the east. There are considerable remains of the 14th-century town-walls, and four out of seven gates, the Norman Bargate being much the finest, though shorn of its effigies of Sir Bevis of Hampton and the giant Ascapard. Among many old buildings are the Tudor House (a museum), the adjacent Norman House, and the Woolhouse. Southampton is furnished with the usual municipal and other institutions, and has besides the Watts Memorial Hall (1876), a grammar school (1553; rebuilt and reorganised 1872-75), the Hartley Institution (1862; now Hartley University College, in new buildings since 1914), and the headquarters of the Ordnance Survey (1857). St Mary's Church (1878-79), by Street, is a memorial to Bishop Wilberforce. St Michael's Church, the oldest in the borough, contains Norman tower arches, and several of the private houses are of Norman architecture. The *Domus Dei*, or God's House, dates from the end of the 12th century, and is one of the earliest hospitals in England; in its chapel (now used for French service) are buried the Earl of Cambridge, Lord Scrope, and Sir Thomas Grey, executed by Henry V. for treason in 1415. The Pilgrim Fathers' monument (1913) is a beacon on a column 50 feet high, near the point where they embarked. Southampton docks, which are owned by the Southern Railway, are situated at the confluence of the rivers Itchen and Test, and the quays face on both estuaries. Started in 1836 by the Southampton Dock Company and transferred to the L. & S.W. Railway in 1892, they now include some fifty berths, six graving docks, and a monster

floating dock (1924) capable of lifting a ship of 60,000 tons displacement. A new dock is projected on the Test estuary between Royal Pier and Millbrook point. The docks are approached from the Solent by a wide and deep channel known as Southampton Water, from which vessels go direct to the berths without having to pass through locks. The largest merchant vessels in the world are domiciled here; and though comparatively small in area, the port has been so developed that it ranks as one of the largest in the United Kingdom as regards ships' tonnage. There are direct sailings for British and Continental ports, New York, Brazil, South and East Africa. Yacht and ship building, engineering, and marine aircraft construction are actively carried on. Incorporated as a borough by Henry I., Southampton returns two members to parliament, and since 1898 has a bishop suffragan under Winchester. Pop. (1851) 45,305; (1901, with Shirley and Freemantle) 104,911; (1911) 119,012; (1921) 162,200.

Southampton supplanted the Roman station of *Claesentum*, which stood about one mile to the north-east, and its foundation is ascribed to the Anglo-Saxons. It is called Hamtun and Suth-Hamtun in the Saxon Chronicle, and Hamtune in the Domesday Book. After the Conquest Southampton, from which there was ready transit to Normandy, began to prosper rapidly, and in early times it traded with Venice and Bayonne, Bordeaux and Rochelle, Córdoba and Tunis. A great part of it was burned by the combined French, Spanish, and Genoese fleets in 1338, and in the following year its defences were strengthened. Southampton is the birthplace of Isaac Watts (to whom in 1861 a monument was erected in the West Park), of Charles Dibdin, and of Sir J. E. Millais.

SOUTHAMPTON WATER is a fine inlet, stretching north-westward from the point at which the Solent and Spithead unite. It is 11 miles long and nearly 2 miles wide. The Isle of Wight, which intervenes between the Southampton Water and the Channel, forms a magnificent natural breakwater, and occasions a second high-water two hours after the first. Southampton Water receives the Test or Anton, Itchen, and Hamble.

See the map at the article PORTSMOUTH; J. Silvester Davies's *History of Southampton* (1883); and *The Victoria County History of Hampshire*, vol. iii. (1908).

Southampton, HENRY WRIOTHESLEY, EARL OF (1573-1624), the friend and patron of Shakespeare (q.v.), was mixed up with Essex's insurrection, took part in the colonisation of Virginia, was imprisoned in 1621 for opposition to the court in parliament, and died of fever at Bergen-op-Zoom whilst fighting for the Dutch. See Life by Mrs Stopes (1922).

South Australia is that part of Australia which lies south of lat. 26° S. and between the longitudes 129° and 141° E., comprising an area of 380,070 sq. miles. On the west it is bordered by Western Australia, on the north by the Northern Territory and Queensland, and on the east by Queensland, New South Wales, and Victoria. The actual boundary between it and Victoria lies slightly west of long. 141°, owing to an error in the original survey.

The State is made up of two tablelands separated by a great valley, and two great plains bordering the eastern tableland on the east and north. The Great Valley is mainly occupied by Spencer Gulf and Lake Torrens; on its west, dotted with large dry lakes, rises a fairly level tableland averaging 1000 feet in height; eastwards the second tableland lies about half as high again, but slopes from nearly 3000 feet on the edge overhanging the valley to 500

feet where it is merged in the plains of the Murray basin. North of it, surrounding Lake Eyre, the second series of plains runs across the Queensland border. Embedded in the eastern tableland is a second valley, chiefly occupied by St Vincent's Gulf, but including also the lowlands between Adelaide and Gawler. Till lately the settled area was confined to these lowlands, the tableland above them, and a patch round Mount Gambier in the far south-east; but recent improvements in wheat-growing have made cultivable great areas of the Murray basin, between the river and the Victorian border, and the success of an irrigation colony at Renmark has opened the way for further settlement along the north bank of the Murray, which will be supplied with water from an immense reservoir at Lake Victoria in New South Wales.

Apart from those already mentioned, the chief geographical features of the State are the lower Murray and the series of lagoons (Alexandrina, Albert, the Coorong) at its mouth; the inland lakes and swamps, of which Lake Torrens is a cut-off from Spencer Gulf, Lake Eyre a quickly evaporating reservoir for the rivers of western Queensland, and Lake Gairdner a still more evanescent rain-water tank; the ridges of the eastern tableland, of which the most noticeable are Flinders Range, running north from Spencer Gulf (St Mary's Peak, 4000 feet; Mount Remarkable, 3178 feet), and Mount Lofty Range, east of Adelaide (Mount Lofty, 2334 feet); and Kangaroo Island (q.v.). The highest point in the State is Mount Woodruffe (about 5000 feet) in the Musgrave Ranges far to the north-west.

History.—The Dutch ship *Gulden Zeepaert* in 1627 sailed along the south coast of Australia, eastward of Cape Leeuwin, as far as the western borders of South Australia. The first Englishman to see its shores was Captain Grant, who in 1800 sighted the coast near Mount Gambier; and two years later Flinders explored the two great gulfs and Kangaroo Island, and on his way east met the French navigator Baudin in Encounter Bay. These distant views did not encourage colonisation; but Sturt, voyaging down the Murray in 1830, discovered good pastoral land along the lower course of that river, and the next year a private company formed in England put forward a scheme of settlement. In 1834 a body of 'Colonisation Commissioners for South Australia' was created by act of parliament to deal with the new colony's immigration and land settlement in accordance with the views not long before urged publicly by Edward Gibbon Wakefield (q.v.); in other respects it was decided that the colony should follow the usual type of crown colony. The first settlers landed on Kangaroo Island in July 1836 but removed almost at once to the mainland plain on which Adelaide now stands, and on 28th December the colony was formally constituted at Glenelg. For a few years progress was slow, but the discovery of copper in 1842 and 1845, aided by the excellent administration of Sir George Grey (q.v.), greatly stimulated South Australia's prosperity; and, though at first the gold discoveries in the eastern colonies drew population away, it was soon found that South Australia was well fitted to provide the wheat for which the hordes of Victorian diggers were clamouring. Wheat and wine have since been its staple products. In 1901 it became a State of the Australian Commonwealth.

Geology.—Geologically South Australia has two well-marked divisions—the southern (tablelands, great valley, and eastern plain) and the northern or Lake Eyre basin. The foundation of Archæan rocks on which both divisions rest comes to the surface on Kangaroo Island (where it runs east and west), in patches on Eyre and Yorke Peninsulas,

on the eastern edge of the Mount Lofty Range, and between Lake Frome and Hergott Springs. Plutonic rocks of similar age occur near the New South Wales border and in the Gawler Ranges on the western tableland. Above these come the Cambrian deposits which are the special geological feature of the State; they form the backbone of the eastern tableland from lat. 30° southwards to Encounter Bay, and in their southern position show indisputable evidence of glacial action. West of the Great Valley sandstones (possibly Devonian) cap the Archæan strata; and the Nullarbor Plains, in the extreme west of the State, are Eocene limestone, which also shows up along the Murray. The rest of the southern division is overlaid with recent alluvial deposits. In the northern area the Archæan foundation is in evidence in the Peak and Denison Ranges west of Lake Eyre, and reappears in the Macdonnell Ranges across the border of the Northern Territory. Upon it lies a thick Jurassic deposit containing workable brown coal, and upon that a series of Cretaceous clays, apparently an extension of the Queensland formation known as the 'Rolling Downs' beds, and serving the same purpose of capping impermeably the artesian waters of central Australia. Above the clays occur at intervals patches of desert sandstone (probably Upper Cretaceous), and on the lower Barcoo there are Pleistocene deposits containing fossil remains of large marsupials, fresh-water crocodiles, and lizards, all now extinct. In the south-eastern corner of the State is an area dotted with extinct craters, the basalts from which overlie beds of Tertiary limestone; Mount Gambier is the best known. Similar basalts occur on Kangaroo Island.

Climate, Fauna, Flora.—See AUSTRALIA.

Industries.—The pastoral industry occupies the greater part of the interior, whose aridity unfits it for anything else, and makes it not very suitable even for that; the State contains only 8 per cent. of the sheep, 11 per cent. of the horses, and less than 3 per cent. of the cattle of the Commonwealth. But it is stated on good authority that South Australian sheep bear a greater weight of wool than those of the other States, the average over a long series of years being 8 per cent. higher than that of Victoria. In forestry and mining also the State's natural resources are limited; the usual Australian metals and minerals are found, but only copper has been seriously profitable. The principal mines are at Wallaroo and Moonta, in the Yorke Peninsula; four to five thousand men are engaged in the industry. Recently great iron deposits (the estimate of ore in sight is 21,000,000 tons) at Iron Knob, south-west of Port Augusta, have been acquired and are being exploited by the Broken Hill Proprietary Company. Radio-active pitchblende has been obtained at Olary, on the line to Broken Hill.

The State's chief industry, as has been already said, is agriculture, which in this case means practically wheat-growing. From 1880 to 1908 the cultivated area remained steady at 2 to 2½ million acres; developments in the Murray basin, already referred to, then began to increase that area, which is now over 3½ million acres and still growing (about 70 per cent. in wheat, and 16 more in wheaten hay—i.e. wheat sown specially to be cut unripe for making hay). Per head of population the cropped area is more than double that of any other State except Western Australia. Nearly 44,000 acres are under vines; Victoria, which comes next in this respect, has only 32,000. The annual wine-production in 1918-23 averaged 7 million gallons (nearly 73 per cent. of the Commonwealth's total) against Victoria's 1,656,000. In 1925 it was 10½ million gallons, 79 per cent. of the Australian yield. In table-grapes, on the other hand, South

Australia produces barely 11 per cent. of the Commonwealth's total. The consistently admirable system of land laws has greatly aided the settlement of 'small farmers' on limited agricultural areas.

Population.—At the census of 4th April 1921 the population of South Australia was 495,160, almost equally divided between the sexes. There were also 1609 aborigines living in a civilised or semi-civilised condition, and possibly 3000 more within the State boundaries in scattered and uncivilised communities. On 31st March 1926 the population was estimated at 555,740. Eighty per cent. of the whites are Australian born, and nearly 16 per cent. were born in the United Kingdom; a small but compact colony of German origin is centred in the hill-country east of Adelaide. The growth of the population was steady up to 1885, when the area then capable of profitable agriculture was fully occupied; it then slackened considerably, and was for many years less than 1 per cent., but is now recovering. Fifty-five per cent. of the inhabitants live in or near Adelaide. In regard to religion, the chief feature is the great percentage of Methodists (24, as against 12 for the Commonwealth as a whole), largely due to the former influx of Cornish miners to the copper-mines. The educational system is that usual throughout Australia (see EDUCATION); there is no state supervision of private schools, although a law of 1878 provides for it if asked for. The University of Adelaide, established in 1874, has 18 professors and 119 lecturers for about 1450 students, of whom 818 are undergraduates, besides a Conservatorium of Music with a staff of 10 teachers and nearly 400 students. More than a third of its income is derived from public funds. There are also several Schools of Mines, of which the principal one at Adelaide has nearly two thousand students.

Government, &c.—The State government is of the usual 'responsible' type, with a Governor appointed by the Crown, a Council of twenty members, and an Assembly of forty-six. Six ministers administer nine departments. The councillors are elected for six years on a property qualification, the Lower House for three years by adult suffrage; the members of both Houses are paid £200 a year. The State sends six senators and seven representatives to the Federal parliament.

Imports from overseas are valued at about 14 millions, and exports at a little over 19 millions. The principal exports are flour (especially to Java and South Africa), wheat, and wool (mainly to Britain). The State owns 2452 miles of railway, of which 1190 are on a gauge of 5 feet 3 in., and the rest on one of 3 feet 6 in.; those on the broader gauge connect with the Victorian lines. Parts of the State are also served by two Federal railways, one connecting Port Augusta at the head of Spencer Gulf with Coolgardie in Western Australia, the other (which used to belong to the State but was taken over by the Commonwealth) running from Port Augusta northwards to Oodnadatta, and intended eventually to connect with a line now under construction southwards from Port Darwin in the Northern Territory. The Coolgardie line is of 4 feet 8½ in. gauge, as all Federal lines are intended to be, but the conversion of the Oodnadatta line has not yet been undertaken. It has been proposed to continue the Federal main line eastwards across South Australia to join up with the new 4 feet 8½ in. line that traverses New South Wales from Sydney to Broken Hill, thus giving an uninterrupted passage on the one gauge from Coolgardie to any part of New South Wales and avoid the long detour southwards by Adelaide and Melbourne. The State's only private line runs from Iron Knob on Eyre Peninsula to a port on Spencer Gulf,

whence the iron ore is conveyed to smelters at Newcastle in New South Wales.

See AUSTRALIA and works there cited. Woods's *History of the Province of South Australia* (1894) and Gordon's *Handbook of South Australia* (1908) were published under official auspices. Gregory's *The Dead Heart of Australia* (1906) gives a graphic and generally trustworthy description of the central area, and Cockburn's *Nomenclature of South Australia* (1908) is useful in detail. Henderson's *Life of Sir George Grey* deals fairly with the history of the Province's early years. The South Australian Public Library is now publishing a series of historical monographs, among which Threadgill's *South Australian Land Exploration, 1856 to 1880*, is worth special study.

South Bend, capital of St Joseph county, Indiana, on the St Joseph River (navigable for small steamers), 86 miles by rail E. by S. of Chicago. It has large manufactories of automobiles, wagons, agricultural implements, furniture, woollens, paper, sewing-machine fixtures, &c. In the suburb of Notre Dame, 2 miles to the north, is a Catholic university. Pop. (1880) 13,280; (1890) 21,819; (1920) 70,983.

South Bethlehem. See BETHLEHEM (Pennsylvania).

Southbridge, a town of Massachusetts, on the Quinebaug River, 70 miles by rail SW. of Boston, with manufactories of cottons, woollens, optical goods, cutlery; pop. 14,000.

South Carolina, one of the original states of the American Union, with an area of 30,570 sq. m., including 400 sq. m. of water-surface, is nearly triangular in outline, and is bounded on the N. and NE. by North Carolina, SE. by the Atlantic Ocean, and SW. by Georgia. Numerous islands near the southern part of the coast are separated from the mainland and from each other by shallow sounds and inlets. For 100 miles inland the land is generally low and level, much of it still covered with pine forests (*Pinus palustris*). West of this alluvial plain is a range of undulating sandhills about 60 miles in width. This 'middle country' was long the least fertile part of the state. Farther west the 'ridge-country' rises, generally abruptly, from the Savannah to the Broad River on the north, presenting a region of rare beauty and fertility. The average elevation of the western third of the state is nearly 2000 feet above the sea-level. Mount Pinnacle, Caesar's Head, and Table Mountain, belonging to the Blue Ridge range, in the north-west part of the state, rise to the height of about 4000 feet. Geologically the eastern part of the state is Quaternary or alluvial and the western is Archaean, with extensive Tertiary and older formations intermediate. Most of the rivers—the largest the Santee (q.v.)—are navigable by steamboats nearly to the foot-slope of the ridge region, where they supply abundant water-power.

The state has varied mineral products. The gold-belt extends from the North Carolina line in a south-westerly direction, but the output is insignificant. Granite is abundant in Abbeville, Fairfield, and Newberry counties; and itacolumite, a flexible sandstone, is quarried for grindstones in Spartanburg. Kaolin of superior quality, and used for artificial teeth, is obtained in Chester county. Pliocene marl is abundant in Horry, Sumpter, and Marlborough counties. Post-pliocene is found in Edisto Island, and near the Savannah, Santee, Ashley, and Cooper rivers. But the most important mineral product of South Carolina is its phosphate rock, the deposit extending about 70 miles from the mouth of the Broad River near Port Royal to the head-waters of the Wando, north of Charleston. Its direction is parallel with the coast, and its width in some places is 30 miles. It crops out

near the Ashley River, where it was first observed. This great phosphate bed is generally covered with Quaternary clays and sands, and its nodular phosphatic layer rests upon deep strata of calcareous marl, beneath which Cretaceous marls extend along the entire eastern part of the state. The product in 1893 amounted to 502,564 tons, but in 1920 it had decreased to 44,141 tons, in consequence of the exhaustion of supplies and of the discovery in Florida of larger beds of similar phosphate. It is obtained as a tribasic phosphate, and is used mainly in the manufacture of manure (superphosphates). The average of lime phosphate is from 52 to 60 per cent. of the rock. Gray iron ore (magnetite) is found in Union, York, and Spartanburg counties; and copper pyrites (chalcoppyrite), galena, limonite, malachite, pyrolusite, and pyromorphite or phosphate of lead have been found in the western part of the state, and sand for glass in Aiken and Barnwell counties. Deer, wild turkeys, raccoons, foxes, squirrels, and other small game are still numerous in the forests; and the rivers, sounds, and inlets are stocked with a great variety of fish. Shad and oyster fisheries are valuable. Alligators of large size inhabit the tidal rivers.

South Carolina, called the Palmetto State from the growth of the cabbage-tree (*Subal Palmetto*) near the coast, ranks twenty-sixth in point of population, and is one of the two states—Mississippi is the other—where the negro population outnumbered the white. By the census of 1890 the population was 1,151,149—692,503 negro, 458,454 white, 172 Indian, and 20 Asiatic; in 1920 it was 1,683,724—864,719 negro, 818,538 white, 304 Indian, 163 Asiatic. There are forty-six counties. Charleston is the largest city (pop. 1920, 67,957), and Columbia (37,524) is the capital. The mild climate is salubrious except in the rice-lands, which are rendered unhealthy by the presence of malaria. The low islands along the coast afford desirable summer-resorts, as well as the western mountain-region known as 'the land of the sky.' The average rainfall in the eastern part is from 42 to 44 inches. The coast lies within the usual limits of West India cyclones, which are often destructive of life and property. Charleston (q.v.) suffered severely from a cyclone in 1835, and, much more terribly, from an earthquake in 1886.

Economically South Carolina is mainly an agricultural state. Cotton is the chief staple. Tobacco is also grown; and maize, oats, wheat, and rice are the principal cereals. Peaches and apples among fruits, and asparagus and beans among vegetables, are the most valuable. There is some stock-raising and wool-growing. Of industries outside agriculture the making of cotton goods is the chief; lumbering (yellow pine, cypress, red gum, &c.) is also carried on; and there are manufactures of cottonseed oil and cake, fertilisers, flour, tar, rosin, turpentine. Charleston, Georgetown, and Beaufort are the chief centres of commerce, rice, cotton, lumber, phosphate, naval stores, cottonseed, cottonseed oil, oil cake, fish, and spring vegetables being the principal exports.

In 1562 John Ribault, at the head of a party of French Protestants sent over by Admiral Coligny, built a fort on an island in the harbour of Port Royal, and named it *Arx Carolina*, in honour of the king Charles IX. The twenty-six colonists left by Ribault soon abandoned the fort to return to France. In 1630 Sir Robert Heath obtained a grant from Charles I. reaching from latitude 36° N. to the Gulf of Mexico, but failure to colonise forfeited the title. In this grant the territory was named *Carolana* for Charles I. In 1662 Charles II. granted to Lord Clarendon and seven associates all the territory from the Atlantic to the Pacific

lying between parallels 31° and 36° N. Two years later the northern boundary was made 36° 30'. In 1670 three ship-loads of English settlers under William Sayle landed at or near Port Royal, but the next year moved to the right bank of Ashley River. In 1680 they moved again to the present site of Charleston. The proprietary government under the 'fundamental constitution,' drawn up by John Locke (see NORTH CAROLINA), lasted till 1729, when George II. bought out the proprietors and divided Carolina into two royal provinces. Subsequently South Carolina became one of the most flourishing of the British colonies and attracted an intelligent and enterprising class of settlers from Europe, including many French Huguenots, who came soon after the revocation of the Edict of Nantes in 1685. Hence the Gallic origin of so many distinguished names in the history of the state.

Sir John Yeamans, who had been appointed governor, brought from Barbados two hundred negro slaves in 1671. The blacks in a few years nearly equalled the whites, and since 1820 have been more numerous in the state. During the revolutionary war South Carolina furnished her full quota of men and means, and suffered much from British invasion and occupation. This state was the first to ratify the Articles of Confederation, 5th February 1778, and the eighth to ratify the constitution, 23d May 1788. In 1832 a convention called by the legislature passed the ordinance of Nullification (q.v.). South Carolina was the first state to secede from the Union. A convention called by the legislature met on the 17th December 1860, and passed an ordinance of secession by a unanimous vote on the 20th. Six sister slave-states soon followed the example of South Carolina, and formed the Southern Confederacy, which was subsequently increased by four more. South Carolina was readmitted into the Union on 25th June 1868. Since the accomplishment of reconstruction the state has attained a high degree of prosperity. It sends seven representatives to the national congress. School attendance since 1922 has been compulsory. There are separate schools for white and coloured children. For higher education there are the University of South Carolina at Columbia, Clemson Agricultural College, Charleston City College, various denominational colleges (one for coloured students), and colleges for women, a college for coloured youths, a military academy, and a normal and industrial college.

See UNITED STATES; Histories of South Carolina by Ramsay (1867), McCrady (various works, 1897–1901; continued by Roy Smith, 1904), Snowden (editor, 5 vols. 1920).

South Chester. See CHESTER.

Southcott, JOANNA, founder of the Christian sect known as Southcottians, was born in April 1750 at the farm of Tarford in the parish of Ottery St Mary, Devon. As a girl she did dairy-work at home, and later, till over forty, found employment in various families in Devon as domestic servant and as assistant in the upholstery business. Her service was faithful and her character on all showing blameless; but in the view of her father she was unduly religious. In 1792, claiming to be divinely visited, and judging herself to be chosen to warn the world of the imminence of the second coming, an event eagerly sought for by her as by all Southcottians, she began prophesying in prose and in verse; and many of her prophecies, as to war, harvests, &c., were shortly fulfilled. Publications onwards from 1801 brought growing note, and as the result of a trial of her prophetic gifts, held in December 1801 at Exeter, she made constant

adherents, among others, of the engraver William Sharp, who in 1812 engraved her likeness, and of several clergymen of the Church of England. In 1802, at Sharp's suggestion, she came to London, where further trials brought widened fame, and organisation was given to the movement, preachers appearing and services being held; while between 1802 and 1808, when the practice was discontinued, over 14,000 seals (written pieces of paper signed by Joanna herself and by the recipient and sealed on the back when folded up) were issued (not seemingly sold) to adherents. In 1813 she announced that she was in the sixty-fifth year of her age (1814) to bear by the power of the most high a second Shiloh or Prince of Peace. Signs of pregnancy, even on medical testimony, duly appeared, and great excitement prevailed; while, with the view of providing a father at law, an earthly marriage is said to have been entered into. But on 27th December 1814 Joanna merely died. An autopsy revealed no pregnancy. No organic cause of death appeared, but the brain owing to the high state of putrefaction was not examined, and apoplexy was given as the cause of death. The appearances of pregnancy were set down (not necessarily fairly) to deception; followers, however, continued in their belief, some at the time as afterwards alleging that Joanna would yet return to give birth to a literal child, others maintaining that Revelation xii. had been fulfilled, a child being born, but a spiritual child, and one 'caught up to God, and to his throne.' In her lifetime Joanna's followers are said to have numbered 100,000, but later dwindled to a handful, a revival occurring, however, in the early 20th century. From the time of the founder a 'Lifting up of Hands' has been held on 12th January (New Year's Eve, old style), when petition is made for the overthrow of evil and the establishment of Christ's kingdom on earth. Outside Britain there are believers in the United States, Canada, Australia, New Zealand. And from the original sect have sprung sects led by John Ward, John Wroe (Christian Israelites), James White (New and Latter House of Israel). Joanna's writings (latterly dictated) are numerous. Among the chief are *The Strange Effects of Faith* (1801-2), books of sealed prophecies and visions (1803-5), *A Dispute between the Woman and the Power of Darkness* (1802), *A Warning to the World* (1804), *The Trial of Joanna Southcott, 1804* (1805), *The True Explanation of the Bible* (1804-10), *The Book of Wonder* (1813-14, relating to the birth of Shiloh), *Prophecies announcing the Birth of the Prince of Peace* (1814). Joanna early adopted the plan of sealing up her writings and having them placed in a box, to be opened when the events predicted matured. The box, strongly nailed and corded, is, according to prophecy, to be opened only when in a time of crisis the bishops of the Church of England demand it, a preliminary study by the bishops of Joanna's work and a subsequent examination by them of such writings of hers as are revealed being, however, imposed as necessary conditions. Willingness has been expressed, as in 1918 and 1924, to open the box, but the conditions enjoined have been rejected, and the box remains unopened. In their lifetime secrecy is preserved as to the custodians of the box. The appearance of rival boxes is said to be due to the existence of boxes of relics belonging to old believers. Two were opened in 1925, one at Hammersmith holding nothing of real value, the other near Bournemouth containing interesting Southcottian manuscripts. According to some, Joanna Southcott foretold the Great War and the feminist movement. See Alice Seymour, *The Express* (2 vols. 1909), and C. Lane, *The Life and Bibliography of Joanna Southcott* (Exeter, 1912).

South Dakota, one of the northern central states of the American Union, ranks fourteenth in area and thirty-seventh in population. It is bounded on the north by North Dakota, on the east by Minnesota and Iowa, on the south by Nebraska, on the west by Montana and Wyoming, and has an area of 77,615 sq. m., including 747 sq. m. of water. The river Missouri running north and south (and eventually forming the south-east boundary) cuts the state into two nearly equal portions. The eastern half, mostly undulating prairie, contains two plateaus, the Coteau du Missouri and the Coteau des Prairies (where there are some small salt lakes), divided by the valley of the James or Dakota River. The western half is more broken country, watered by the Grand, Owl, Cheyenne (two forks), Bad and White Rivers, all of which flow into the Missouri. The Black Hills on the south-west form a rugged and forested region, nearly 5000 square miles in area, whose highest point, Harney Peak, reaches 8200 feet. East of the Black Hills are the Bad Lands (see MAUVAISES TERRES). The climate is dry and healthy, though extremes of temperature are recorded, and the rainfall is generally sufficient for cultivation purposes except in parts of the west.

Slightly over two-thirds of the total area are given over to farming, the chief crops being corn, oats, wheat, and barley. Agriculture is pursued mostly in the eastern portion of the state, but in the north-west irrigation has brought many thousands of acres into cultivation. The number of live-stock is considerable, and among the Bad Lands cattle-raising is important, while there is a certain amount of timber available. In the north-west there are lignite coalfields and among the Black Hills there are rich gold-mines (see GOLD); other minerals found are silver, tin, copper, and lead. The principal industries are the making of butter and cheese, flour and grist milling, and manufacturing of lumber products. There are about 4300 miles of railway in the state.

There are numerous elementary and secondary schools, while the state educational institutions include a school of mines, an agricultural college and a university (founded 1882) at Vermilion. There are also various sectarian colleges and three Indian schools. South Dakota sends two senators and three representatives to the Federal Congress. It was separated from North Dakota (q.v.) in 1889, at which date the two new states were both admitted to the union. The state capital is Pierre (3000), but Sioux Falls (25,000) and Aberdeen (15,000) are the principal towns. Population of South Dakota (1890) 348,600; (1920) 636,547, of whom over 16,000 are Indians and about 60,000 are foreign-born whites.

South Easton, a former borough of Pennsylvania, at the mouth of the Lehigh River, opposite Easton, to which it has been annexed since 1890.

Southend-on-Sea, an Essex watering-place, at the mouth of the Thames estuary, 42 miles E. of London. Dating from a visit here of Queen Caroline and the Princess Charlotte in 1804, it was in great part built by Sir S. Morton Peto (1809-89), has a public hall (1872), a new pier, over a mile in length, with tramway and concert-room, and a handsome eight-mile promenade. Southend-on-Sea is a municipal (1894), a county (1914), and parliamentary (1918) borough. Pop. (1851) 2462; (1881) 7979; (1901) 28,857; (1911) 62,713; (1921) 106,021.

Southern Cross, one of the star groups in the southern hemisphere of the heavens. It lies in right ascension 12 hours, and dec. 60° S., being thus a considerable distance from the south pole of the

heavens. It was added to the list of constellations by Royer in 1679. The four principal stars form a



Quadrant of the Southern Heavens from the Pole to the fortieth degree, showing the Southern Cross, *a*, and the Triangle, *b*. The two bright stars at *c* are α and β Centauri.

rough cross when seen above the pole. The figure is of considerable size, being about 6° of dec. in height.

Southerne, THOMAS, dramatist, known as 'honest Tom Southerne' in the world of his day, was born at Oxmantown in County Dublin in 1660, studied at Trinity College, Dublin, and entered at the Middle Temple, London, but in 1682 began his career as playwright with a compliment to the Duke of York in *The Loyal Brother, or the Persian Prince*. Dryden wrote the prologue and epilogue, raising his fee on the occasion, and Southerne had the honour of finishing Dryden's *Cleomenes, or the Spartan Hero* (1692). Southerne served a short time under the Duke of Berwick, and at his request wrote the *Spartan Dame*, receiving £120 for the copy-right. His best plays, both tragedies, were produced in the reign of William III.—*The Fatal Marriage* (1694), and *Oroonoko* (1696), based on Aphra Behn's novel. His comedies are thin, and hardly more decent than the rest in that day. Southerne contrived to thrive in his vocation, and is pleasantly described as a venerable old gentleman, regular in attendance on evening prayers, always neat and decently dressed, commonly in black with his silver sword and silver locks. Pope describes his friend as him whom Heaven sent down to raise the price of prologues and of plays. He died 26th May 1746.

Southernwood (*Artemisia Abrotanum*), a shrubby species of *Artemisia* (see WORMWOOD), found wild in south Europe, and cultivated in old-fashioned gardens for its pleasant aromatic odour.

Southey, ROBERT, poet-laureate, was born at Bristol on 12th August 1774. His father, Robert Southey (1745–92), was an unlucky linen-draper; his mother, Margaret Hill (1752–1802), came of good old yeoman ancestry, and was a bright, sweet-tempered woman, who could whistle like a blackbird. Much of his lonely childhood was passed with his mother's half-sister, Miss Tyler (1739–1821), a rich, genteel old maid who hated noise and matrimony, and had a passion for cleanliness and the drama. With her he saw many plays; read Shakespeare and Beaumont and Fletcher, Hoole's *Tasso* and *Ariosto*, the *Faerie Queene*, Pope's *Homer* and Sidney's *Arcadia*; and himself scribbled thousands of verses. He had meanwhile had four schoolmasters, and in 1788 was placed by

an uncle, the Rev. Herbert Hill, at Westminster There Picart's *Religious Ceremonies* led him 'to conceive a design of rendering every mythology the basis of a narrative poem'; there he formed lifelong friendships with C. W. W. Wynn and Grosvenor Bedford; and thence in 1792 he was expelled for writing an article against flogging in a school magazine. Next year, however, he entered Balliol College with a view to taking orders. He went up to Oxford a republican, his head full of Rousseau and 'Werther,' his religious principles shaken by Gibbon; and he left it in 1794 a Unitarian, having learnt a little swimming and a little boating, and ingrained his very heart with Epictetus. And at Oxford he had a visit from Coleridge, who infected him with his dream of a 'Pantisocracy' on the banks of the Susquehanna. The Pantisocrats required wives; and wives were forthcoming in three Miss Frickers of Bristol. The eldest, Sara, fell to Coleridge; the second, Edith, to Southey; and Mary, the third, to a Robert Lovel, who with Southey in 1794 published a booklet of poems, and died two years afterwards penniless. The Pantisocrats furthermore required money, and money was not forthcoming; so, having tried medicine, and been sickened by the dissecting-room, having been turned out of doors by his indignant aunt, having lectured with some success, and having on 14th November 1795 secretly married his Edith, Southey started the same day alone on a six months' visit to Lisbon, where his uncle was chaplain to the British factory. There he laid the foundation of his profound knowledge of the literatures and history of the Peninsula. He returned to England to take up law, but reading Coke to him was 'threshing straw'; so after sundry migrations—Westbury near Bristol, Burton near Christchurch, Lisbon again for a twelvemonth (1800–1), and Ireland (a brief secretaryship to its Chancellor of the Exchequer, with intervals of London—in September 1803 he settled at Greta Hall, Keswick, in the Lake Country. The Coleridges were there already, and thither came Mrs Lovel: three households were to rest on Southey's shoulders.

His school friend Wynn allowed him £160 a year from 1796 till 1807, when a government pension of a like amount was granted him (he was turning meanwhile a Tory), and on this he devoted himself to a life of strenuous, incessant authorship. *Joan of Arc* had already appeared in 1795, and *Thalaba* in 1801; there followed *Madoc* (1805), *The Curse of Kehama* (1810), *Roderick* (1814), *History of Brazil* (1810–19), *Lives of Nelson* (1813), *Wesley* (1820), and *Bunyan* (1830), *A Vision of Judgment* (1821), *Book of the Church* (1824), *History of the Peninsular War* (1823–32), *Colloquies on Society* (1829), *Naval History* (1833–40), and *The Doctor* (1834–47), in which comes the nursery classic of 'The Three Bears.' His works number nearly fifty, and fill more than a hundred volumes; and to them must be added his contributions to the periodicals—to the *Quarterly* alone ninety-three articles (1808–38). These paid him handsomely, so that he died worth £12,000; but the *History of Brazil* brought him in eight years only the price of one article, and *Madoc* in a twelvemonth only £3, 17s. 1d.—*Madoc*, which Scott read and thrice re-read, and which Southey himself with naive vanity admitted to be 'the best English poem since *Paradise Lost*.' His life was a busy and happy one: at forty-six he could say, 'I have lived in the sunshine, and am still looking forward with hope.' It flowed quietly on, the chief events in it his visit to Scott and Scotland (1805), his first meeting with Landor (1808), the visits from Shelley and Ticknor (1811, 1819), his appointment to the laureateship (1813), the death of his first boy

Herbert (1806-16), the surreptitious publication of his revolutionary drama *Wat Tyler* (1817; written 1794), little tours in Belgium (1815), Switzerland (1817), Holland (1825, 1826), and France (1838), an honorary D.C.L. of Oxford (1820), his return as M.P. for Downton (unsolicited and declined, 1826), and Peel's offer of a baronetcy, with the welcome addition of £300 a year to his pension (1835). It came at a time of sorrow, for his wife, who had 'for forty years been the life of his life,' had six months before been placed in an asylum, and though she was brought back to Keswick, she was brought back only to die (1837). Southey never held up after that, though in 1839 he married the poetess Caroline Anne Bowles (1787-1854), for twenty years his friend and correspondent, and returned with her to Greta Hall, intending resolutely to set about two great works which he had long had in contemplation—a History of Portugal and a History of the Monastic Orders. It was not to be, for Wordsworth in 1840 found him vacuous, listless in his noble library, the 14,000 books he had collected, 'patting them with both hands affectionately like a child.' The end came on 21st March 1843; he is buried in Crosthwaite churchyard.

Macaulay in 1830 expressed a doubt whether 'fifty years hence Mr Southey's poems will be read;' the doubt has been amply justified. No poet probably so well known by name is so little known by his poetry. There are some short exceptions of course—the 'Holly Tree,' 'Battle of Blenheim,' 'Stanzas written in my Library,' half-a-dozen more. But the 'Simorg,' the 'Glendoveers,' 'Mohareb'—how many can localise these creations of Southey's muse? His epics repel, not so much by prolixity or by their irregular, sometimes rhymeless metres, as by the unreality of their fact and fancy. They remind us of scene-paintings; and a scene-painting even by Roberts will fetch just nothing in the auction-room. With Southey's prose it is otherwise. He wrote out of the fullness of knowledge, for something more than the mere sake of writing; and his was that rarest gift of good pure English. Yet even here he wrote far too much, and he was often unhappy in his choice of subjects. One book alone by him, the *Life of Nelson*, belongs to universal literature. But though there have been better poets than Southey, no poet has been a better man than he.

His *Life and Correspondence* (6 vols. 1849-50), by his younger son, the Rev. Cuthbert Southey (1819-89), contains a delightful fragment of autobiography, written in 1820-25, but coming down only to 1789. It also gives hundreds of his letters to Cottle (q.v.), Lander, Lamb, William Taylor, Rickman, Ebenezer Elliott, Kirke White, Bernard Barton, Charlotte Brontë, Crabb Robinson, Sir Henry Taylor, &c. A *Selection* from these was edited by his son-in-law, the Rev. J. W. Warter (4 vols. 1856), who also issued Southey's *Commonplace Book* (4 vols. 1849-51); and a smaller selection by M. Fitzgerald (1912); his *Correspondence with Caroline Bowles* was ed. Dowden (1881). See the latter's *Southey* (1880); and memoirs by Sidney R. Thompson (1888), Dennis (new ed. 1895); and the *Early Life* by Haller (1917).

South Georgia, a mountainous island, in 54° 30' S. lat. and 36°-38° W. long., nearly 800 miles E. by S. of the Falkland Islands, of which it is a dependency. Discovered in 1675, it was taken possession of by Captain Cook in 1775; first crossed by Shackleton in his adventurous journey of 1916. The area is over 1000 sq. m., and there is a population of some 1300 (Norwegians), the island being the headquarters of several large whaling companies. The shore factories are lighted by electricity, and a number of the bays and promontories have lights. See Ferguson in *Trans. Roy. Soc. Edin.*, I. iv. (1915).

South Molton, a municipal borough of Devonshire, on the Mole, 10 miles ESE. of Barnstaple, with a fine Perpendicular church; pop. 2800.

South Orkneys, a group of small islands, about 780 miles SE. of the Falkland Islands and 200 miles E. of the South Shetlands (q.v.), were discovered by the English captain Powell in 1821. They are a dependency of the Falkland Islands.

South Pole. See ANTARCTICA, POLAR EXPLORATION.

Southport, a watering-place of Lancashire, near the Ribble estuary, 18 miles N. of Liverpool, 34 WNW. of Manchester, and 19 S. by W. of Preston. The first house was a wooden inn built from a wreck here in 1792, on a sandy waste; and since about 1830 the place has grown more and more popular, enjoying as it does a mild climate, and having broad level sands. Southport is a spaciously conceived garden city, and has 100 acres of developed land seaward of the central promenade. This includes the Marine Parks, King's Gardens and Princes Park, with a modern amusement park and a marine lake; while Victoria Park (42 acres), Rotten Row with its famous herbaceous border, and Hesketh Park (30 acres) with astronomical and meteorological observatories, &c., almost adjoin the promenade. The total area of parks and gardens is about 300 acres. Lord Street, the principal thoroughfare, is a magnificent boulevard, in which open-air concerts are given during summer. The Municipal Buildings consist of Town Hall, Cambridge Hall (1874), Atkinson Public Library and Art Gallery (1878), Victoria Science and Art Schools (1887). The town has a fine suite of public baths (reconstructed 1926), municipal, technical, and other schools, an Opera House (1891), Winter Gardens and Botanic Gardens, and a large number of fine hotels and hydropathics. Nathaniel Hawthorne, then United States consul at Liverpool, describes Southport as it was in 1856 in vol. iii. of his *English Notebooks* (1870). It was made a municipal borough in 1867, a county borough in 1905, the boundary being extended in 1875 and 1912, and a parliamentary borough in 1918. Pop. (1921) 76,621.

South Sandwich Group. See SANDWICH GROUP.

Southsea, a south-eastern suburb of Portsmouth (q.v.), is a fashionable watering-place of recent growth, with two piers, a fine esplanade 2 miles long, a canoe lake, a common, a modernised castle of 1540, and other fortifications, barracks, &c.

South Sea Scheme (or BUBBLE) was originated by Harley (q.v.), Earl of Oxford, in 1711, with the view of restoring public credit and providing for the extinction of the floating national debt, which at that time amounted to £10,000,000. This debt was taken up by a number of eminent merchants, to whom the government agreed to guarantee for a certain period the annual payment of £600,000 (being 6 per cent. interest), a sum which was to be obtained by rendering permanent a number of import duties. The monopoly of the trade to the South Seas was also secured to these merchants, who were accordingly incorporated as the 'South Sea Company,' and at once rose to a high position in the mercantile world. The extravagant ideas then current respecting the riches of the South American continent were carefully fostered by the Company, who also spread the belief that Spain was prepared to admit them to a share of its South American trade. In 1717 the Company advanced to government other 5 millions. Their shares nevertheless rose day by day; and even when the outbreak of war with Spain in 1718 deprived the most sanguine of the slightest hope of sharing in the treasures of the South Seas, the Company continued to flourish. Far from being alarmed at the expected failure of the Mississippi Scheme (q.v.), the South

Sea Company believed sincerely in the feasibility of Law's scheme, and resolved to avoid what they considered as his errors. In the spring of 1720 they proposed to take upon themselves practically the whole national debt (at that time upwards of 30 millions), on being guaranteed 5 per cent. per annum for $7\frac{1}{2}$ years, at the end of which time the debt might be redeemed if the government chose, and the interest reduced to 4 per cent. The directors of the Bank of England, jealous of the prospective benefit and influence which would thus accrue to the South Sea Company, submitted to government a counter-proposal; but the more dazzling nature of their rivals' offer, in spite of protest from Walpole and other long-headed leaders, secured its acceptance by parliament. During the passing of their bill the Company's stock rose steadily to 330 on April 7, falling to 290 on the following day.

Up till this date the scheme had been honestly promoted; but now, seeing before them the prospect of speedily amassing abundant wealth, the directors seem to have thrown aside all scruples and made use of every effective means at their command for keeping up the factitious value of the stock. Their zealous endeavours were crowned with success; the £100 shares were quoted at 550 on May 28, and 890 on June 1. A mania of gambling seized the nation; preposterous companies of all kinds were floated, some of which were even prosecuted by the South Sea Company (under the 'Bubble Act') and exposed as swindling schemes. A general impression having by this time gained ground that the Company's stock had reached its maximum, so many holders rushed to realise that the price fell to 640 on June 3. Thereupon the directors sent agents to buy up eagerly; and on the evening of June 3, 750 was the quoted price. This and similar artifices were employed as required, and had the effect of ultimately raising the shares to 1000 in the beginning of August, when the chairman of the Company and some of the principal directors sold out. On this becoming known a wide-spread uneasiness seized the holders of stock, every one was eager to part with his shares, and on September 12 they fell to 400. The consternation of those who had been either unwilling or unable to part with their scrip was now extreme; many capitalists absconded, either to avoid ruinous bankruptcy or to secure their ill-gotten gains, and the government became seriously alarmed at the excited state of public feeling. Vain attempts were made to prevail on the Bank to come to the rescue by circulating some millions of Company's bonds.

The country was now wound up to a most alarming pitch of excitement; the punishment of the fraudulent directors was clamorously demanded; and parliament was hastily summoned (December 8) to deliberate on the best means of mitigating this great calamity. Both Houses, however, proved to be in as impetuous a mood as the public; and, in spite of the moderate counsels of Walpole, it was resolved to punish the authors of the national distresses, though hitherto no fraudulent acts had been proved against them. An examination of the proceedings of the Company was at once commenced, with results discreditable to the management; the private property of the directors was confiscated (to the amount of upwards of 2 millions) for the benefit of those who had suffered; seven millions due to the government were remitted; the Chancellor of the Exchequer, Aislaby, and other eminent persons were found guilty of having received bribes. The ruin wrought by the Bubble was incalculable, but the Company continued to exist and to trade till 1750, and had certain privileges till 1807. In 1863 its annuities were redeemed or converted into

government stock. The South Sea House in Threadneedle Street was the headquarters of the Company.

South Shetlands, a group of islands, some 750 miles SE. of the Falkland Islands, in 61° S. lat. Generally snow-covered, they are, like the South Orkneys (q.v.), an important whaling centre and a dependency of the Falklands.

South Shields, a seaport, county and parliamentary borough, and market-town of Durham, situated on the south bank of the Tyne at the mouth of that river, 9 miles ENE. of Newcastle-upon-Tyne. The name is said to have originated with the Tyne fishermen, who built sheds ('sheelds' or 'shields') on the river banks as a protection against the weather. On the Lawe, an eminence overlooking the river, the Romans had an important military station, approached from the south by the Ryknield Way. In later times it was called Caer Urfa, and it is said to have been the birthplace of King Oswin. Salt-pans were established here in 1489, and glass-works in 1619. The oldest part of the town extends for about two miles along the river-bank, and the streets, once narrow and dingy, have been widened and improved. The modern streets are wide and well-built, and South Shields is popular as a watering-place. The coast southward is very fine, the cliffs—magnesian limestone of the Permian system—being hollowed into picturesque caves. The principal public buildings are the town-hall, opened in 1910 (the old town-hall erected in 1768 stands in the centre of the market-place); the public library, news-room, and museum (1859); the marine school (opened 1869); the Theatre-Royal (1866); and the Ingham Infirmary (1873). At the east side of the town are the North and South Marine Parks, 45 acres in extent, divided by the pier parade. The Roman Remains Park at the Lawe contains many interesting relics of the Roman occupation. The south pier—a gigantic breakwater 5317 feet in length, protecting the harbour from the south-east gales, was begun in 1854, and completed in 1892. The harbour is lined with ship and boat yards, iron, glass, alkali, and rope works, paint and varnish manufactories, &c. Within the borough is the Tyne Dock, the property of the London and North-Eastern Railway, from which coal and coke are shipped to all parts of the globe. The dock, opened in 1859, covers an area of 50 acres. There are large collieries in the town. The first lifeboat was built at South Shields, and was used for the first time on 30th January 1790. A memorial to the inventors Wouldhave and Greathead has been erected on the pier parade. Near it is preserved the old 'Tyne' lifeboat which saved no less than 1068 lives. A life-brigade was established here in 1866. A steam-ferry for passengers and carriages plies between North and South Shields. South Shields was incorporated in 1850. Since 1832 it has returned one member to parliament. Pop. (1851) 28,974; (1891) 78,391; (1901) 96,267; (1921) 118,631.

Southwark, or 'The Borough,' on the Surrey side of the Thames, was annexed to the City of London (q.v.) in 1327, and is one of the metropolitan boroughs, with three members of parliament. Since 1904 it is the see of a bishop (previously of a suffragan bishop). In St Mary Overie's (now St Saviour's Cathedral) Gower was buried and King James I. of Scotland married. The polytechnic is well known. Pop. 184,000.

Southwell, a town of Nottinghamshire, since 1884 a cathedral city, on the ancient Ermine Street, 7 miles W. by S. of Newark and 12 NE. of Nottingham. A church was founded here by Paulinus about 630; but the stately cruciform minster, with its three towers, is wholly of post-Conquest

date, comprising Norman nave and transepts (1110), Early English choir (1250), and Early Decorated chapter-house (1300), the last with some beautiful carving. It measures 306 feet by 123 across the transepts, and the lantern tower is 105 feet high. A collegiate church until 1841, it became in 1884 the cathedral of a new diocese, including the counties of Notts and Derbyshire, taken from Lincoln and Lichfield; and in 1888 it was reopened after restoration. Its eagle lectern originally belonged to Newstead priory, having been fished out of the lake there about 1750. In the old 'Saracen's Head' Charles I. surrendered to the Scots commissioners (1646); Byron's mother occupied Burgage Manor House (1804-7); and there are picturesque ruins of the palace of the Archbishops of York (c. 1360; much altered and enlarged by Wolsey). The collegiate grammar-school was refounded in Henry VIII.'s time.

Southwell, ROBERT, poet and Jesuit martyr, was born about 1562, son of Richard Southwell of Horsham St Faith's in Norfolk. He was stolen from his cradle by a Gypsy woman, but soon recovered, and at fifteen was sent to Douai for his education. Challoner states that he studied also at Paris, but certain it is that he soon went to Rome, being received into the Society of Jesus on the festival of St Luke 1578. After a residence at Tournai he returned to Rome and distinguished himself so highly in the course of philosophy and theology as to be appointed prefect of the English college. He was ordained priest there in 1584, and three years later arrived in England in company with Father Garnet, who was also to earn the martyr's crown. Southwell was first sheltered by Lord Vaux, and next became domestic chaplain to the Countess of Arundel. Six years of quiet followed in which he fearlessly followed his vocation, and wrote his *Consolation for Catholics* as well as most of his poems. At length in 1592 he was betrayed into the hands of the authorities, was kept some weeks and infamously tortured many times in the house of an abandoned ruffian named Topcliffe, then transferred to the Gatehouse, and next to a noisome dungeon in the Tower. 'Though thirteen times most cruelly tortured,' writes Cecil, 'he cannot be induced to confess anything, not even the colour of the horse whereon on a certain day he rode.' After three years' close imprisonment he wrote to entreat the grace of an open trial to Cecil, who is said to have made the brutal reply that 'if he was in so much haste to be hanged he should have his desire.' He was transferred to Newgate, and, after three days' of confinement in *Limbo*, carried to Westminster for trial. The inevitable sentence followed, and on the 21st February 1595 he suffered at Tyburn, the victim of a barbarous statute, with all the high courage of the primitive martyrs. His prose writings are no longer interesting, but his poems retain their value. His longest poem is *Saint Peter's Complaint*; his most famous, *The Burning Babe*, a beautiful little piece of sanctified fancy, to have written which Ben Jonson told Drummond he would have been content to burn many of his poems. See Christobel Hood, *The Book of Robert Southwell* (1926).

South-west Africa, formerly German South-west Africa, a territory administered under League of Nations mandate by the Union of South Africa, the north-eastern ribbon-like extension to the Zambezi (the Caprivi Zipfel), being under the Bechuanaland Protectorate. The country is described under DAMARALAND, NAMAQUAS, OVAMPPOS. Largely desert, it has stock-raising lands in the east. Diamonds, copper, and vanadium are produced. A constitution was set up in 1925, with

a Legislative Assembly (two-thirds elected). Area, 322,393 sq. m., including 10,573 in the Caprivi Zipfel; pop. about 228,000, including 19,000 Europeans, nearly half Germans; capital Windhoek.

Southwold, a picturesque Suffolk watering-place, 41 miles N.E. of Ipswich. A municipal borough since 1489, it was almost destroyed by fire in 1659, but retained its fine Perpendicular church (1460), 144 feet long. In Southwold or Sole Bay a bloody but indecisive sea-fight was fought between the English and the Dutch on 28th May 1672. Pop. 3300.

Souvestre, ÉMILE, French novelist and playwright, was born at Morlaix, 15th April 1806, and, after some years of struggle, drifted into journalism, and at thirty went up to Paris, where he soon made some reputation by his charming sketches of Brittany and its people. These form the still delightful books, *Les Derniers Bretons* and *Foyer Breton*, his best work. Another deservedly popular book, *Un Philosophe sous les Toits*, was crowned by the Academy in 1851. Souvestre's plays were less successful than his stories, which, although didactic, are really seldom dull. He died in Paris, 5th July 1854. His *Causeries historiques et littéraires* (2 vols. 1854) are interesting.

Souza, MADAME DE, a charming French writer, was born in Paris, 14th May 1761, her maiden name Adélaïde-Marie-Émilie Filleul. Her parents died early, and she was brought up in a convent, from which she emerged only to marry the Comte de Flahaut, then fifty-seven, a union which was not happy. At the outbreak of the Revolution she found refuge, together with her only son, first in Germany, then in England, and here learned of her husband's execution at Arras (1793). For solace she turned to writing, and, in the midst of grief and poverty, wrote her first book, the fresh and delightful *Adèle de Sénange* (Lond. 1794). After Thermidor she tried to return to France, but had to tarry a while at Hamburg, where she met the Marquis de Souza-Botelho (1758-1825), afterwards Portuguese minister at Paris, whom she married in 1802. The charm of her conversation and manners, her bright wit, and above all her goodness made her the queen of a group that numbered many of the most distinguished men in Paris. The Restoration brought her the great grief of long separation from her son, who had been aide-de-camp to Napoleon. She died in Paris, 16th April 1836. Later novels were *Émilie et Alphonse* (1799); *Charles et Marie* (1801), a delightful story, something in Fanny Burney's manner, and coloured throughout by English impressions; *Eugène de Rothelin* (1808), an exquisite piece of work, its hero a Grandison without insipidity; *Eugénie et Mathilde* (1811), her longest and best sustained story, in which we find close traces of her own history; and *La Comtesse de Fargy* (1822). Madame de Souza was a product of the best side of the 18th century, and she helps us to understand the politeness, the harmoniousness, the taste, the reticence—all that was noble and exquisite in the old régime. See Sainte-Beuve's *Portraits de Femmes*, and Baron de Maricourt's *Mme. de Souza et sa Famille* (1907).

Sova, ANTONÍN, Czech lyric poet, born in 1864.

Sovereign, in Politics, the person or body of persons in whom the supreme executive and legislative power of a state is vested. In limited monarchies sovereignty is in a qualified sense ascribed to the king, who, though the supreme magistrate, is not the sole legislator. A state in which the legislative authority is not trammelled by any foreign power is called a sovereign state. See GOVERNMENT; and for the 20s. piece, see POUND.

Soviet (*Russian* 'council'). See, for an explanation of the system, **SOCIALISM** (Vol. IX. p. 485); for its application, **RUSSIA** (Vol. VIII. p. 843). Soviets were also set up for a while in Bavaria and Hungary, and attempts have been made elsewhere (Argentina, Finland, &c.).

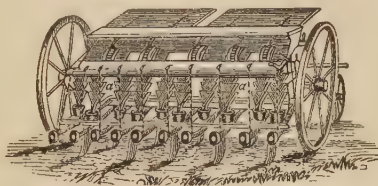
Sowerby, JAMES (1757-1822), was a native of Lambeth, who commenced as a portraitist and miniaturist, but now is remembered by his *English Botany, or Coloured Figures of all the Plants Natives of Great Britain* (36 vols. 1792-1807; new ed. 12 vols. 1863-86, the descriptions in the first by Sir J. E. Smith, M.D.). Other works dealt with Fungi, Conchology, and Mineralogy. Three sons who followed in their father's footsteps were James de Carle Sowerby (1787-1871), George Brettingham Sowerby (1788-1854), and Charles Edward Sowerby (1795-1842); and a son of the second was also George Brettingham Sowerby (1812-84), the author of many illustrated works on natural history.

Sowerby Bridge, a manufacturing town in the West Riding of Yorkshire, on the Calder, 3 miles SW. of Halifax. It has a town-hall (1857) and manufactures of worsted and cotton, oilcloth, chemicals, iron, &c. Tillotson was a native of the parish. Pop. 11,500.

Sowing-machines. Formerly sowing was always performed by scattering the seeds from the hand over the prepared surface of the soil. This mode, distinguished as *hand-sowing*, is still employed in many places, especially on smaller holdings and in garden husbandry. Formerly there were broadcast sowers which were carried in the hand, and in which the seed was scattered by a mechanism worked by a crank. These have been almost entirely superseded by machines of various kinds drawn by horses or tractors—the broadcast sowing-machine, the drilling-machine, and the dibbling-machine. The first is employed chiefly for cereals and grasses, the other two for any kind of seed.

Cereals.—As above mentioned, cereals may be sown broadcast, drilled, or dibbled. If the first method is to be adopted, the land receives what is called the seed-furrow, or, if rough, it gets a single stroke with the harrows, and the seed is then sown either by hand or by the broadcast-machine. This machine consists of a triangular frame with the apex to the front, supported on three wheels, and carrying a long wooden box of the form of a triangular prism, set with a flat side—the lid—uppermost. This box, which is placed at right angles to the line of draught, is furnished with a row of small holes at the bottom, about 7 inches apart; and a little above this row is placed a longitudinal spindle, carrying a set of hard circular brushes, one opposite each hole, and deriving a rotatory motion from the axle of the hind-wheels. The size of the apertures can be adjusted to the desired quantity of seed per acre by means of a movable plate outside provided with holes corresponding to those of the box. When the box is supplied with seed, and the machine set in motion, the grain drops through the holes, which are kept from clogging by the rapid rotation of the brushes. The box is made of such a length (16 to 20 feet) that 30 to 35 acres may be sown in a day. The seed is then covered by harrowing. This machine is much used in Scotland, being rather better suited to hilly and uneven surfaces, and, from its more rapid execution, to a climate which frequently interferes with agricultural operations. In England, where the climate is more favourable and the surface more level, the drilling-machine is the favourite. So it is now in certain parts of Scotland, where the amount of seed deposited by drilling has increased immensely. The

land is prepared for sowing by as complete pulverisation as possible, and its surface is made quite even by the harrow and roller. The drill (fig.), which in the arrangement of some of its essential



Corn-drill.

parts corresponds to the broadcast-machine, differs from it in being furnished with a set of coulters, which are hollowed behind to enclose the lower ends of a corresponding set of flexible steel tubes, whose upper ends are fixed opposite to the holes in the seed-box. By this machine a series of furrows of uniform depth are made by the coulters; into these furrows the seed is directed by means of the tubes. In the newest types sharp steel discs replace the 'knife' form of coulter and have the advantage of greatly reducing the draught. The modern drill-machine covers the seed most uniformly. The harrowing is generally completed before drilling begins. The spindle inside the seed-box is provided with grooved cylinders or pinions in place of brushes, and the seed-rows are generally made from 4 to 10 inches apart. The advantages of this machine over the broadcast sower consist in the greater regularity of deposition of the seed, which admits of hoeing and other cleaning operations during the early period of growth; in the uniform depth at which the seed is planted, so that none of it is lost by being buried, while it is all covered; in the protection of the operation from the disturbing influence of winds; in the saving of seed and greater yield of grain, it being often found that by drilling a fourth of the seed may be saved, and a better crop obtained; in the free access of sun and air during growth; and in the less liability of the crop to 'lodge' flat at the root. But it has one disadvantage: an ordinary drill cannot sow more than 10 to 12 acres per day, and employs more men and horses than the broadcast-machine. From 2½ to 3 bushels of seed per acre suffices with the drill, whereas from 3 to 4 is necessary with the broadcast-machine, and from 4 to 5 bushels with the hand. The great saving of seed and other advantages thus fully atone for the extra work involved by the drill.

The third method of machine-sowing, by dibbling, is employed chiefly on the light soils in the south of England, and now even there not generally, at least in the case of cereals, so that a minute description of the machines by which the operation is effected is unnecessary. Suffice it to mention that dibbling only requires about one-third of the seed which is necessary in drilling, and presents still greater opportunities for weeding and stirring the soil in the early stages of growth, but is attended with various important defects, and is more expensive. The maize- or corn-planter used in the United States is essentially a dibbling-machine, which drops small groups of seeds at definite intervals in the rows.

When a cereal crop is to be followed by grass the grass seeds are sown a few days, perhaps even a week or two, after the other crop by a broadcast-machine or by the hand.

Beans.—The sowing of this crop (see **BEAN**) is performed by means of the *bean-barrow*, a machine the same in structure as the drilling-machine for corn, but wanting the coulters, and having only

three tubes, through which the seeds fall. Peas are frequently sown along with beans, the latter acting as a support to the former, and the two together better preventing the growth of weeds. The hand is also sometimes adopted.

Turnips.—For this crop the ground must be more thoroughly cleaned and broken down than for any other; after which—if the drill-system is pursued—it is formed into drills from 26 to 29 inches apart, which are then supplied with manure, and covered with the drill-plough, splitting the original drills. The new ridges thus formed being directly above the manure, the seeds are sown on the top of each ridge by means of the *turnip-drill*. This machine has, instead of a seed-box of the ordinary form, two tin or tinned-iron barrels, placed on a spindle. Each cylinder has a row of holes round its middle circumference, the row being covered by a circular sliding collar of thin metal, perforated with corresponding holes. Each seed-box has its corresponding seed-tube and hollow coulter, as in the corn-drill; but the turnip-machine has in addition a roller in front of the coulters for compressing the crests of the ridges, and some machines have two light rollers attached behind which slightly compress the earth raised by the coulters and cover the seeds. In the southern counties of England a different form of machine is used, one which sows the seed in rows on the flat surface, and perhaps at the same time drops artificial manure, or waters the seed-bed, or both.

Sow-thistle (*Sonchus*), a genus of Compositæ (Cichoriææ). The Common Sow-thistle (*S. oleraceus*) abounds in Britain and in most parts of



Sow-thistle (*Sonchus oleraceus*).

Europe as a weed in gardens and cultivated fields. It is an annual plant, delighting in rich soils, grows to a height of 2 or 3 feet, with somewhat branching stem, and small yellow flowers in corymbs. The tender tops and leaves are much used in the north of Europe as greens. It is a favourite food with hares and rabbits, is eaten by swine, sheep, and goats, but not relished by cattle and horses. The Corn Sow-thistle (*S. arvensis*) is a perennial with large yellow flowers, frequent in cornfields in Britain and throughout great part of Europe. Nearly allied to the genus *Sonchus* is *Mulgedium*, to which belongs the Alpine Blue Sow-thistle (*M. alpinum*), whose beautiful blue flowers adorn some of the most inaccessible spots of Switzerland and of Scotland.

Soy, or SOYA, is a thick and piquant sauce made from Soy Beans (the seeds of the papilionaceous plants *Glycine Soja* and *G. hispida*). The seed is about 2 inches in length, and the full plant from 2 to 3 feet in height. It is a native of China, Japan, and the Moluccas, and is grown to an enormous extent in Manchuria, where twenty-five per cent. of the cultivated area is given up to it. Its importance as an article of European trade dates only from 1908, though it had long been more or less used. Not only are the beans, in various forms, an excellent food for cattle, but the

bean oil is used for burning, cooking, as a lubricant, as a substitute for butter, for making soap, high explosives, and the bean cake is a valuable fertiliser. Above all, by soaking, crushing, and boiling the beans and then adding sugar and phosphate of potash, a thick milky liquid is procured, which, when filtered, can be drunk fresh, or made into cheese, rich in casein. The beans can also be made into a sauce or used as a substitute for chocolate.

Soyer, ALEXIS (1809–58), was born at Meaux, was designed for the church, but became the most famous cook of his time. He had a post in Prince Polignac's kitchen in 1830, and was nearly murdered there by the revolutionists, but escaped to London, and was *chef* in the Reform Club (1837–50). He went to Ireland during the famine (1847), and in 1855 to the Crimea to reform the food-system. He wrote various books on cookery, and an account of his experiences in the Crimea. See the memoirs by Volant and Warren (1858).

Sozomen, a Constantinople lawyer (5th c.), born at Gaza, who wrote a church history largely based on Socrates. See CHURCH HISTORY.

Spa, a watering-place of Belgium, stands amid beautiful wooded hills 20 miles by rail SE. of Liège. The principal buildings are the casino, bath-house, and similar institutions for the use of visitors. The springs, all chalybeate and alkaline, are cold, bright, and sparkling, and efficacious in anæmic complaints, heart diseases, &c. This water is exported to all quarters of the globe. Spa is famed for the manufacture of fancy wooden lacquered ware and of a liqueur. Pop. 8200. The virtue of the waters was known as early as the 14th century, and the place was particularly famous as a fashionable resort in the 16th and 18th centuries. Its public gaming-tables were suppressed in 1872. From March to November 1918 Spa was the seat of the German military headquarters on the west. From Spa the generic term for a watering-place or mineral baths is derived.

Spaccaforno, a town in the south-east corner of Sicily, 30 miles SW. of Syracuse. In an adjoining valley are some remarkable 'Troglodyte' caves, ranged tier upon tier. Pop. 13,000.

Space. See PSYCHOLOGY; DIMENSION; and GEOMETRY.

Spade-husbandry. The operation of digging is performed with a spade, or pronged fork, or with a steam-digger. The spade or fork is thrust in with the foot, and the mass of earth is first loosened by the lever-power of the handle, then lifted and inverted. When this operation is performed in spring or summer, the ground should be dry, so as to obtain pulverisation as easily and to as great extent as possible. In stronger soils, which are dug in autumn, a little moisture is desirable, as the land lies fallow, and the frosts of winter afterwards pulverise and reduce it to a proper degree for receiving the crops in spring. Digging by hand is mainly confined to the cultivation of gardens and small 'crofts,' for, though a most efficient means of cultivating the soil, it is too expensive for field-crops. It is resorted to, however, for digging over or trenching land which has been in timber or full of stones or boulders. Formerly the spade was the only implement used for digging, but steel forks are now more largely used, being lighter and more easily driven into the soil. Besides preparing the land for plants, the spade and the fork, chiefly the latter, are used for taking crops, such as potatoes and carrots, out of the ground. For the important subject of spade-husbandry and cottage-farming as an economic and social problem, see PEASANT PROPRIETORSHIP.

Spadix. See SPATHE.

Spagnoletto. See RIBERA.

Spagnuoli. See MANTUANUS.

Spahi, the Turkish form of the Persian word *Sipahi* (from which we get Sepoy), was the term for the irregular cavalry of the Turkish armies before 1836. From the old Turkish troops in Barbary, the native Algerian cavalry in the French service are still named *spahis*.

Spain (Span. *España*) occupies the larger part of the south-western peninsula of Europe, and attains in Cape Tarifa the most southerly point of the whole continent. It lies between 43° 45' and 36° 1' N. lat., and between 3° 20' E. and 9° 32' W. long. It is bounded by the Bay of Biscay and the Pyrenees, by the Mediterranean, and by the Atlantic and by Portugal. From Fuenterrabía in the north to Tarifa in the south is 560, from Cape Finisterre in the north-west to Cape Crenis in the north-east is 650 miles. The area of continental Spain is 190,050 sq. m., and the population in 1920 was 20,541,824. In 1834 the Balearic and Canary Isles were, however, included in the country, which was then divided into forty-nine provinces; but the names of the fourteen more ancient kingdoms and provinces are still in use (see table). Ceuta in northern Africa is included in the province of Cádiz.

Ancient Provinces.	Modern Provinces.	Area in sq. miles.	Census Pop. 1920.
NEW CASTILE.....	Madrid	3,084	1,067,637
	Toledo.....	5,919	442,933
	Guadalajara.....	4,676	201,444
	Cuenca.....	6,636	281,628
LA MANCHA.....	Ciudad Real.....	7,620	427,365
	Burgos.....	5,480	336,472
	Logroño.....	1,946	192,940
	Santander.....	2,108	327,669
OLD CASTILE.....	Soria.....	3,983	151,595
	Segovia.....	2,635	167,081
	Ávila.....	3,042	209,360
	Palencia.....	3,256	191,719
LEÓN.....	Valladolid.....	2,922	280,931
	León.....	5,936	412,417
	Zamora.....	4,097	266,215
	Salamanca.....	4,829	321,615
ASTURIAS.....	Oviedo.....	4,205	743,726
	Coruña.....	3,051	708,660
GALICIA.....	Lugo.....	3,814	469,705
	Orense.....	2,694	412,460
	Pontevedra.....	1,695	533,419
ESTREMADURA.....	Badajoz.....	8,451	644,625
	Cáceres.....	7,667	410,032
	Sevilla.....	5,428	703,747
	Cádiz.....	2,334	547,827
ANDALUSIA.....	Huelva.....	3,913	330,402
	Córdoba.....	5,299	565,262
	Jáén.....	5,203	592,297
	Granada.....	4,928	573,682
MURCIA.....	Almería.....	3,360	358,149
	Málaga.....	2,812	554,301
	Murcia.....	4,453	638,639
	Albacete.....	5,737	291,833
VALENCIA.....	Valencia.....	4,150	926,442
	Alicante.....	2,185	512,186
	Castellón.....	2,495	306,886
ARAGON.....	Zaragoza.....	6,726	494,550
	Huesca.....	5,848	250,503
	Teruel.....	5,720	252,096
	Barcelona.....	2,968	1,349,282
CATALONIA.....	Tarragona.....	2,505	355,143
	Lérida.....	4,630	314,670
	Gerona.....	2,264	325,619
	Navarra.....	4,055	329,875
BASQUE PROVINCES.....	Vizcaya.....	836	409,550
	Guipúzcoa.....	728	258,557
	Álava.....	1,175	98,668
	Baleares.....	1,935	338,894
ISLANDS.....	Canarias.....	2,807	457,663
Total..		194,800	21,338,381
Possessions on the north and west coasts of Africa.....		109,200	51,461
Possessions on the Gulf of Guinea.....		10,831	118,293
General Total..		314,831	21,508,135

For a moment in the 16th century Spain was the most important country in Europe; but its population of 10 millions, unequal to the drain caused by constant warfare, emigration, expulsion of some of the inhabitants of the peninsula, and above all by adverse economic and industrial conditions, fell to 6 millions in the 17th century. The numbers then slowly rose: (1768) 9,307,804; (1797) 10,541,221; (1857) 15,464,340; (1900) 18,607,674. The town and industrial population has augmented in a greater ratio than the rural and agricultural, but emigration, especially to the eastern South American states and to Mexico, has been regular. In 1920 there were twenty-seven towns with populations greater than 50,000; the most important were Madrid, the capital (750,896), Barcelona (710,335), Valencia (251,486), Seville (*Sevilla*, 205,529), Málaga (150,584), Saragossa (*Zaragoza*, 141,350), Murcia (141,175), Bilbao (128,819), and Granada (103,368). The most densely populated provinces are those of Vizcaya, Barcelona, Guipúzcoa, Madrid, and Pontevedra. The Spanish nation is composed of a number of national groups with different characteristics (and also, in some cases, with different political aspirations); the Andalusian is noted for his insouciance; the Castilian for his pride; the Galician for his laboriousness; the Aragonese for his indolence. The most progressive and independent province is Catalonia, a pre-eminence accounted for not merely by the favourable climate and the irrigation work done by the Moors, but also by the energetic character of the people. There are about 400,000 Basques (q.v.) in Spain, some 50,000 gipsies, and some Jews. Of the former great colonial empire nothing now remains save a few possessions in Africa, of which only the municipality of Melilla (50,170), the district of Bata or Río Muni (area, 10,000 sq. m.; pop. 68,024), and the islands of Elobey (27,592) and Fernando Po (20,650) are of importance. The huge district of Río de Oro (100,000 sq. m.) has only a few hundred inhabitants. The situation in the Spanish zone of Morocco (q.v.; area about 8000 sq. m.; pop. about 600,000) and in Iñi (q.v.; area about 1000 sq. m.; pop. about 20,000) remains uncertain.

Configuration.—The coast-line is estimated at 1317 miles, of which 712 belong to the Mediterranean and 605 to the Atlantic. Spain has thus but 1 mile of coast-line to 145 sq. miles of area, while Italy has 1 to 40 and Greece 1 to 7. The shore of the Bay of Biscay presents an almost unbroken wall of mountain and rock, but in the north-west and west appears the most southerly prolongation of the fiord or firth system of Norway, western Scotland, and Ireland, forming as usual fine harbours—Ferrol, Coruña, Vigo, &c. Portugal indents a frontier of nearly 400 miles; to the south, from Portugal to Gibraltar, the Atlantic coast is low. Cádiz is here the chief harbour. The southern Mediterranean shore is rocky, backed up by the huge mass of the Sierra Nevada and its prolongations to Cape Gata. Málaga and Almería are the chief harbours here; in the south-east and east are the naval arsenal of Cartagena and the commercial ports of Valencia and Barcelona and others. Though almost a peninsula, this uniform character of the coast-line and the great elevation of its central plateau give Spain a more continental character in its extreme range of temperature than any of the other peninsulas of Europe. The greater part of its surface consists of a plateau of between 2000 and 3000 feet above the sea-level, traversed by loftier ranges. On the east the plateau is buttressed by chains which descend rapidly to the Mediterranean. On the north the Sierra de Moncayo and its neighbours rise sharply from the valley of the Ebro; the Sierra Morena on the south is of inferior elevation; the western ranges

run into the frontier of Portugal, and lose themselves in the Atlantic. Outside the plateau lie the highest summits of the whole country, the Pico de Mulhacén or Muley Hacén (11,420 feet) in the Sierra Nevada (q.v.) and the Pic de Néthou (11,170) in the Pyrenees (q.v.), which are continued along the north coast as the Catabrian Mountains. The plateau itself is traversed by four mountain-ranges—the Iberian (including Moncayo), which separates the valley of the Ebro from that of the Douro (*Duero*); the Guadarrama Range, which divides the Douro from the basin of the Tagus (*Tajo*); the Sierra de Toledo, which forms the watershed between the Tagus and the Guadiana; while the southern buttress, the Sierra Morena, forms the northern wall of the valley of the Guadalquivir. The whole plateau has a general slight inclination from east or north-east to south-west, and hence all the considerable rivers of Spain except the Ebro flow westward to the Atlantic. The general elevation of the plateau conceals the real height of its mountains and passes; thus, the highest point of the railway from the north to Madrid is about 60 feet higher than the tunnel of Mont Cenis, and that of the old coach-road through the Guadarrama is 300 feet higher still.

Geology.—A mass of granitic, Cambrian, and Silurian rocks extends from Galicia south-east to the valley of the Guadalquivir. The Carboniferous formation occupies the north and south-west corners of the great plateau. The valley of the Ebro is a trough of Secondary rocks extending from the Bay of Biscay to the Mediterranean; another band of Secondary rocks forms the region of Andalusia south of the Guadalquivir; the Upper Cretaceous formation stretches from the basin of the Ebro to the granite of the Guadarrama and to the east of Madrid; these older formations are overlaid by Tertiary, Eocene and Miocene, marine and fresh-water deposits. The visible surface of Spain consists of 37 per cent. of crystalline and Palaeozoic rocks, 34 per cent. of Tertiary, 19 of Secondary rocks, and 10 per cent. of Quaternary deposits. The remains of undoubted volcanoes are found at Olot in Catalonia, at Cabo de Gata in the south-east, and at Cuidad Real in La Mancha. To the frequency of older igneous action, and to the fractured conditions of the later rocks, is perhaps due the great mineral wealth of Spain.

Climate.—The configuration of the country renders the climate very varied. In Estremadura and New Castile the winters are bitterly cold, and the summers arid and hot. The northern provinces have an equable climate, while Andalusia is sub-tropical. In parts of the north-west the rainfall is among the heaviest in Europe. In the east and south-east occasionally no rain falls in the whole year. The rainfall in the Western Pyrenees is very great, yet on the northern slope of the valley of the Ebro there are districts almost rainless. The western side of the great plateau, speaking generally, is more humid and much colder than the eastern, where irrigation is necessary for successful cultivation. With this difference in climate goes a corresponding difference in flora. The high tableland in the centre is characterised by low shrubs and an absence of trees; Catalonia and Valencia resemble the south of France as regards vegetation, and Andalusia resembles North Africa; in the north there are meadows, both for pasture and agriculture, and forests. The wolf, lynx, fox, genet, wild-boar, badger, ibex, &c., and the eagle, vulture, snipe, and various forms of wild-fowl are found in Spain.

Agriculture.—About 44 per cent. of the total area of the country is arable, about 48 per cent. pastures and mountains, while about 8 per cent. is classed as 'unproductive.' Of the 'productive'

area, however, much is not under direct or regular cultivation, but machinery is gradually superseding primitive methods of farming, and progress is being made with irrigation, notably in Alicante. About three-quarters of the working population is occupied with agriculture. Wheat and barley to the extent of 11 and 4½ million acres respectively, are the principal grains; oats, rye, maize, and beans and other vegetables are also grown on the plains of León and Old and New Castile. In the south, beet-sugar and rice are cultivated to a certain extent. Other products from the south are cotton, esparto grass, and the mulberry. There are devoted to olives and to vines about 4 and 3½ million acres respectively, the wines of Alicante, Málaga, and Jerez or Xeres (sherry) being especially famous. The Spanish olive-crop, mostly from Andalusia (*Andalucía*), is one of the most important in the world, while vines are grown all over the country. Dates, figs, apples, oranges, &c., are plentiful in different parts. There are still large numbers of sheep, which roam over central Spain, but the famous merino breed has rather deteriorated, while goats, mules, and asses are the most common domestic animals. Cattle are reared in Galicia, but the bulls for the Bull-fights (q.v.) generally come from the south.

Mining and Industries.—Minerals exist in Spain both in great variety and in large amount, but at present mining takes place only close to the sea or in the basin of the Guadalquivir; there is no doubt that further developments are possible. About 6 million metric tons of coal are produced annually, mostly from Asturias, but also from León, Valencia, and western Andalusia. Iron and copper are found in western Andalusia, and iron also in the Basque country; zinc and lead in Murcia, and zinc also in the Basque country; quick-silver in La Mancha. Tin, salt, manganese, silver, and mercury are also mined. About 140,000 workers are employed in connection with the mining industries.

Catalonia, with its capital Barcelona, is the seat of the manufacturing industries of Spain, the cotton-mills there having some 2 million spindles. There are also woollen and paper mills, manufactories of silk and leather, glass-making, preparing of wine and fruit (especially for foreign consumption), but metal industries, foundries, &c. (in connection with the coal and iron found in the vicinity), are also located at Oviedo in Asturias and Bilbao in the Basque country, and there are various manufactories at Cádiz. Fishing (sardines, cod) is important, and there is some shipbuilding.

Trade and Commerce.—Imports have generally exceeded exports, and since 1921 the former have averaged per annum 117 million sterling in value, and the latter 64 million sterling. The principal imports are food-stuffs (grain, &c.), tobacco, minerals (glassware, &c.), machinery, chemicals, iron and steel manufactures, raw and manufactured cotton, and the principal exports are wine, fresh and dried fruit, olive-oil, vegetables, timber, and mineral ores. Most of the trade is done with Great Britain (to the extent of one-fifth), France, the United States, and the Argentine. The principal ports are Barcelona, Bilbao, and Cádiz, but the Spanish merchant marine chiefly confines itself to coastal (and not to ocean) trade. In the kingdom there are altogether over 9350 miles of railway belonging to private companies, but legislation in 1925 allows for a certain amount of state control. The gauge of the principal lines differs from that of France for strategical reasons. In 1926 an ambitious (but very necessary) programme was drawn up for extension and electrification, chiefly in the north. Mainly owing to the steepness of the gradients, it is not expected that the Pyrenean

tunnels now under construction (the Sompur and Puymorens tunnels, connecting Pau with Saragossa and Foix with Vich) will affect international traffic to any marked extent. Owing to the mountainous character of much of Spain, motor transport would seem to be of great importance and value.

Finance.—Since the Great War, the Budget has been balanced at about £120,000,000 sterling per annum. The revenue is obtained chiefly from taxes on real estate and on movables, from the customs, post-office, and the state monopolies (tobacco, lotteries, &c.). The expenditure is devoted principally to interest on the national debt (to the extent of one-quarter), to the army (especially with reference to Morocco), and to the public works. The national debt amounts to some £680,000,000 sterling. The wealth of the country has increased considerably during the 20th century, but much of the capital invested in Spanish concerns, such as the railways, comes from abroad.

Constitution.—The government is that of a hereditary monarchy, based on the constitution of 1876. The parliament (*Cortes*) consists of a senate (360 members) and congress (417 members) of equal authority. Half of the senate sit by their own right (royal princes, grandees with a certain income, high military, civil, and ecclesiastical dignitaries) or are nominated by the crown, while the other half are elected by the corporations of state, to be renewed by one half every five years. The congress is elected for five years by universal male suffrage (over 25 years of age), in proportion of one deputy to every 50,000 inhabitants, and every elector is eligible for candidature. Senators and deputies are paid. The monarch and each of the chambers can take the initiative in legislation, while the executive is vested under the monarch in a council of ministers. Every commune has its own elected council (*Ayuntamiento*), half elected every two years, with its president and executive functionary (*Alcalde*), and each province has a governor and its own elected assembly (*Diputación Provincial*). Local government, for which there is universal male and female suffrage (over 23 years of age), is largely independent of the central authority. The principal courts of justice are the Supreme High Court, the fifteen Divisional High Courts, and the fifty Provincial High Courts. The Dictator, Primo de Rivera (q.v.), suppressed temporarily much of the constitution.

Religion and Education.—Practically the whole of the population belongs to the Roman Catholic faith, but there is freedom of worship for all. There are 9 archbishoprics (the primacy being Toledo), with 47 suffragan sees and 66 cathedrals. The church is supported by the state. Many religious orders are established in Spain (though theoretically against the concordat of 1851), and there are nearly 10,000 monks and 40,000 nuns, many of whom devote themselves to education.

According to the 1920 census about 50 per cent. of the total population is illiterate (in 1860 the proportion was 75 per cent.), despite the fact that since 1857 primary education has been compulsory. With better remuneration, the teaching profession, however, has now considerably improved. The state supports the primary and partly controls the private and the secondary schools (*Institutos*). There are various ecclesiastical schools and many schools of art, industry, commerce. There are eleven universities—Barcelona, Granada, Madrid, Murcia, Oviedo, Salamanca, Santiago, Saragossa, Seville, Valencia, Valladolid—attended by some 25,000 students.

Defence.—Military service is compulsory for all over the age of 21, two years being spent in the active army and sixteen years in the other stand-

ings. The army of continental Spain is divided into eight divisions, each under a captain-general. The peace effective of the active army is about 150,000 of all ranks, and of the second line about 90,000, but the Moroccan situation after the Great War gave rise to further mobilisation. The war strength can be brought up to 750,000 at once. The personnel of the navy amounts to about 16,000 of all ranks.

See separate articles on the provinces and the principal towns of Spain. For the Topography see books by Webster (1882, in Eng.), Bazin (1895, in Fr.), Cerceda (1922, in Span.), Hielscher (1922, in Eng.); also Åberg, *Lacivilisation énéolithique* (1921), and Mayer, *Alt-Spanien* (1922). For Travels and General Description, Borrow, *The Bible in Spain*, and A. J. C. Hare, *Wanderings in Spain*; also books, all in English, by Marden (1909), Calvert (1911), Howells (1913), Dickinson (1914), Chapman and Buck (1920), Newell (1922), Bell (1924); books on the cathedrals by Gade (1911), and on the cities by Symons (1918); and the admirable *Spanish Series* of monographs (ed. Calvert, 1906 *et seq.*), profusely illustrated, on various aspects of Spanish life, painting, architecture, &c. For Social Life, Eliot, *Old Court Life in Spain* (1893); Morel-Fatio, *Études* (1890-1904); Altamira, *Psicología del pueblo español* (1902); and books in English by Higgin (1902), Williams (1902), Havelock Ellis (1908), Tyler, (1909), Shaw (1910). For Economics and Politics, Guyot, *L'Évolution politique et sociale en Espagne* (1899); books in English by Ward (1911), Deakin (1924), in French by Marvaud (1910), Jolliclerc (1921), in Spanish by Murciana (1915), Graell (1917). For the Law and Constitution, books in Spanish by Calvo Márcos (1893), Barrio y Mier (1894), Gay (1905), and in German by Poseda (1914). For Spanish painting, see ART.

HISTORY.—Spain (*Spania*, *Hispania*, *Iberia* of the Greeks and Romans), from its position as the south-west peninsula of Europe, beyond which was the ocean only, early became a very eddy of tribes and races. Palæanthropic man was succeeded at the end of the Mousterian stage by Neanthropic races from Africa. Of these the Pyrenean race (perhaps Cro-Magnon) in the north seems to be represented to-day by the Basques of Spain. The Eurafrican, still traceable in the present population, brought the Capsian culture which developed into Aurignacian. North Spain is rich in art works of the Upper Palæolithic stages (see ART). Whatever his relation to the Cro-Magnon race, Iberian or Mediterranean man can be traced back to the transition between Palæolithic and Neolithic. To this dark long-headed race the prevailing type of present-day Spaniard belongs. It occupied nearly the whole of Spain and the south of France before the Roman conquest. Overlying these Iberian tribes are probably two invasions of Celtic peoples; the earlier mingled with the Iberians, and formed the Celtiberian tribes of central and western Spain; the later has left the more purely Celtic names in the north and north-west. There was probably never any Iberian nation—only a congeries of tribes of the same race like that of the North American Indians, but in a higher state of civilisation—a civilisation excelling that of contemporaneous Gaul or the more purely Celtic tribes to the north. Omitting traces left by mere traders, such as the supposed 'prospectors,' the Phœnicians on the south and south-west, the Egyptians on the east, Greeks from Massilia on the north-east, the first power which seriously attempted to occupy Spain was Carthage (q.v.). The Carthaginians had probably succeeded to the commercial enterprises of their mother-country Phœnicia; but it was not until they had retired baffled from Sicily that the occupation of Spain was seriously begun. Hamilcar, first of the great line of Carthaginian generals, opened the conquest in 238 B.C. (see CARTHAGE, HAMILCAR, HANNIBAL). Here again they were met and thwarted by the Romans (see ROME, HANNIBAL, SCIPIO). It then became the

task of the Romans to conquer Spain. In subjugating the Iberian and Celtiberian tribes of Spain they found far greater difficulty than with any more purely Celtic race. Spain early showed her tenacity of resistance. The sieges of Saguntum, Numantia, Clunia are memorable in history. Even when conquest seemed assured Viriathus (147-140 B.C.), probably a native, and Sertorius, a Sabine leader (83-72 B.C.), tried the capacity of the best generals of Rome. It was in Spain too that the final issue between Cæsar and the Pompeians was fought out at Munda. Spain was not completely brought under Roman rule till the time of Augustus. Once subdued, it became thoroughly Roman. The impress of Rome has been deeper on the language, manners, and religion of Spain than on those of any other country. Under the Romans Spain was divided first into two provinces—Nearer and Farther Spain: in the time of Augustus these became three—Bætica, embracing nearly the modern Andalusia; Lusitania, Portugal with some of the western Spanish provinces; and Tarraconensis, comprising the remainder of the country. Local rule and customs and speech were, however, not wholly obliterated in the varied Municipia and Respublicæ. Celtiberian coinage continued contemporaneously with that of Rome, and for probably 200 years after Augustus. All the great arts and works of Roman civilisation flourished. Latin was the language of the educated classes, and Spain furnished a large contingent of authors to the silver age—Martial, Seneca, Quintilian, Lucan, Silius Italicus, Columella, Pomponius Mela. Trajan was a Spaniard. Some of Spain's greatest cities still bear Latin names—Legio (León), Emerita Augusta (Mérida), Cæsar Augusta (Zaragoza or Saragossa), Pompeiopolis (Pamplona). During Roman rule Christianity was introduced into Spain, and rapidly spread. In 325 A.D., at the Council of Nicea, Hosius of Córdoba was the greatest name in the west, overshadowing that of the bishop of Rome. Prudentius (338-405), almost the first Latin Christian poet, was a native of northern Spain. Two centuries later (560-636) Isidore, bishop of Seville, was the most learned writer of the west.

With all western Europe Spain felt the effects of the downfall of the Roman empire. The native Spanish legionaries were serving in all parts of the empire; barely two foreign legions garrisoned the whole of Spain. Thus, when the Suevi, Alans, Vandals (c. 409), Visigoths (414; see GOTHs) invaded Spain, the country, which had cost the Romans two centuries to subdue, had little means of resistance. The Suevi established themselves in Galicia and Lusitania, the Vandals penetrated farther south, and gave their name to (V)andalusia; thence in 429 they crossed to Africa. The Visigoths brought with them more than a tinge of Roman civilisation. Though both Visigoths and Vandals were nominally Christians, their Arian heresy placed them in opposition to the native bishops, the most ardent defenders of the Nicene faith. For some time Spain was only a province of a larger Visigothic kingdom. Theudis (573) was the first Visigothic king who fixed his court in Spain. It was not till the reign of Leovigild (584) that the Suevi were definitely dispossessed, and not till the reign of Suintilla (624) that the Byzantine Romans were finally expelled from the east coast; and even to the end they retained the Straits of Gibraltar and a few towns in southern Portugal; and some native tribes in the Orospeña Mountains preserved their independence. The abjuration of Arianism by the sons of Leovigild strengthened the church at the expense of the monarchy. The bishops were supreme in the councils of Toledo, which were also the chief councils of the state. The Jews, unmolested by the Arians, were now persecuted and rendered

hostile. They intrigued with the Mohammedan Arabs, who had conquered North Africa and crushed out Christianity. Their assistance and that of the count of the Roman possessions in the straits enabled Tarik to land at Tarifa; and the Gothic monarchy was destroyed at the battle of the Guadalete (711), where fell also Roderic, last of the Gothic kings. The chief mark left by the Goths in Spain was in legislation; first in the *Lex Romana Visigothorum*, then in the *Fuero Juzgo* or *Forum Judicum*. The tradition of a conquering caste and the events of the reconquest made the Spanish aristocracy look on the Visigoths as the English gentry do on the Normans; otherwise their influence has been exaggerated. The few remains of art are copies of Byzantine models. Of literature not a trace remains.

The Moors in Spain.—Seldom has there been so rapid a conquest as that of Spain by the Arabs and Moors. In 714 they had gained the whole of Spain except the north and north-west. In 719 they had added the Narbonne to their dominions; in 732 they reached their extreme northern limit when defeated by Charles Martel at the battle of Tours. The Arabs and Moors were divided by racial, tribal, sectarian, and dynastic differences. The old quarrels which had existed in Arabia before the time of Mohammed broke out again in Spain as soon as the first enthusiasm of conquest had subsided. Arabs and Berbers of North Africa were ever at strife; the feuds between the sects of Islam raged bitterly in Spain, and the claims of rival dynasties—e.g. the Abbasides and Ommiades—weakened the common cause. Whenever the Moors were united the progress of the reconquest was checked; the Christians gained ground when division and disunion spread among the invaders. The final expulsion was delayed for centuries through the civil strife of the Christian kingdoms. The rule of the early emirs was by no means harsh; a Gothic chief Theudoric preserved an independent Christian kingdom, Todmir, in Valencia and the neighbouring provinces. The Jews were treated almost as equals, the Christian religion was tolerated to the Mozarabes (see MORISCOS). There were differences in the several provinces, but at Córdoba only, which became the capital of the western khalifate (see KHALIF, MOORS), was any persistent persecution carried on. Under Abderrahman I., the heir of the Ommiades, and his successors the Arab rule in Spain attained its highest glories. He (756) and his son Hakam I. (796) made Córdoba the finest city in the west; its mosque (786-796) is still one of the grandest remains of Arabic architecture. No Christian people in the west was then capable of such work. The greatest chief of this period was Almansor, who forced back the tide of Christian conquest and penetrated to Compostela in Galicia (997); but all his conquests were lost at Catala-ñazor (1002). Many Moorish names survive in Spanish topography. The origin of the various Spanish kingdoms of the reconquest is obscure. Pelayo, said to be of Gothic or mixed Roman blood, began the reconquest at Covadonga in 718. A little later a distinct organised resistance commenced in Navarre and in Aragon. The counts of Barcelona established themselves in the Spanish March which dated from Charlemagne (q.v.) and Louis. The most important of these kingdoms was that of Asturias. Galicia on the west was soon annexed to it, then León to the south. Alfonso I. (739-756) had already overrun the country as far as the Mondego and the Sierra de Guadarrama. Alfonso II. (791-842), the ally of Charlemagne, pushed his raids as far as Lisbon, and founded in the north the cities of Compostela and Oviedo. Alfonso III. (866-909) removed the capital to León, and reached in one ex-

pedition the Sierra Morena. The unwise division of his dominions among his sons retarded the advance for a time. After the battle of Catalañazor the Christian frontier stretched from the Tagus to Tudela on the Ebro; and Castile (the land of frontier castles), which had been governed from 932 by semi-independent counts, rose into a new kingdom. From this period date the constitutional liberties of Spain. The councils summoned by the king continued those of Toledo, and were as much political as ecclesiastical: assemblies of the nobles and magnates to settle the succession or election of kings were held in 931 and 933; but the first more general Cortes was that of León, 1020. In it was established the right of *behetria*—i.e. of changing lords, which in Spain prevented many of the worst feudal abuses, but encouraged civil war. Many of the *fueros* were now granted in order to attract defenders to towns reconquered and denuded of inhabitants (see FUERO).

After the death of Bermudo III. (1037) the crowns of León and Castile were united under Ferdinand the Great; his son, Alfonso VI., by his capture of Toledo (1085) made the Christian power predominate. In spite of a defeat at Zalacca (1086) and at Ucles (1108), Toledo was never reconquered by the infidels, and the Guadiana instead of the Tagus was now the Christian boundary. To the reign of Alfonso VI. belongs the story of the Cid (q.v.), of his strange career as ally alternately of Moor and Christian, of his occupation of Valencia from 1096 to 1102. Henry of Burgundy founded the country or kingdom of Portugal in 1095 (see PORTUGAL). Alfonso VII. lost the battle of Alarcos (1194), but the great victory of Navas de Tolosa (1212), under the allied kings of Castile, Navarre, and Aragon, broke entirely the power of the Almohades, and made New Castile secure. The separation of León from Castile (1157–1230) weakened for a time the Christian forces. Under St Ferdinand, the grandson of Alfonso IX., the crowns of León and Castile were finally united. He wrested Córdoba from the Moors (1236), Jaén (1246), Seville (1247), Jerez and Cádiz (1250), Granada became a tributary kingdom, and the line of the Guadalquivir was held by the military orders of Calatrava, Santiago, and Alcántara. Ferdinand died in 1252. Navarre (q.v.) by the succession of the line of Champagne had become almost a French kingdom. To the east Saragossa had been taken in 1118. Valencia had been lost for a time, but first Majorca and the Balearic Isles (1228), then Valencia (1237) fell before the arms of Jaime I. of Aragon, and Murcia was won for Castile (1244).

In constitutional progress Navarre and Aragon kept pace with Castile. Each had its separate Cortes, with three estates in Navarre and four in Aragon, and its own code of laws. Castile used the *Fuero Juzgo* and the *Fuero Real*, limited by local *fueros*; in Navarre and Aragon the *fuero* was supreme. Catalonia had her *usages*. The *Siete Partidas* of Alfonso X. did not become law till 1384. In ecclesiastical matters Spain had become more closely papal; the Roman rite had superseded the Isidorian or Mozarabic after the taking of Toledo; the finest of the cathedrals of Spain—León, Burgos, Toledo, &c.—date from this period. Christian Spain had increased immensely in wealth, yet it took nearly two and a half centuries to destroy the remains of Moorish power. The period between the death of St Ferdinand and the accession of Isabella of Castile (1468) was one of trouble and almost constant civil war. The influence of the Moors on Christians was in some ways more marked than before. Alfonso the Wise (1252–84) in his court at Toledo adopted the best of Moorish science and literature, and the philosophy and art

which they had acquired from the Greeks and Byzantines, and henceforth Spanish was not inferior to Moorish civilisation. A century later the Moorish influence was almost wholly ill in the Sevillian court of Pedro the Cruel, the ally of the Black Prince, whose whole career and death by his brother's hand was more like that of an oriental sultan than of a western monarch. The troubles of Castile arose from disputed successions, from long minorities, from the claim of the nobles, even those of the royal family, to transfer their allegiance to any sovereign they might choose (*behetria*). The Infantes de la Cerda and Henry of Trastamare acted alternately as subjects of Castile, Aragon, or France, or entered into alliance with the Moors, as might serve their private interests. The only trustworthy allies of the crown were the burghers and the clergy, but the rivalry of the cities made their allegiance doubtful. At the death of Henry IV. (1474) the crown of Castile was left with two female claimants, his daughter Juana (the Beltranaña) and his sister Isabella. The election of the former meant union with Portugal; by the marriage of Isabella with Ferdinand of Aragon her election united Castile and Aragon. Under a series of strong monarchs, whose authority was limited by a powerful aristocracy, Aragon had become a strong Mediterranean power—to the Balearic Isles had been nominally added Corsica and Sardinia, more really Sicily and Naples, with claims on Northern Italy; these claims and possessions after the union led to the waste of Spanish blood and treasure for centuries, without any corresponding advantages. The conquests from the Moors in this period were few but important—Tarifa (1292), to recover which the African Moors made their final effort of conquest; their defeat on the Salado (1340) entailed the loss of Algeciras in 1344; and Gibraltar, which they had recovered after 1309, became Spanish in 1462. Henceforth the Moors existed in the Peninsula on sufferance only, while the Christians were gathering their forces for the final blow.

Small as were the resources left to the Moors, they were weakened still further by dissensions in the ruling families. Boabdil, the last king of Granada, would have made terms with Castile; his uncle, Muley Hacem of Málaga, and his nephew, El Zagal, opposed a strenuous resistance. Alhama was taken 1482, Ronda 1485, Málaga 1487, Baza 1488, and the Spanish sovereigns with an army of 100,000 men sat down to the siege of Granada in 1491. January 2, 1492, the city surrendered; October 12, 1492, Columbus discovered America; in 1512, after the death of Isabella, Ferdinand wrested Spanish Navarre from its Gascon kings.

Henceforth the history of Spain is no longer exclusively Spanish, but also European. The whole of the Peninsula except Portugal was united under one rule, but true political unity was very far from having been attained. Aragon and Navarre still preserved their separate Cortes, privileges, and regnal titles; the Basque Provinces continued almost a republic under a Spanish suzerain. In Castile, however, the royal power had been greatly strengthened; the fatal mistake of the *procuradores* in accepting royal pay under Pedro the Cruel ensured the ultimate subservience of the Cortes. The masterships of the great military orders had become the gift of the crown in 1476, and in 1513 Pope Hadrian VI. annexed them permanently to it; the *Hernandades* (q.v.), or ancient associations, first of the bishops, afterwards of civil bodies, for defence of their rights and for the suppression of disorder, became a powerful governmental police; the Inquisition, first employed on a large scale against the Albigenses by the Domini-

cans in 1248, had been remodelled (1478) to the profit of the crown. But the increased power of the monarchy lay chiefly in the condition of the conquered provinces. Their incorporation was an immense gain to the country, but it gave the king a basis for despotism, and a standing force where-with he could crush any revolt in the north. The still advancing wave of Mohammedan power was not finally rolled back until the battle of Lepanto (1571) and the raising of the siege of Vienna (1683). The Moors of Barbary were still able to harass Spain and seriously to check her trade; but the most fatal legacy of the Moors was the fact that Spain had won her glory as champion of Christianity against Islam in the peninsula, and continuing this rôle she wasted all her resources, and failed, as champion of Roman Catholicism against Protestantism in Europe.

On the death of Isabella her eldest daughter Joana, who had been married to Philip, son of the Archduke Maximilian, sovereign of the Netherlands, succeeded, jointly with her husband, to Castile. Ferdinand retired to Aragon. Philip died in 1506, and Ferdinand resumed the government of Castile as regent for his daughter, who was incapacitated by insanity. Ten years afterwards he died, leaving all his kingdoms to Juana, with her son Charles as regent. Till the arrival of Charles Spain was really governed by Archbishop Ximenez (q.v.), whose work in the interest of the crown was almost as important in Spain as that of Richelieu later in France; his intolerance to the conquered Moors brought on revolts, and all the subsequent troubles with the Moriscos were the result of the policy which he initiated. For the history of Charles I. as Charles V. Emperor of Germany, and of his action towards the Protestants and his campaigns in Italy and Germany, see CHARLES V. His reign was marked by the triumph of absolutism in Castile. His appointment of Flemings to high offices in Spain, and his exorbitant demands for supplies, led to the rising of the cities of Castile and to the war of the *comuneros*. These were vanquished at Villalar in 1521, and Toledo surrendered soon afterwards. A more popular movement in Valencia was crushed by the nobles of that province. Charles by timely appointments had separated the cause of the nobility from that of the cities; and on the refusal in 1538 of the nobles and clergy to share the burden of taxation these bodies ceased to be summoned to Cortes. The conquest of Tunis in 1535 was a brilliant feat of arms; the attempt on Algiers (1541) utterly failed. The troubles in Germany prevented Charles from following up these campaigns, which might have had results of great benefit to Spain. Worn out by disease, frustrated in all his plans, having failed in the election of his son Philip as emperor, Charles resigned first his hereditary dominions in 1555, and in 1556 abdicated the empire in favour of his brother Ferdinand, and his other crowns in favour of Philip, and retired to the monastery of Yuste, where he died in 1558.

When Philip II. (q.v.) ascended the throne of Spain her dominions were at their greatest. Spain, to which Portugal was added in 1580, Sicily, a great part of Italy, the Low Countries (Holland and Belgium), the whole of North America except the English and French possessions, the whole of South America after 1580, the Philippine and other islands in the East, and possessions in Africa formed the first empire on which it could be said that the sun never set. Philip had inherited the difficulties and complications of his father's policy without his father's ability. Dull, tenacious, yet irresolute, the type of a conscientious bigot, he lived ruthlessly up to his own ideal. He acted as the cham-

pion of orthodoxy in Europe; wherever the faith was in danger there would he protect it. He sacrificed everything to this. And he ruled alone, with no assistant body of councillors, with secretaries only. Well served he was by generals, ambassadors, admirals, by great men in all departments; he had the finest fleets and armies of his age; he never swerved from his purpose; he did not, like his father, retire when baffled, but died working in his life's cause to the end. His return to Spain in 1559 was marked by his presence at the autos de fé at Valladolid and Seville. He failed in his attempts on Tunis and Algiers, but raised the siege of Malta in 1565; he put down the rebellion of the Moriscos in 1568-71, and Don John of Austria gained for him in 1571 the great sea-fight of Lepanto, which stayed the advance of the Turks in the Mediterranean. The action of Philip in introducing the Inquisition (q.v.), popular among the lower classes in Spain, but abhorred elsewhere, the license of the Spanish soldiery, and the stern rule of Alba produced a revolt in Flanders in 1559, which led to the formation of the United Provinces in 1609 (see HOLLAND). The abilities of the regents and generals, especially of the Duke of Parma, who took Antwerp in 1585, gave for a time hope of reconquest; but the loss of the Armada (1588), and the diversion of Parma's forces against France (1590-92), made the contest hopeless. Henceforth Philip's power evidently declined. A quarrel with his secretary, Antonio Perez, led to an outbreak in Aragon and the restriction of its liberties in 1592. His communications and commerce with the colonies and with Flanders were continually threatened by Dutch and English corsairs. Philip had introduced the practice of raising money in Spain without consent of the Cortes, which was no longer regularly summoned. From ignorance of the true principles of political economy the very wealth of Spain hastened her decline. The false colonial policy of the time, with its restrictions and monopolies, gave all the profit of the commerce to contraband trade; the supply of only the precious metals made gold and silver cheaper in Spain than elsewhere and all other commodities dearer. Her rising industries died away. The bullion left her to purchase from foreigners things which she no longer produced and for which she had nothing else to give. Districts cultivated by the Moors became desert, population declined, and both the forces and resources of Spain by sea and land diminished yearly. Philip II. died September 13, 1598, in the palace of the Escorial.

Philip II. had reigned alone; with his son Philip III. began the reign of favourites, which continued with slight intermissions through both Austrian and Bourbon dynasties to the Revolution. The Duke of Lerma was the real sovereign. The ability of Spinola, who recovered Ostend in 1604, and of the captains trained in the school of Flanders upheld the prestige of the Spanish arms for a while; but her power was declining. The expulsion of the Moriscos, an agricultural population, in 1609 weakened her still more. In 1618 Lerma fell from power, but no improvement took place. Philip IV. (1621-65) possessed some taste for literature and art, but was as incapable of governing as his father. In the Thirty Years' War Spain fought on the side of the emperor, and her soldiers greatly contributed to his success, but she had no share in the profit. The government was in the hands of the Conde-Duke of Olivares, whose ambitious projects and wasteful expenditure introduced corruption everywhere. All offices became venal. The rights of the more independent kingdoms of Spain were violated, bringing about the revolt of Catalonia; the navy was almost destroyed by

the Dutch at Dunkirk in 1639; Rousillon was lost in 1642; with the battle of Rocroy (1643) departed the renown of the Spanish infantry, and the military supremacy henceforward belonged to France; Naples and Catalonia rose in revolt in 1648. In 1655 Jamaica was taken by the English. The marriage of the Infanta Maria Teresa to Louis XIV. and the peace of the Pyrenees (1659) assured to that monarch the supremacy in Spain which had formerly been exercised by Philip II. in France. After an inglorious struggle Portugal and all her colonies were lost in 1640. The reign of the childless Charles II. (1665-1700) closed the Austrian dynasty, a period of degradation surpassed only by that of the Bourbon Charles IV. a century later. Spain was considered as a prey to whichever of the great powers of Europe could lay hands on her. A brief war against France in alliance with Holland lost Franche Comté. Spain shared in the great wars of Louis XIV., but whoever else won she was always a sufferer; and the lack of a navy left her commerce and her richest colonies at the mercy of the buccaneers. A first treaty of partition of her dominions was made in 1698, followed by a second in 1700, after the death of the rightful heir, Leopold of Bavaria, in 1699. Contrary to his father's provisions, Charles left the throne to the grandson of Louis XIV. This did not avert the War of Succession (q.v.) and the losses which it occasioned. At the beginning of the 17th century the Spanish armies were the first in the world, her navy was the largest; at its close the latter was annihilated, her army was unable without assistance from Louis XIV. to establish the sovereign of her choice; population had declined from 8 to less than 6 millions, the revenue from 280 to 30 millions; not a single soldier of talent, not a statesman, remained to recall the glories of the age of Charles V. and Philip II.; the whole country grovelled in discontent at the foot of unworthy favourites raised to power by court intrigues, and dependent on a foreign prince.

The first of the Bourbon kings of Spain, Philip V. (q.v.), was proclaimed in Madrid, May 1700. He was accepted by the Cortes of Castile, but not by Aragon or Catalonia. His rival, the Archduke Charles, was supported by all the enemies of Louis XIV. The theatre of the War of Succession included Flanders, Germany, and Italy, as well as France and Spain and their colonies. In Flanders and Germany the English under Marlborough were victorious, but in Spain they fought with less success. Gibraltar was taken by Sir George Rooke in 1704, Valencia and Barcelona were occupied by Peterborough in 1705, and Philip was twice driven from Madrid. But with the aid of Berwick he won the battle of Almansa (1707), and Vendôme defeated Stanhope at Brihuega and Villaviciosa in 1710. The exhaustion of France, and the elevation of the archduke to the empire, led to the treaty of Utrecht in 1713. Catalonia submitted in 1714, and Spain was forced to adhere to the treaty, losing all her Italian possessions, Sardinia, Minorca, Gibraltar, and Flanders.

Philip V.'s first care was to alter the law of Spanish regal succession in accordance with the Salic law of France, a change productive of serious consequences later. Though during the war Philip had shown much spirit, a constitutional melancholy led him to resign his crown in 1724 to his son Louis, on whose death, after a reign of a few months, Philip resumed power. The entire government was in the hands of his second queen, Isabel Farnese, and her minister Alberoni. Their whole policy was directed to the establishment of her sons in Italy as duke of Parma and king of Naples and Sicily. In this she succeeded, but the gain was simply for the House of Bourbon; it

brought no advantage to Spain. To Philip V. succeeded his son Ferdinand VI. (1746-59). His choice of ministers was good, and his avoiding war gave the country an opportunity of internal development. This led to the greater reforms of his half-brother Charles III. (1759-88). He had already been successively duke of Parma and king of Naples and Sicily, and his was the most flourishing of all the Bourbon reigns. He brought with him his Italian ministers, Grimaldi and Esquilache, who made the policy of the early part of his reign too subservient to that of France. Afterwards he gathered round him the most intelligent Spaniards of his day. Superstitiously religious though he was in private life, his reign was yet notable for the expulsion of the Jesuits in 1757, for reasons which have never been clearly explained. The years 1764-66 were marked by reforms in the administration of the colonies, where great abuses existed. Only 840,000 dollars out of a revenue of 4 millions really entered the treasury. These revenues rose shortly from 6 million to 20 million dollars for Mexico alone. His home policy was equally successful: new manufactures were established, roads were improved, more beneficial commercial treaties were made, banks were introduced, and population increased with wealth. Through fear of the movement spreading to her own colonies, Spain wisely remained neutral during the war of independence of the United States. The foreign events of the greatest importance were a fruitless expedition to Algiers in 1775, the recovery of Minorca in 1782, and the fruitless siege and blockade of Gibraltar (1779-82). The great defect of this reign was that nearly all Charles's ministers were *afrancesados*; their reforms were based rather on the theories of the French encyclopædists than on the real needs and the principles of liberty still existing in Spain. There was a wide gulf between the educated classes and the body of the nation. Charles IV. (1788-1808) retained for a short time his father's ministers; but they were soon replaced by Godoy, whose unbounded influence over Charles and his queen, limitless greed, and shameless subservience to the French, especially to Napoleon, brought the nation to the verge of ruin. He not only accumulated almost all offices in his own person, but in secret schemes with Napoleon bargained for himself half of Portugal as an independent kingdom, or a hereditary vicerealty in America. On the outbreak of the French Revolution, in spite of ties of blood and of old treaties, Charles IV. was the last to protest against the overthrow of royalty and the execution of Louis XVI. A campaign was then begun on the Pyrenean frontier in 1793, with some success at first, changed to defeat as soon as the Republic could spare forces to turn against her southern neighbour. In 1795 the peace of Basel gained for Godoy his title of Prince of Peace; and the treaty of Ildefonso (1796) bound Spain to an offensive and defensive alliance with France against England. The result was disastrous. In 1797 Jervis won the naval battle of St Vincent: Trinidad was taken, and Cádiz bombarded. But Nelson was repulsed at Tenerife (Teneriffe), Porto Rico was preserved, and the expeditions of Beresford and Whitelocke in La Plata eventually failed. The commerce and communications of Spain with her colonies was almost wholly destroyed. A scandalous quarrel between Charles IV. and his son Ferdinand (1807) augmented the hatred of the nation against Godoy. All three parties appealed to Napoleon for his arbitration and intervention. In view of the utter degradation of the crown many of the best men in Spain believed that a short rule by Napoleon might stem the tide of corruption. The royal family and the favourite attempted flight, but this was prevented by a

popular outbreak at Aranjuez. Godoy was hurled from power. Charles IV. abdicated in favour of his son, Ferdinand VII., March 17, 1808. French troops entered Madrid. Charles IV., his queen, and son Ferdinand, with Godoy, were summoned to Bayonne. There the crown was renounced by Ferdinand in favour of his father, who in turn ceded it to Napoleon. But on May 2 an unsuccessful outbreak in Madrid had begun the war of liberation, and Napoleon had to face a nation in arms. June 6, Joseph Bonaparte was proclaimed king of Spain. Nominally he reigned till 1813, but the Juntas, the representatives of the nation, acknowledged only the captive Ferdinand VII. For details of the French occupation of Spain, their forcible expulsion by Spanish, Portuguese, and English, see MOORE, WELLINGTON, PENINSULAR WAR, &c. While these operations were going on, the patriots were making great efforts to reform the government, and to give more real liberty to the people. The task was difficult; the absolutist party was still strong, and the liberals were divided; but the Constitution of Cádiz of 1812 is really the commencement of modern Spain. When Ferdinand returned in March 1814, he found the absolutists still powerful enough to enable him to reject the constitution to which he had sworn, to re-establish the Inquisition, and to remove all restrictions to his rule. An insurrection headed by Riego and Quiroga forced him to accept the Constitution from 1820 to 1823, but through the mistakes of the liberals, with the aid of 100,000 French soldiers under the Duc d'Angoulême, he regained his authority, and remained absolute master till his death. In December 1829 the childless Ferdinand married his fourth wife, Cristina of Naples. Up to this time his brother, Don Carlos, had been considered heir. In prospect of issue, Ferdinand promulgated (March 31, 1830) the pragmatic law of Charles IV., 1789, restoring the old law of Spanish succession. In September 1832 he revoked this sanction, but again recalled his revocation. Don Carlos was exiled to Portugal. April 4, 1833, Cortes acknowledged Ferdinand's daughter Isabella as heir to the throne, with her mother as regent. Ferdinand died September 29, 1833. During his reign the whole of Spanish continental America was lost (see PERU, &c.), and of all the vast colonies there remained only Cuba, Porto Rico, the Philippine, Caroline, and Mariana islands, Fernando Po, the Canaries, and a few ports and towns in Africa and the Straits. The opinion of Europe, which in 1823 had been conservative, and had enabled Ferdinand to regain absolutism by French help, had in 1833-40 become liberal, and this, with English help far more than the skill of her own armies, enabled Cristina to vanquish Don Carlos; but her government was far from strong, revolts and *pronunciamentos*, both by liberals and conservatives, were continually occurring. Monks were massacred in Madrid and Catalonia in 1834-35; church property was confiscated. The constitution of 1812, enlarged in 1836, was sworn by Isabella on attaining her majority in 1843. The marriage of the queen to her cousin, Francisco de Assisi, and of her sister to the Duc de Montpensier, only weakened her position. Successive ministries rose or fell from power, all inefficient or corrupt. Narváez in 1844 showed some energy. O'Donnell conducted successfully a campaign in Morocco in 1859-60. On the whole, liberalism advanced; republicanism appeared after 1848. In disgust at corrupt administration the country accepted a *pronunciamento* by Prim and Topete at Cádiz in 1868. Isabella fled to France, and there resigned in favour of her son, Alfonso XII. The programme of the military leaders was simply destructive. A provisional government of two years (the chief event

of which was to furnish the pretext for the Franco-German war of 1870) ended in the choice of Amadeus (q.v.) of Savoy as king. In 1873 he resigned the crown. The republic which followed showed the wide differences between the Federalists and the conservative Republicans. This situation occasioned the second Carlist war, 1872-76 (see CARLISTS). On the waning of their cause, Isabella's son, Alfonso XII., was proclaimed king, December 29, 1874. February 27, 1876, Don Carlos withdrew to France. Mainly through the talents of his minister, Cánovas del Castillo, Alfonso's reign of eleven years (1874-85) was a time of relative prosperity and improvement, and enabled his queen Cristina quietly to succeed as regent for his posthumous son, Alfonso XIII., born May 17, 1886. During the regency, which lasted till 1902, liberal and conservative ministries alternated peacefully, while the influence of the church was considerably extended (though this led to the crisis with the Vatican in 1910). In Cuba (q.v.), however, there had been trouble and disaffection since 1895, intensified by the threatened interference of the United States, and by the mysterious blowing-up of the American warship *Maine* in Havana harbour in Feb. 1898. From April to August the United States and Spain were at war. Cuba was invaded by American troops, while the Spanish fleet was totally destroyed, part at Manila and part at Santiago. Spain surrendered Cuba, Porto Rico, and the Philippines, receiving £4,000,000 for the latter, while the sale to Germany of the Caroline, Pelew, and Ladrone Islands followed. Subsequent foreign policy has been in favour of a general rapprochement with Spanish America. In home politics, elections continued to be conducted and cabinets to be formed largely by corruption and intrigue. Much trouble has come from the separatists of Catalonia, who demand an autonomous state with its own parliament, executive, judicature, and official language. Centering mostly in Barcelona, a cosmopolitan and industrial town, there have been many grave disorders, strikes, and riots, notably in 1902, 1909, 1912, 1917, and 1919-20. An artificial trade prosperity at the beginning of the Great War (during which Spain remained strictly neutral) was followed by the inevitable reaction.

The situation in Morocco (q.v.) has been difficult ever since the Spanish-Rif campaign of 1894. The first Spanish-French agreement was drawn up in 1904, but German interference (especially at Agadir in 1911) raised further complications, making necessary the new agreement of 1912, which marked out the Spanish and French protectorates and the international zone of Tangier. In 1921 the Rif (q.v.) leader, Abd-el-Krim inflicted a crushing defeat on the Spanish forces at Anual, continued on the offensive, and in 1925 invaded the French protectorate. A determined Spanish and French campaign eventually brought about his overthrow in 1926. It was this 'running sore,' this wastage of men and money in Morocco, that furnished the occasion for the *coup d'état* of General Primo de Rivera in 1923. The army had always wielded considerable influence in politics, some of the *Juntas* or Committees of Defence acquiring great (and often unconstitutional) power, but hitherto the 'silent veto' had been exercised behind the scenes. The military directory of Primo de Rivera dissolved parliament, abolished the cabinet, established martial law, and set itself to reform the administration, at the same time suppressing all republican and separatist movements. In 1925 the directory gave way to a semi-civilian government with Primo de Rivera at the head. In the recent past, the illiteracy of the common people, the laxness of the executive in the carrying-out of laws, the lack of business initiative, and the absence of organisation

in schemes for housing, town-planning, railway-building, &c. (not to mention the political chaos of the 19th century) have very seriously retarded the development of the country. Spain has great natural resources, while her position in the intellectual world of the 20th century is assured by her brilliant achievements in literature, art, and music.

See separate articles on the different periods and personalities in Spanish history, such as INQUISITION, MOORS, CHARLES V., PHILIP II., &c., with the books there cited. See also the large general Histories in Spanish by Lafuente (new ed. by Valera, 22 vols. 1888), Ortega Rubio (8 vols. 1908-10), and Altamira y Crevea (4 vols. 1909-11); the smaller works in Spanish by Baró (1911), and Salcedo (1914), in English by Burke (2d ed. 1900), Hannay (1917), and Chapman (1919). See also Danvila, *El Poder Civil en España* (6 vols. 1885-87); Poole, *The Moors in Spain* (1887); Lea, *Inquisition in Spain* (4 vols. 1906-7); Martin Hume, *Spain 1479-1788* (3d ed. 1913) and *Modern Spain 1788-1918* (new ed. 1923); Butler-Clarke, *Modern Spain 1815-1898* (1906); and History of the Spanish-American War by Wilson (1899).

SPANISH LANGUAGE AND LITERATURE.—Three Romance Languages (q.v.) are still spoken in Spain: Castilian, generally known as Spanish; Catalan, a dialect of Provençal; and Galician, closely allied to Portuguese. Castilian, which has been deservedly called 'the noblest daughter of Latin,' is spoken, with slight local variations, by more than two-thirds of the population. The reason for its having to a great degree supplanted Catalan and Galician is to be found quite as much in political causes as in its own richness of vocabulary and stately measured cadence. Its chief characteristics are the purity of its vowel-sounds and the strong guttural, the origin of which is doubtful, though its introduction is undoubtedly modern. The Castilian vocabulary contains a large number of Arabic words chiefly connected with agriculture or science; Greek words, mostly of learned and modern introduction; the traces of Basque and Gothic are slight. The influence of French is very noticeable, particularly during the 18th and 19th centuries. Castilian is the form of Spanish spoken by some 60 millions in Mexico, Central and South America (excepting Brazil).

See on the subject generally, Gröber, *Grundriss der Romanischen Philologie*; Diez, *Grammaire des Langues Romaines* (Fr. trans.); the admirable article by Morel-Fatio and Fitzmaurice-Kelly in the *Encyclopædia Britannica*; also Cejador y Frauca, *Historia de la Lengua y Lit. Castellana* (1915 et seq.); the Dictionaries of the Spanish Academy (1st ed. 1726); Spanish-English dictionaries by Neumann and Baretto (1837), Velázquez (1878), Cuyas (1906), &c.; Grammars by Knapp (1887), Butler-Clarke (1892), Sanin Cano (1918), &c. For Catalan, Milá y Fontanals, *Estudios de la Lengua Catalana*. For Galician, Arce, *Gramática Gallega* (Lugo, 1868).

Castilian Literature.—The earliest existing documents in Spanish belong to the first half of the 12th century. The first monuments of Spanish literature are poetical. The *Poema del Cid* (see Cid), ascribed to the later half of the 12th century, is a typical *chanson de geste*; picturesque and spirited at times, it breathes the spirit of the turbulent age which produced it. Written in unformed and uncouth language, it displays a barbarous and irregular versification. The lines vary in length from twelve to sixteen syllables, and the same rhyme is carried on through long passages. To the 13th century belongs a body of religious poetry of tame character and slight merit. Gonzalo de Berceo is the first Spanish author whose name has come down to us. He wrote rhyming lives of saints and praises of the Virgin, which closely resemble in style, subject, and versification those of other monkish authors of his own and the succeeding century. The 13th century saw the formation of literary Castilian. To this

period belongs Alfonso the Wise, king of Castile (see ALFONSO X.), who left behind him a large and valuable body of works written either by himself or at his direction. The most important of these is the code of laws, with digressions on moral and political philosophy, known as *Las Siete Partidas*. This treatise, embodying anterior Gothic codes, has been the groundwork of all subsequent Spanish legislation; it forms also a most important monument of the language, which now for the first time appears as an instrument fitted for literary production. A collection of verse, mostly of a religious character, and undoubtedly belonging to this period, has been long a puzzle to scholars from the circumstance that, appearing as the work of Alfonso the Wise, it is written in the Galician dialect. Alfonso's literary tastes were shared by his nephew, Don Juan Manuel, author of several works of great interest which have come down to us, and of many others now unfortunately lost. He is best known by the *Conde Lucanor* or *Libro de Patronio*, a series of stories mostly of eastern origin, loosely connected together and with rhymed morals attached. The most original writer of the 14th century is Juan Ruiz, archpriest of Hita, a disreputable cleric, who relates his love adventures in poetical form, interlarding them quaintly with moral fables and religious hymns. In spite of great blemishes and frequently recurring obscene and blasphemous passages, the work is valuable from its vivacity and the excellent picture it gives of one side of life at the time. The verse is still that of the earlier poets, fourteen syllable lines, stanzas of four lines with one rhyme repeated. In prose these early centuries produced little that is worthy of note, as Latin was still much used. By the direction and, probably, under the supervision of Alfonso the Wise, was compiled the *Grande y General Historia*, extending from the creation nearly to his own times. This work was continued by official chroniclers, generally as a bare record of events, down to the time of Ferdinand and Isabella. Pedro Lopez de Ayala wrote the history of the kings under whom he lived in somewhat more picturesque and lively style than his predecessors; his *Rimado de Palacio* is a caricature of the different classes of society of his time, for studying which his high position and many adventures gave him admirable opportunities.

In the 15th century two new and important branches of Spanish literature appear—the Romances of Chivalry (*Libros de Caballerías*) and Ballads (*Romances*). The *Amadis de Gaula* (see AMADIS), first and best of books of chivalry, has come down to us in a translation from a Portuguese version, of which the original is lost. It is, however, certain that this is not the earliest form of the story in Spanish. The *Amadis* is not free from the exaggerations and stilted style that deface later books of its class, but, unlike them, it contains passages of great beauty, and, in spite of its being a translation, its language is generally dignified and pure. The popularity of the class was great; but successive authors rivalled one another in wild exaggeration and the frigid impossibility of the adventures of their heroes, who live under social conditions that have never existed, and in a world without geography. The Romance of Chivalry was dying a natural death when Cervantes gave it the *coup de grâce*. The origin of the Spanish ballads is very uncertain; they are probably of indigenous growth, as no striking parallels can be cited to support the theory that they are imitated from the poetry of the Moorish conquerors of Spain. The great mass of them was collected in the 16th and 17th centuries from the mouths of the people, but many of them are of much earlier date. Handed down orally from

generation to generation, they underwent considerable modification, and their language alone cannot be taken as a sufficient clue to their date. Their structure is characteristically Spanish; the lines may be considered either as octosyllabic or as of sixteen syllables with *césura*; the same *asonante* or vowel-rhyme is continued throughout whole compositions. In subject these ballads range from sacred history to the Arthurian and Carolingian cycles, but the most valuable and interesting are those which celebrate the national heroes and the Moorish champions against whom they fought.

Thus far the works mentioned have been of purely national character or derived from sources common to the writers of the middle ages; but at the court of John II. the influence of Provençal literature began to make itself strongly felt, and a generation of stilted and affected poetasters arose encouraged by the king, who formed one of their number. The works of many authors of this school are collected in the celebrated *Cancionero de Baena*; with the exception of a few religious pieces they are of slight merit, but they succeeded in enriching Spanish with new lyric metres. At the end of the 15th century appeared the *Tragicomedia de Calisto y Melibea*, better known as the *Celestina*. It is said to be the work of two authors, but the wonderful evenness of its style makes this hard to believe. The *Celestina* partakes of the nature of novel and drama. Written entirely in dialogue, but at the same time immoderately long and unsuited for dramatic representation, it is unique amongst works of its time and country, being perfectly unaffected in style. Taking its subject from a side of life that must have been familiar to its authors, it neither shirks nor courts obscene details, but aims at and thoroughly succeeds in giving a true and animated picture, and at the same time enforcing a moral lesson. It soon became one of the most popular books in Spain, and was translated into most European languages.

It is probable that from Roman times the Drama (q.v.) never became extinct in Spain. It is mentioned in the *Siete Partidas*, and one of the earliest extant pieces of Spanish is a miracle-play, *El Misterio de los Reyes Magos*. The modern Spanish drama, however, must reckon its origin from the end of the 15th century, when Juan del Encina wrote *églogas* or *representaciones* of pastoral character, some of which were undoubtedly acted. Gil Vicente and Torres Naharro imitated and improved upon the methods of Encina, but Lope de Rueda, playwright and actor (fl. 1550), must be considered as the father of the Spanish dramatists, and as such he is mentioned by Cervantes. Continuing the pastoral drama of his predecessors, Rueda also wrote regular plays, divided into acts. In these the influence of the Latin stage is perceptible. The best part of Rueda's work consists of his spirited interludes (*entremeses*, *loas*) of a popular and burlesque character. Cervantes (q.v.) commenced his career as a dramatic author, but his two earlier pieces, *La Numancia* and *El Trato de Argel*, though finely conceived, were unsuccessful.

With the decay of the popularity of the romances of chivalry is coincident the rise of the novel in its different forms. In the *Diana Enamorada*, Montemayor and Gil Polo directly imitated the Italian. Cervantes and Lope de Vega each produced a novel of the kind, but the false and exaggerated sentiment and inferior verse to which the impossible shepherds generally treat one another in these compositions make it hard to understand the popularity which they undoubtedly enjoyed. Side by side with the pastoral novel, but with stronger growth, thrived the realistic *novela picaresca*, or rogue's story (see NOVELS), subsequently brought to perfection by Le Sage, who in his *Gil Blas* drew

largely upon his Spanish models. The earliest book of the kind is *Lazarillo de Tormés*, ascribed, apparently without reason, to Diego Hurtado de Mendoza (see MENDOZA), a poet and historian of the time of Charles V., at whose court he played a considerable part. *Lazarillo*, the hero, like his brethren of the other books of the class, is a poor boy of shady antecedents, who, by his own ingenuity and unscrupulousness, with varying fortune pushes his way, generally as a servant, amongst all classes of society. So admirable a vehicle for amusement and satire was not neglected, and *Guzmán de Alfarache*, *Marcos de Obregón*, *La Pícarra Justina*, and many others go to prove the popularity of this kind of story. A solitary and not very brilliant example of the historical novel at an early date is the *Guerras de Granada* by Hita.

Some of the older poets, amongst them the Marqués de Santillana, had imitated Italian models, but the influence of Petrarch and his school is most directly felt in Juan Boscán and Garcilaso de la Vega, who flourished in the first half of the 16th century. The latter in his *églogas* brought hendecasyllables to perfection in Spanish, and left at his early death a small collection of the most beautiful poetry in the language. An imitator of, and at times a translator from, Virgil and Petrarch, he is not unworthy of his models; the harmony of his verse is unsurpassed, unless it be by the *Coplas de Manrique*, probably one of the finest elegies extant.

Lyric poetry reached its culmination in the first half of the 16th century. Most of it is of religious character. In sublimity of conception and perfection of execution Herrera's (see HERRERA) odes and elegies are entitled to a very high place in European literature. Whilst Herrera sang of the victories and reverses of his time, Luis de León drew his inspiration from nature, solitude, and religious meditation. Sweetness of language never deserts him, but his productions are uneven in merit. The brothers Argensola (q.v.) owe their fame rather to good taste than to poetic inspiration. These writers come within the Spanish golden age, during which prose reached its highest development in the religious and mystic writings of Luis de León, Luis de Granada, St Teresa, and Juan de la Cruz, in the histories of Mariana (q.v.) and Solís, and in parts of the writings of Cervantes (see CERVANTES). The *Don Quixote*, with its quaint humour, rollicking fun, melancholy touches, and profound views of human nature, is deservedly, both at home and abroad, the best-known and best-loved book in Spanish. Unique amongst the works of its time, and far superior to the other efforts of its author, it belongs to no class, and has no successor in Spanish or any other literature. Cervantes' other works, the *Galatea*, *Persiles y Sigismunda*, *Viage del Parnaso*, dramatic works and novels, are read chiefly on account of the interest which must be felt for the author of *Don Quixote*.

Contemporary with Cervantes was Lope de Vega (see VEGA), the idol of his time, the 'prodigy of nature' (*monstruo de la naturaleza*), as he was called on account of the immense mass and great variety of his writings. Almost every branch of literature was familiar to him. Of dramas alone he wrote over 2000, besides a great body of lyric verse, epic and mock epic, novels both pastoral and of adventures, and criticisms. It is by his dramas that he is best known, and especially by those of cloak and sword (*capa y espada*). These within certain well-defined limits afford considerable scope for variety. The scene is invariably laid in some Spanish town. The principal characters are two lovers, whose adventures and somewhat stilted dialogue are parodied and relieved by those of their servants, one of whom

is generally the *gracioso* or buffoon, whose homely pleasantries sometimes jar disagreeably in the midst of fine and solemn passages. The metre of the Spanish drama is generally the same as that of the ballads; some variety, however, both of grouping of rhymes and of metre is admitted. A distinctive feature is the exceeding intricacy of the plots. This characteristic is so marked as to have led several critics to believe that a Spanish drama requires a Spanish audience to follow it intelligently. The great amount of the productions of Lope de Vega precluded all attempt at finish. His verse, however, is always flowing, and he generally attains success by thoroughly carrying out his own maxim that the drama is a purely popular form of literature, and that the only critics to be regarded are the mass of those who pay their money at the theatre-door. Calderón de la Barca (see CALDERÓN) outlived the golden age of the drama of his country. More philosophic, careful, and with a higher ideal than Lope, he is generally incapable of carrying out his gigantic enterprises, and is, broadly speaking, a poet of fine passages rather than a dramatic author of high merit. In attempting sublimity he frequently becomes bombastic and misty, and is deeply infected with the bad taste of his time. He perfected the *auto sacramental*, a religious play, or rather a dramatised theological discussion, in which such characters as Conscience, Free-will, Hope, and the cardinal virtues take part. On these, to modern taste, somewhat dull compositions, in which Christian theology is frequently jumbled up with pagan mythology, Calderón lavished a great deal of his best verse, and to them his reputation amongst his contemporaries was largely due. Equal to Lope or Calderón as dramatists, though inferior as poets, are Tirso de Molina (see TELLEZ) and Moreto. The former handled to perfection his native language, and is, more than any other, characteristically a Spaniard of his time. His defects are the want of a high ideal and the frequent coarseness of his language. Outside his own country he is chiefly known as the author who first dramatised the story of Don Juan Tenorio, the *Burlador de Sevilla*, a theme whose impressive nature he well knew how to take advantage of. Moreto is the most correct of Spanish dramatists, and his *Desdén con desden* merits special mention, even in an age which produced, besides the authors already mentioned, Rojas and Alarcón (q.v.). The number of dramas produced at this time is almost incredible, and some, even of the anonymous ones, are such as in a less fertile age would have sufficed to found a reputation.

Spanish eloquence has always had a tendency to become bombastic; mannerisms and affectation of the worst kind have been mistaken for cultured style; extravagance of metaphor was rife even at the best period (see EUPHUISM); but when literature began to decay all these defects became more marked. The typical representative of this *culto* school is Luis de Góngora (see GÓNGORA), a poet who enjoyed great popularity in the golden age, and whose example probably did much to hasten a climax which had already become inevitable. In his youth he wrote simply and correctly short lyric pieces of great beauty. It is difficult to believe that this is the same Góngora who, a few years later, produced the *Soledades* and *Polyfemo*, poems so obscure, bombastic, and crammed with *concetti* that before his death they required lengthy commentaries. Amongst those who protested against the tendency of the times, whilst frequently allowing themselves to be carried away by it, was Francisco de Quevedo y Villegas (see QUEVEDO), the bitter satirist and writer of trenchant verse. Extremely versatile, his writ-

ings include erotic verse, light lyrics, essays on government, picaresque novels, and theological discussions. In his merits and defects he closely resembles Swift. The best known of his works are his *sueños*, or visions, in which the motives and manners of his time are held up to ridicule with a masterly and unsparing hand.

At the end of the 17th century the sun of Spanish glory set, and with it the sun of Spanish literature, so suddenly and completely as not to leave an afterglow behind it. Of the succeeding century only a few names deserve mention. Padre Isla (q.v.) in *Fray Gerundio* ridiculed the low ebb of education, and particularly of pulpit oratory, with wit and good sense worthy of a better age. Samaniego and Yriarte wrote some clever fables in the style of the inimitable Lafontaine. The Academy, founded during the first half of the 18th century, produced the magnificent dictionary which is its chief claim to the gratitude of scholars. When literature seemed at its lowest ebb, and nothing found favour unless slavishly imitated from the French, Moratin (q.v.) came to add one more name to the glorious list of dramatists.

The despotic rule of Ferdinand VII. (d. 1833) drove into exile practically all writers of liberal tendencies, but the successful production (1835) of the play, *Don Alvaro* by the Duque de Rivas, was a victory for romanticism. A new period of Spanish literature began, characterised by a direct realism (apt to degenerate into over-emphasis) and by a distinctly national (or more often, regional) spirit. The first of these regional novelists was Fernán Caballero, whose *Gaviota* is marked by keen personal observation, but the first half of the 19th century was rendered noteworthy by a group of poets: Espronceda, passionate and impetuous; Zorrilla, more restrained, but also more facile; Becquer, author of some charming lyrics; and Campoamor, whose delicate craftsmanship found expression in *Doloras*. Echegaray produced many plays of the sentimental type, while the poet Núñez de Arce won fame with his virile *Gritos del combate*. The development of the novel (often relying more on characterisation rather than on plot), however, has been the predominant feature of modern Spanish literature, and *Pepita Jiménez* (1874) of Valera and *El Sombrero de tres picos* (1874) of Alarcón still remain two of the most outstanding examples. Four novelists, in particular, connect the 19th with the 20th century: Pereda, almost reactionary in spirit, described the picturesqueness and rough grandeur of Santander; Emilia Pardo Bazán wrote delightfully of Galicia; Pérez Galdós, who has been compared to Dickens in his development of characters and in his love of the fantastic, helped to form a Spanish national consciousness with his huge series of historical novels, *Episodios Nacionales*; while Valdés interprets Asturias with a keen sense of humour and psychological understanding. There are four novelists belonging more particularly to the 20th century: the forcible Blasco Ibáñez, who is at his best in describing the humble life of Valencia, devotes himself in some of his later works to controversial social problems, but in some respects is too much influenced by the French naturalistic school; intense energy is also characteristic of the Basque, Pío Baroja, whose novels give a vivid and truthful presentation of life, but are somewhat unequal in construction; 'Azorín,' also a good critic, draws homely scenes with great detail and delicacy; but the art of Miró, equally sensitive, is almost more spontaneous. Ayala and Valle Inclán are both novelists and poets; the former (from Asturias) views life from an earnest detached point of view, while the style of the latter (from Galicia) is graceful, rhythmical, and subtle. The novelist León and the poets Jiménez and Asunción

Silva are the best of the younger school, but on the whole, the influence of the French *symbolistes* has been very penetrating. In the field of drama, the cosmopolitan Benevente, a Nobel prize-winner, with his great powers of vital character-drawing, has a worthy successor in Martínez Sierra. The Quintero brothers specialised in the writing of comedies, often for the *género chico* (short plays or sketches with songs and music). As regards scholarship and learning, two names stand out brilliantly in the 19th century—those of Mila y Fontanals and of Menéndez y Pelayo; while the philosophers Unamuno and Ortega y Gasset, both men of extremely wide culture, and the critic Menéndez Pidal, belong more to the 20th century. Periodic literature of a not very high order is abundant. There has always been considerable literary activity in Spanish America, but few writers of any special importance appeared before the Nicaraguan, Rubén Darío (q.v.), one of the most brilliant of the modern poets, with a mastery of technique allied to genuine lyrical powers. The Uruguayan, Rodó, specialised in æsthetic criticism.

Catalan Literature.—The intercourse between Catalonia and Provence has been great from the earliest times. The troubadours of Provence carried with them across the Pyrenees their own language as well as their own poetical forms. Their influence may be seen in the works of Raymond Lully, whose poem 'Despair' (*Lo Desconort*) is deeply impregnated with their mannerisms. At the later end of the 14th century a consistory of the *gay saber* was founded at Barcelona in imitation of the one already existing at Toulouse. From this may be dated the partial emancipation of Catalan verse. Two Valencian poets distinguished themselves in their native language. Ausias March, whose songs of love and songs of death are fine in spite of intentional obscurity, and Jaume Roig, whose bitter satire, *The Ladies' Book*, is supposed to contain details of his own life. Roig died in 1478, and at the union of Castile and Aragon Catalan sank to the position of a dialect. In prose the principal monuments of old Catalan are the works of Lully, including the interesting *Book of the Order of Knighthood*; the *Chronicles*, some of which are interesting both in matter and manner, especially that of Ramón Muntaner; and one romance of chivalry entitled *Tirant lo Blanch*, an exaggerated example of the defects of the class. In the 19th century a successful movement (not unconnected with politics) was set on foot to make Catalan, which had come from the Middle Ages virtually unchanged, a literary and not merely a popular language. Some of the verse of Verdaguer is very charming and natural, while more recent poets are Maragall, Carner, and López-Picó. The shadow shows of Robredo at the beginning of the 19th century can be said to have started the modern Catalan theatre, of which the most vigorous and dramatic exponents have been Guimerà, Gaul, and Rusiñol, while contemporary prose is well represented by Eugen d'Ors.

In Galician, which has never been a literary language, few books exist, with the exception of collections of popular songs.

CASTILIAN.—The standard English history of Spanish literature is that of Fitzmaurice-Kelly (new ed. 1926, superseding all former editions), but see also the general histories by Ticknor (6th ed. 1888), Butler-Clarke (2d ed. 1909), Ford (1919), and Northup (1925), all in Eng.; by Becker (1904, in Ger.); by Castro (1890), César Barja (1923-24), and Hurtado and Palencia (2d ed. 1925), all in Span. For the period up to the 16th cent. see the work by Amador de los Ríos (1861-65), for the Middle Ages, the work by Wolf (1859, in Ger.), and for contemporary literature, works by Mandariaga (1923) and A. F. G. Bell (1925), in Eng. For the drama in the time of Lope de Vega, in the 17th cent., and in contemporary

times respectively, see works by Rennert (1909, in Eng.), Morel-Fatio (2d ed. 1923, in Span.) and González-Blanco (1917, in Span.), as well as general histories by Castel (1882, in French) and Schäffer (1890, in Ger.). See also various books by Menéndez y Pelayo, including *Orígenes de la Novela* (1905-7) and *Historia de la Poesía Castellana* (1911-13). There are anthologies by Ford (1901), Fitzmaurice-Kelly (1913), and Farnell (1920); and histories of Spanish-American literature by Menéndez y Pelayo (1911-13, in Span.) and Coester (1917, in Eng.).

CATALAN.—See Mila y Fontanals, *De los Trovadores* (1861); Tubino, *Historia del renacimiento contemporáneo* (1880); Denk, *Altatalanische Literatur*; histories by Rubió y Ors (1880), d'Oliver (1919), and studies on the drama by Urquiza (1911), Curet (1919), all in Spanish; anthology by Amade (1908.)

Spalato, or less correctly SPALATRO (Slav. *Split*), the busiest town of Dalmatia, stands on the Adriatic, 160 miles SE. of Fiume. Here in a beautiful situation the Emperor Diocletian built a colossal palace (*Salonæ Palatium*, whence perhaps Spalato, though more probably from 's palátiov'), to which he retired when he abdicated the throne in 305. The palace faced the sea, looking southwards; its walls were from 570 to 700 feet long and 50 to 70 feet high, and enclosed an area of 9½ acres. It stood square like a Roman camp, and had a gate in the middle of each side, and was of the most solid construction. Architecturally it is of the highest interest in that it contains several features that presage the architectural styles and devices of modern times. Inside the palace the roads connecting the gates crossed at right angles in the middle, and two of the four courts thus formed were each occupied by a temple (or similar building), one to Æsculapius, the other to Jupiter. So at least says an ancient tradition, though some modern authorities claim the latter, and others the former, as the mausoleum of the emperor. The temple of Jupiter is externally an octagon with a colonnaded peristyle and internally a circle covered by a dome. Where the projecting portico was built there now stands a tower built in the 14th and 15th centuries, thoroughly restored in 1891-92. Since the year 650 this temple has been a Christian cathedral; it contains a magnificent marble pulpit. The interior was extensively restored in the years immediately preceding 1885. The other temple is used as a baptistery; it is of small size and rectangular in shape. All the interior buildings and nearly all the exterior walls of this gigantic palace are still standing in a fairly good state of preservation. But the interior was converted into a town in 639 by the citizens of Salona (q.v.) who escaped the destruction of their town by the Avars, and it has been occupied ever since. The existing city of Spalato lies, more than half of it, outside the palace walls. It contains a museum rich in the remains of Salona, and has a lively trade; the Lasva railway (1895-97) connecting it with Bosnia and the Danubian lands. Its industries embrace the manufacture of liqueurs (rosoglio and maraschino), bricks, ropes, &c. Pop. 25,000. See ROMAN ARCHITECTURE; and books on the palace by R. Adam (in Eng. 1864) and G. Niemann (in Ger. 1910).

Spalding, a Dutch-looking town on the Welland in Lincolnshire, 14 miles SW. of Boston, with a fine church (Decorated and Perpendicular), built in 1284 and restored by Sir G. Scott. A castle and a monastery existed here prior to the Conquest. The grammar-school, of which Bentley was master in 1682, was founded in 1563; new school buildings were erected in 1881. Ayscoughfee Hall, dating originally from 1420, was the residence of the antiquary Maurice Johnson, who helped to found the Society of Antiquaries and the Spalding

Gentlemen's Society (1710; resuscitated in 1889). Spalding lies in the centre of the fertile Fen District (see BEDFORD LEVEL), and has an active trade in agricultural produce. The river is navigable up to the town for vessels of 80 tons. Pop. 14,000.

Spalding, JOHN (fl. 1624-45), was the commissary clerk of Aberdeen and diarist, after whom is named a well-known northern Book-club (q.v.).

Spallanzani, LAZARO, naturalist and traveller, was born at Scandiano, in the duchy of Modena, Italy, on 12th January 1729. After studying at Reggio di Modena and Bologna, natural science, mathematics, the classical tongues, law, and other subjects, he was in 1754 appointed to the chair of Logic, Metaphysics, and Greek at Reggio, and soon afterwards was transferred to Modena. But he took the greatest interest in natural history and physiological questions. Amongst other things his attention was directed to the doctrine of spontaneous generation propounded by Needham and Buffon, which after careful study and experiment he overturned. On the re-establishment of the university of Pavia Spallanzani was appointed (1768) professor of Natural History and keeper of the museum, which he greatly enriched with fishes, crustacea, and testacea, the fruits of his numerous excursions. In 1785-86 he spent nearly a twelvemonth in Turkey engaged in scientific observation, and during the year 1788 visited Naples whilst Vesuvius was in eruption, the Lipari Isles, and Sicily, and wrote an account of his inquiries, *Viaggi alle due Sicilie* (6 vols. 1792). He died of apoplexy, 11th February 1799. In *Dissertationi di Fisica Animale e Vegetale* (2 vols. 1780) he clearly demonstrated the true physiological nature of digestion, and established, on the basis of experiment, the respective functions of the spermatozoa and the ovum in reproduction.

Span, a measure of length, being the distance between the tips of the thumb and little finger when the fingers are expanded to their fullest extent. This space averages about 9 inches, which accordingly is the fixed measure given to the span.

Spandau, a town and first-class fortress of Prussia, since 1920 part of Berlin, is situated at the confluence of the Havel and the Spree. The principal defence of the capital on the west side, it has very strong modern fortifications, including a citadel. In the 'Julius tower' of this structure was preserved in gold the 'Reichskriegsschatz' of £6,000,000 that the government, according to a law of 11th November 1871, kept in reserve for a great war. Spandau has government munition works and an arsenal. Pop. (1875) 27,630; (1890) 44,611; (1910) 84,855; (1919) 95,474. One of the oldest towns of Brandenburg, it was a favourite residence of the electors. It surrendered to the Swedes in 1634, to the French in 1806, and in 1813 to the Prussians.

Spanheim, FRIEDRICH, theologian, was born at Amberg, January 1, 1600; studied at Heidelberg and Geneva; visited Paris and England; was appointed in 1631 to the chair of Theology at Geneva, in 1641 at Leyden; and died there, April 30, 1648. He contributed to the controversy with Amyrant *Disputatio de gratia universalis* (1644), &c.—EZECHIEL SPANHEIM, son of the foregoing, was born at Geneva, December 7, 1629, studied at Leyden, and was appointed professor of Rhetoric there in 1651. He next became tutor to the sons of the Elector Palatine, and with them travelled in Italy and Sicily. In 1665 he represented the Palatinate and Brandenburg as resident in England; in 1680 he went for nine years to Paris as ambassador extraordinary. He took part in the peace of Ryswick, later went on missions both to Paris and

London, and died at the latter, 7th November 1710. He had great learning in the history of ancient law and in numismatics, and his *Dissertationes de usu et præstantia numismatum antiquorum* (best ed. 1706-16) and *Orbis Romanus* (1704) made his name widely known.—FRIEDRICH SPANHEIM, his brother, was born at Geneva, May 1, 1632, studied at Leyden, was appointed to the chair of Theology at Heidelberg in 1655, at Leyden in 1670, and died there, May 8, 1701. He defended Calvinism against Descartes and Cocceius. His collected works fill 3 volumes (1701-3).

Spaniel, one of the longest established breeds of dogs. Dr Caius gives a description of the spaniel in his treatise *Of Englishe Dogges* (1576). The working spaniel may be divided into the Clumber, the Sussex, and the Field Spaniel. The Clumber derives his name from the estate of the Duke of Newcastle, who originally imported them from the kennel of the Duc de Noailles, and bred them for many years at Clumber Castle (q.v.). The pure breed was guarded with jealousy. Clumbers are usually worked in a team of four or five; as they generally hunt in silence, they are extremely useful in thick cover, the game not being alarmed without cause. In appearance the Clumber is a handsome lemon and white dog, short in the leg, long in body, coat like a setter, a massive head with large drooping ears.

The Sussex is also a variety of long standing, though the pure breed was only resuscitated in 1870 with great difficulty. In colour the Sussex should be a 'golden-liver' or brown, otherwise it closely resembles the Clumber.

The Black Spaniel is bred mainly from Sussex blood. The 'cocker' and the 'springer' are names indiscriminately applied to field spaniels of unknown breeding; they are generally liver and white, and are probably cross-bred Sussex.

Though there are records of the existence of an English water-spaniel, yet the breed has been entirely eclipsed by the Irish water-spaniel. The Irish dog resembles a large poodle in face and size, an untrimmed coat curling all over the body; in colour it should be a reddish liver.

Toy Spaniels, though identical in name, have little in common with the working spaniel. They are divided into the black-and-tan King Charles, first brought into notice by Charles II., and the red and white Blenheim, established by the Duke of Marlborough. The toy spaniel should not weigh more than 10 lb., and should have a short turned-up face like a pug-dog. From their long coats and small size these dogs are only fitted for pets, but are bright and cheery in disposition.

Spanish Fly. See CANTHARIDES.

Spanish Legion. See EVANS (DE LACY).

Spanish Main (i.e. *main-land*), a name given to the north coast of South America from the Orinoco to Darien, and to the shores of the former Central American provinces of Spain contiguous to the Caribbean Sea. The name, however, is often used of the Caribbean Sea itself, especially in connection with the Buccaneers (q.v.).

Spanish Marriages. See GUIZOT.

Spanish Needles (*Bidens bipinnata*), a world-wide pest of cultivation of American origin, spreading by means of its hooked fruits. The name is given to other plants of the genus, to which belongs also the comparatively innocent Bur-marigold.

Spanish Succession. See SUCCESSION WARS.

Spanish Town. See JAMAICA.

Spar (Ger. *Späth*), a miners' term for any bright crystalline mineral, used in books for certain minerals—bitter spar, brown spar (see

DOLOMITE), calc spar, calcareous spar, or Iceland spar (see CALCITE), Fluor Spar (q.v.), heavy spar, or barytes (see BARYTA), &c.—in which, however, it has no proper generic significance.

Sparks, JARED, American historian, was born at Willington, Connecticut, 10th May 1789, graduated at Harvard University in 1815, and became tutor in mathematics and natural philosophy there, and one of the conductors of the *North American Review*. In 1819 he was settled as a Unitarian minister at Baltimore, where he wrote *Letters on the Ministry, Ritual, and Doctrines of the Protestant Episcopal Church*. In 1821–23 he edited the *Unitarian Miscellany*, in which he first published his *Letters on the Comparative Moral Tendency of Trinitarian and Unitarian Doctrines*. In 1821 he was chosen chaplain to congress, but two years later he abandoned preaching owing to ill-health, and for seven years was proprietor and editor of the *North American Review*. In 1828 he published a *Life of John Ledyard*, and from 1834 to 1837 edited at Boston 12 volumes of the *Writings of George Washington*. In this important national work Sparks unfortunately doctored the text, and so did much to shape the priggish George Washington of myth. It was followed by the *Diplomatic Correspondence of the American Revolution* (12 vols. 1829–30), and the *Life of Gouverneur Morris* (3 vols. 1832). At this period he began the *American Almanac*, and also his *Library of American Biography*, first issued in two series of 10 and 15 vols. In 1836–40 was published his collection of the *Works of Benjamin Franklin* (10 vols.), and in 1853 his *Correspondence of the American Revolution* (3 vols.). Besides these multifarious literary labours, he was from 1839 to 1849 McLean professor of History at Harvard, and from 1849 to 1853 president of the college. He died 14th March 1866. See memoirs by Brantz Mayer (1867), G. E. Ellis (1869), and H. B. Adams (1892).

Sparling. See SMELT.

Sparrow (*Passer*), a familiar genus of birds of the family Fringillidæ, having a strong conical bill, the upper mandible slightly curved, the lower mandible compressed and shorter than the upper, the nostrils partly concealed by the short feathers at the base of the bill, the legs moderately long and stout, the claws sharp and curved, the tail moderately long, and nearly even at the tip. The species are not very numerous, and are exclusively found in the Old World. The Common Sparrow, or House-sparrow (*P. domesticus*), is plentiful almost everywhere in the British Islands, its distribution following cultivation even to the Outer Hebrides. It is found also throughout Europe as far as to the Arctic Circle, but not in the Faeroes, abounding particularly in the northern countries, from which its range extends eastwards into Siberia, and southwards in Africa to Lake Albert, Morocco, and Madeira. A paler variety is found in Siam, Burma, and the Indian region as far west as southern Persia. Of all British birds the sparrow is the boldest in its approaches to man, and it is too well known to require description. Town sparrows are not mere visitors from the neighbouring country, but constant inhabitants of the town itself, with the smoke of which their plumage is begrimed. The sparrow in its best plumage is not a very beautiful bird, nor so elegant in form as many others of the finch tribe; it has no melodious song, but its habits are interesting, and its frequent lively chirp is pleasing. Sparrows often congregate in great flocks, particularly in autumn. The sparrow is one of the most omnivorous of birds, devouring animal and vegetable food indiscriminately, and eating vast numbers of insects and their larvæ during summer. Their

depredations on crops have induced many farmers to use means for their destruction. They are good to eat, though little used for this purpose in Britain. It is otherwise in France, where all the small birds are sought after as articles of food. But the destruction of sparrows may be carried too far; and in France it has been followed by an increase of caterpillars, vastly more injurious to crops than the sparrows themselves. Since the young are fed upon caterpillars and insect larvæ, the killing of the fledged young has been recommended as the best method of taking advantage of the usefulness of the sparrow and at the same time checking its autumn ravages among the grain. The sparrow makes a rough and ready nest, collecting a quantity of hay or some similar material, in a hole of a wall, and lining it with feathers; sometimes, but more rarely, building a rude dome-shaped nest in the higher branches of a tree. Apart from the habitations of man, which it so much frequents, it often builds in crevices of rocks, or in cliffs on the seacoast, or under the shelter of the nests of rooks, one rook's nest sometimes covering several nests of sparrows. Several broods are produced in succession, and the breeding season is prolonged over the whole summer, one brood succeeding another. In summer the plumage of the sparrow is more brilliant than in winter, and the female is of more sober plumage than the male, exhibiting indeed little diversity of colour. In Italy a species, *P. italia*, is found; and in Sardinia, Sicily, and Malta another species, *P. hispaniolus*, occurs, which in Spain breeds in the woods, while the common sparrow keeps to the towns. About 1862 the house-sparrow was introduced into the United States, and it has also been acclimatised in Australia and New Zealand, in all which places it has become a great pest. The Tree-sparrow (*P. montanus*), the only other British species, is very similar to the common sparrow, but of rather smaller size; rarer and more local, but extending in its range, being found in the Hebrides and St Kilda, very sparingly in the south-west of England, and resident in Ireland near Dublin. It is multiplying in the Faeroes, and extends beyond the Arctic Circle. It is more abundant in some parts of Europe than the house-sparrow. It visits Egypt and Arabia, and is found in the south of Asia as far as the Philippine Islands and the Malay Peninsula. In Java a variety has developed (*P. malaccensis*). The White-throated Sparrow (*Zonotrichia albicollis*), an American form, is really a bunting. It has been found in the east of Scotland and the south of England. Other American sparrows have little in common with the genus *Passer*. The nostrils are in a small groove, and the tail is slightly forked.—The Hedge-sparrow (see WARBLER) is a bird belonging to an entirely different group; and the name sparrow is loosely given to various different birds in various parts of the world. For accounts of the destructiveness of the sparrow, see *The House Sparrow*, by J. H. Gurney, Russell, and Coates, and Miss Ormerod's Reports.

Sparrow-hawk (*Accipiter*), a genus of long-legged, short-winged falcons, nearly allied to and closely resembling the goshawks, but distinguished from them by their smaller size, weaker bill, and long, slender middle toe. The genus is represented in almost all parts of the world. The Common Sparrow-hawk (*A. nisus*), notwithstanding the constant war waged against it by gamekeepers, is still comparatively abundant in wooded districts throughout Great Britain and Ireland. It nests in trees, sometimes building a nest of its own, sometimes adopting one deserted by a crow or other bird. The eggs, four to six in number, are laid early in May, and are of a bluish-white colour marked with reddish brown. The food of the

sparrow-hawk ordinarily consists of small birds, which it takes while on the wing, but when rearing its brood it often commits great havoc among young game-birds and poultry. The adult male measures 13 inches, and has the upper parts of the body bluish gray, the under parts buff-coloured, with bright rufous bars. The female is paler in colouring and measures about 15 inches. The sparrow-hawk was used in falconry, but its feebler



Common Sparrow-hawk (*Accipiter nisus*).

powers of flight made it of less value than the true falcons. It is bold and active, however, and is still often trained to take partridges and small birds; and it is recorded that a single trained sparrow-hawk took 327 birds in less than two months. The American Sparrow-hawk (*Falco sparverius*) is similar in size to the European, but is more nearly allied to the kestrel.

Sparta, anciently LACEDÆMON, the capital of Laconia, and the most famous city of the Peloponnesus, situated on the right bank of the Eurotas, about 20 miles from the sea, in a plain shut in by mountains, of which that on the west side, Mount Taygetus, rises to a height of 8000 feet. The natural defences of the valley of Lacedæmon were so great that it continued unfortified down to the Macedonian period, and indeed was not regularly fortified till the time of the tyrant Nabis (195 B.C.). Previous to the Dorian conquest the primitive Achæans of Sparta seem to have dwelt in four or five scattered hamlets. Therapne, or Serapna, on the other side of the river, seems to have been a Mycenæan city destroyed by the Dorians. The hamlets in course of time, including ultimately Amyclæ, were grouped into one city by the conquerors, and became known as town-districts. Sparta's Acropolis was a steep hill in the northern part of the city, crowned with the temple of Athena Poliouchos or Chalkioikos. Here, as in all Dorian states, were found the three classes—*Helots*, or slaves; *Perioikoi*, freemen without political rights, dwelling in outlying towns; and the *Spartiatæ*, or the governing class of Dorians, with such others as had been admitted before a narrower policy was adopted. The foundation of Spartan greatness was attributed to the legislation of Lycurgus (q.v.). At the head of the government stood two *kings*, one of the family of the Agidæ, the other of the family of the Eurypontidæ, their royalty hereditary in the main line, but limited to sons born while the father was actually king. Their powers were equal, and

they were originally priests as well as judges and generals. After 506 B.C. only one king at once might take the field, and his powers came to be much curtailed by the growing power of the Ephors. These were five in number, elected annually by the people—the first giving his name to the year. Two accompanied the king on campaign, advising the three at home by the *στυράλαι*, or secret despatches. They received foreign ambassadors, imposed taxes, and judged in all matters except those which specially belonged to the kings as priests. The standing council of kings and ephors was the *Gerousia*, consisting of twenty-eight Spartans above sixty, and elected from the chief families by the people. Once a month was held the *apella*, or assembly of all Spartans above thirty, who might vote but could not speak, which only the king, ephors, and members of the gerousia had the right to do. The Spartans never ceased to look upon themselves as merely a military garrison, and all their discipline pointed to war. No deformed child was allowed to be brought up; boys began to be drilled at seven, entered the ranks at twenty, and thereafter had to dine every day in one of the military messes (*ἀνδρεία* or *φιδίτια*) in tents pitched in the public street. From twenty till sixty all Spartans were obliged to serve as Hoplites. In the 5th century the army was divided into twelve *lochoi*, commanded by *lochagoi*. Each *lochos* consisted of 500 men. After the Peloponnesian war the army was rearranged in six *moræ*, each under a *polemarchos*. They never were strong at sea, although at Salamis they had ten ships, and under Lysander defeated the Athenian fleet and so ended the Peloponnesian war.

The earliest struggles of Sparta, after a shadowy war with Tegea (c. 800 B.C.), were with Messenia and Argos. The Messenian war, under king Theopompus, is said to have lasted twenty years (perhaps c. 736–16). A century later (c. 630) the enslaved Messenians revolted in vain. Similar struggles occurred both with the older Achæan inhabitants in the centre of Peloponnesus and with the Dorians of Argos, &c., in which the Spartans were for the most part successful. The Messenian revolt seems to be a turning-point. It was apparently soon after that the rigorous system, later connected with the name of Lycurgus, was set up. The arts had flourished down to the 7th century. From that time they were left to foreigners, and then allowed to die—though not at once, as the fine 5th-century statue discovered on the Acropolis in 1925 shows. Under their stern discipline the Spartans became a race of resolute, rude, and narrow-minded warriors, capable of a momentary self-sacrificing patriotism, as in the story of the 300 heroes who fell at Thermopylæ, but utterly destitute of the capacity for adopting or appreciating a permanently noble and wise policy. The outbreak of the Peloponnesian war (431 B.C.) brought the rivalry between Sparta and Athens to a head, and in the mighty struggle that ensued victory declared on the side of the combatant least capable of maintaining the greatness of Greece. Sparta now attained the hegemony of Greece; but her insolent tyranny in the hour of her triumph excited the indignation of those whom she held in virtual subjugation, and the glorious retaliations of the Thebans under Epaminondas stripped her of all her splendid acquisitions, and reduced the Laconian state to its primitive boundaries. Later the rise of the Macedonian power limited still more the Spartan territory, nor did it ever after attain its earlier dimensions. After a series of vicissitudes Sparta passed into the hands of the Romans, became a portion of the Roman province of Achaia, and finally shared the fortunes of the rest of Greece

(q.v.). The growth of the town of Mithra, 2 miles SW. of Sparta, in the 14th and 15th centuries, led to the total desertion of the more ancient city; but the modern town of *Sparti* (pop. 6700), which was founded by the Greek government in 1836, occupies part of the site of old Sparta, and is again capital of the province of Laconia. The Sanctuary of the Brazen House on the Acropolis, the great theatre just below, and other sites have been excavated by the British School at Athens. See its publications for 1905-10, 1924 *et seq.* The German School has worked at Amyclæ.

Spartacus, leader of the Roman slaves in the great revolt which broke out about 73 B.C., was a Thracian by birth, and from a shepherd had become a leader of a band of robbers when he was captured and sold to a trainer of gladiators at Capua. He formed a conspiracy to escape, and, when it was discovered, broke out with some seventy followers, with whom he made for the crater of Vesuvius, where hordes of runaway slaves soon joined him. He first overpowered and seized the arms of a force sent against him from Capua, next routed an army of 3000 men under C. Clodius, and so passed from victory to victory, overrunning Southern Italy and sacking many of the cities of Campania, his numbers growing to forty, seventy, and even a hundred, thousand men. Great part of Central and Southern Italy had been thrown into pasture-land, on which the flocks belonging to rich absentee nobles were tended by gangs of discontented slaves, who flocked eagerly to the standard of revolt. Spartacus, who failed to get support from the Italian communities, and from the first knew the real weakness of his position, strove to persuade his victorious bands to march northwards to the Alps and disperse to their native regions; but they were intoxicated with victory, and saw glittering before their eyes all the plunder of Italy. Against his better judgment he continued the war, showing himself a consummate captain in the strategy and valour with which he routed one Roman consular army after another, and the policy by which for long he assuaged the jealousies and dissensions amongst his followers. At length in 71 M. Licinius Crassus received the command, and after some time of cautious delay forced Spartacus into the narrow peninsula of Rhegium, from which, however, he burst out through the Roman lines with a portion of his force. Crassus, in despair, urged the senate to recall Lucullus from Asia and Pompey from Spain, but meantime he himself pursued active hostilities against the dreaded enemy. Spartacus finding all hope at an end made a dash on Brundisium, hoping to seize the shipping and get across the Adriatic, but was foiled by the presence of Lucullus, whereupon he fell back upon the river Silarus, and there made a heroic stand against Crassus until he was cut down. In Germany the extreme Communist party, in insurrection in 1919 and 1920, took the name of Spartacists.

Spartanburg, capital of Spartanburg county, South Carolina, 93 miles by rail NNW. of Columbia. It has cotton-mills and other factories, and the Wofford (Methodist; 1853) College. Pop. 23,000.

Spasm (Gr. *spasma*) consists in an irregular and violent contraction of muscular parts—involuntary even when the voluntary muscles are concerned. There are two sorts of spasm. In one there is an unusually prolonged and strong muscular contraction, not rapidly alternating as usual with relaxation, the relaxation only taking place slowly, and after some time. This is known as *tonic spasm* (Gr. *tonos*, 'a bracing up') or *Cramp* (q.v.). When

in a more moderate degree affecting the voluntary muscles generally it constitutes catatonia, in which, from the muscles remaining contracted, the limbs will retain whatsoever attitude they are placed in, until the spasm is over. But the extreme example is Tetanus (q.v.), in which the spasms are so violent and so enduring that they profoundly exhaust the strength of the patient. In the other form of spasm the contractions of the affected muscles take place repeatedly, forcibly, and in quick succession; the relaxations being, of course, equally sudden and frequent. This is named *clonic spasm* (Gr. *klonos*, 'an agitation'), and is popularly known as *convulsions*. The spasmodic twitchings which sometimes occur in the muscles that close the eyelids (orbicularis palpebrarum) are familiar to almost everybody, and are an example of clonic spasm on a very small scale. Epilepsy and convulsive hysteria afford the best examples of this kind of spasm. Chorea (q.v.), or *St Vitus's dance*, is an allied but less regular and characteristic form.

The treatment varies according to the cause of the excessive muscular irritability. Firm pressure on muscles affected with spasm will promote their relaxation, and by strong steady pressure on the masseter muscles the lower jaw has been depressed, so as to open the mouth, in cases of lock-jaw. The medicines which are employed to counteract irregular or inordinate muscular action are termed *antispasmodics*; but spasm may depend upon so many different causes that the remedies which are found most successful in combating it must vary extremely in their nature. There are, however, a few medicines which appear to exercise a control over spasmodic action generally. These may be termed *pure* or *true* antispasmodics. They are various volatile oils, Asa-fetida, Musk, and Valerian, and the Nitrites and Bromides. Amongst the narcotics often useful in these affections we may especially mention Belladonna, Cannabis Indica (or Indian hemp), Chloral, Opium, and Stramonium. Sulphuric ether in draught or inhaled, and inhaled chloroform, are often of service. In some cases, remedies which directly depress the vital powers, such as the prolonged use of the warm bath, or even, in rare cases, the abstraction of blood, are the most effectual means of subduing spasm.

Spasmodic School, a name applied to a group of English poets about the middle of the 19th century, among whom were Philip James Bailey, Sydney Dobell, and Alexander Smith. The name implied an overstrained and unnatural method of sentiment and expression, which sometimes grew out of sheer affectation and not seldom sank hopelessly into bathos. Professor Aytoun's *Firmilian* (1854) was an excellent burlesque of the high-strung and grandiose style of these poets who took themselves much too seriously, and were for a moment also taken at their own valuation by the world.

Spathe (*Spatha*), in Botany, a sheathing bract which encloses one or more flowers, as in the Narcissus. Very frequently the flowers within a spathe are arranged upon a *spadix*, which is a succulent spike, with numerous flowers, and of which a familiar example may be seen in *Arum maculatum*. The spadix is a characteristic feature of the Palms, and in them is compound or branching, and in general is provided not only with a common spathe, but with secondary spathes at its divisions.

Spathic Iron Ore. See CHALYBITE.

Spavin. This term, when used without an adjective, indicates disease of the small bones of the hock, and its presence in any horse is regarded

as an unsoundness. It used to be comparatively common and was considered a very serious defect, so that to call a roadster a 'spavined nag' was about as bad a character as could be given. Fortunately, like many other hereditary ailments, it is not nearly so common as it was. It may occur in any form of hock, but short small hocks tied in below are very liable to it. A large broad flat hock is best. Allowing the hoofs to grow long at the toes and using shoes with high toe-pieces are undoubtedly causes. The lameness may arise suddenly, but as a rule it is gradual in its appearance. It is most evident when the horse is coming out of the stable in the morning: he inclines to walk on his toe, but it tends to diminish on exercise. It is often very obvious in moving him across the stall—away from the lame leg. Frequently there is nothing local at first to indicate the seat of the lameness, but it usually results in an enlargement—the spavin—over the antero-internal aspect of the lower part of the hock, which can be seen and felt. If taken early in a young horse the removal of the shoe, trimming the hoof and shortening it round the toe, the application of a good smart blister and three months at grass will sometimes arrest the mischief. But firing is often necessary, and is most effectual. In a horse past middle life a complete cure is seldom obtained, but an animal slightly lame from chronic spavin can often be utilised on the land when unfit to work on the road or street.

Speaker. See PARLIAMENT.

Speaking-trumpet, an instrument for enabling the sound of the human voice to be conveyed to a greater distance. It is of the utmost use on shipboard in enabling the officers to convey orders during windy weather from one part of the deck to another, or to the rigging. The invention is ascribed to Sir Samuel Morland, in 1670, though Athanasius Kircher laid claim to it. Morland's trumpet was of the same form as that now in use—viz. a truncated cone, with an outward curve or lip at the opening. The theory of the action of this instrument is much the same as that of the sounding-board of a musical instrument, but the sounding-board is aerial instead of solid. The air immediately in front of the instrument is acted upon over so wide a surface that it cannot effectively evade compression and rarefaction by any process of overflow and inflow towards the sides, and the result is as if the air were well laid hold of and firmly set in vibration.

Spear, a weapon of offence, consisting of a wooden shaft or pole varying in length up to 8 or 9 feet, and provided with a sharp piercing point. The spear may be regarded as the prototype of the various forms of piercing weapons, such as the arrow, bolt, and dart, which are projected from bows, catapults, or other engines, and the javelin, assegai, and lance, held in or thrown by the hand. The longer and heavier spears and lances are mainly retained in the hand while in use, but there is no absolute distinction, and the throwing of a spear has in all ages been a form of offensive warfare. In its earliest form the spear would naturally consist of a simple pole of tough wood sharpened to a point at one extremity, which point might be both formed and hardened by charring in fire. From this an improvement would consist in fitting to the shaft a separate spear-head of bone, as is still practised amongst primitive races. No trace of these early spears remains to us, but of the more developed forms having heads of chipped flint or other hard stones examples are plentiful, and most ingenious methods of fixing such heads are yet practised. To flint-heads succeeded heads of bronze (see BRONZE AGE), but these came

only late in the bronze period, and were still in use when the Homeric poems were composed. The bronze spear-heads found in Great Britain and in northern Europe generally were cast with sockets, into which the end of the shaft was inserted, but on the eastern Mediterranean coasts tanged spear-heads were used. These spear-heads were various in form and size, some being three-edged like the old bayonet, others with expanded leaf-shaped blades, some barbed, and some having loopholes either in socket or blade by which they were lashed to the shaft. The war-lance of the mediæval knights was 16 feet long; the weapon of modern cavalry regiments known as lancers may be from 8½ to 11 feet long, usually adorned with a small flag near the head. The Persians at the present day forge spear-heads, for ornamental purposes only, with two and sometimes three prongs. The modern spears of savage tribes, used equally for hunting and for warlike purposes, are frequently barbed with fish and other bones, and their fighting-spears have sometimes poisoned tips. Among the South Sea Islanders a fishing-spear having several slender barbed points is an important weapon. Among civilised communities the hunting-spear continues to be used for following the wild boar and other large game. See also PIKE, HALBERT, TRIDENT.

Spearmint. See MINT.

Spearwort. See RANUNCULUS.

Special License. See MARRIAGE.

Specialty Debt. See DEBT.

Species. This is a term which it is very difficult to define with precision. The word itself means a look, an appearance, a kind; and in common usage things that look the same are said to be of the same species. With more definiteness naturalists speak of a mineral species, and of a species of plants or animals. It is with this last usage that we are here concerned.

In classifying plants or animals we form conceptions of various degrees of comprehensiveness (see BIOLOGY), and for these we use a series of terms, such as class, order, family, genus, species, variety. The need for precision is that every one may know exactly what is meant when any individual or group of individuals is named. In the ordinary system of classification a species is a group of individuals which closely resemble one another, and the species is usually subordinated to a genus—a wider group of similar, but less closely similar, forms—and is superior to a variety, of which there may be several in a species. Thus we group the lions as a species (*Felis leo*) of the genus *Felis*, in the family *Felidæ*, order *Carnivora*, class *Mammalia*, and call the tigers, leopards, cats, and the like other species of the same genus *Felis*. As no one could confuse lion, tiger, and leopard, for the peculiarities of each are well marked, it may be wondered what difficulty there is in defining species.

Let us consider the matter practically. We observe our fellow-men; we see that they differ in many ways from one another, in stature, in features, in complexion, in colour of eyes and hair, and so on; but we do not think of speaking of a red-haired or a blue-eyed species of man. We should as soon think of saying that the red-haired or blue-eyed child in a family was of a different species from its brothers and sisters or from its parents, which would be absurd. We must agree with the systematist when he says that the term species should not be given to a group of individuals which are distinguished from other groups by no greater differences than distinguish members of a family, and when he says that the characters of a species must have some constancy from genera-

tion to generation, which is not of course the case with red hair or blue eyes. This is a common-sense way of limiting the term, but it leaves many difficulties untouched. It is not readily applied to extinct species, of whose generations and individual variations we cannot know much; nor has it been applied to a vast number of forms recorded as species sometimes on the strength of single specimens, and often without any knowledge of their generations.

If we turn to the systematic treatises which classify plants and animals, and compare half a dozen of them, we find ample evidence of the elasticity of the conception of species. *Quot homines tot sententiae*. Thus, as Haeckel notices, one botanist enumerates 300 German species of the common Composite, Hieracium; another reduces them to 106, another to 52, another to about a score! Bechstein said that there were 367 species of birds in Germany, but according to Reichenbach there are 379, according to Meyer and Wolf 406, according to Pastor Brehm 900! But Haeckel himself supplies the best example, for in his important monograph on Calcareous Sponges he admits that as the naturalist likes to look at the problem there are 3 species, or 21, or 239, or 591! We are told that species are groups of individuals agreeing in essential characters which remain constant from generation to generation. But what are essential characters? and how much constancy is demonstrable?

The peculiarities on account of which a specific name is given to a group of individuals should not be of relatively trivial amount like the peculiarities which distinguish the brothers in a family; they should also show a fair amount of constancy from generation to generation; but there is another criterion of great importance. If two different forms when intercrossed have completely fertile offspring, it is unlikely that they were worthy of being distinguished as distinct species. For although there are cases of species—e.g. ducks—crossing and having fertile offspring, the general fact is interspecific sterility. This is in strong contrast to what holds true of most varieties, which may be crossed without diminution of fertility. It is a remarkable fact, showing how far biology still is from understanding the significance of species, that 'nothing readily comparable with the power to produce a sterile hybrid on crossing with a near ally, has yet been observed spontaneously arising, though that characteristic of specificity is one of the most widely distributed in nature' (Bateson, 1913). It may also be noted that more precise inquiry has demonstrated to an unexpected degree the detailedness and intricacy of specificity. There are minute chemical, histological, and physiological differences between nearly related species. The blood crystals of a dog are different from those of a fox; the wind-pipe cells of two allied forms are different in minutiae; two related species may be distinguished by the number and form of the chromosomes in the nuclei; the blood of one species may react differently from that of a neighbour species. There is extraordinarily subtle corroboration of the old statement: 'All flesh is not the same flesh; but there is one kind of flesh of men, another flesh of beasts, another of fishes, and another of birds.'

History.—In the second half of the 17th century John Ray began to be interested in the significance of species, pointing out, for instance, that varieties which can be produced from the seed of the same plant are to be regarded as belonging to the same species. Linnæus invented the system of specific names (the 'binomial nomenclature'), and although he explicitly said that there were as many species as there were different forms created in the beginning ('species tot sunt diversæ, quot diversas

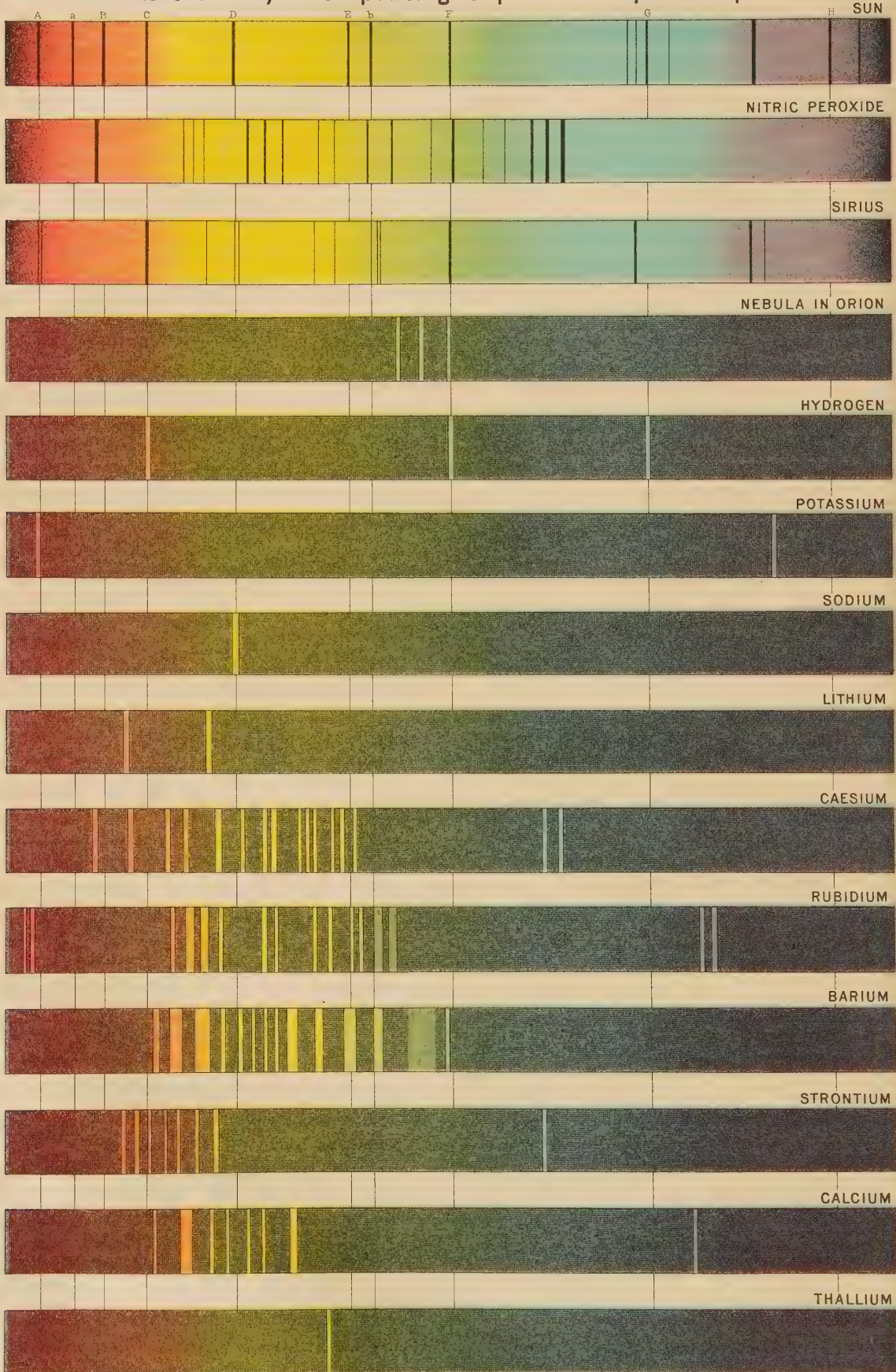
formas ab initio creavit infinitum ens'), he also believed that diversity had arisen by the intermixing of an originally limited number of types, and that the species within a genus may have been one to start with ('ab initio unam constituerunt speciem'). The idea of the fixity of species which was largely taken for granted grew into a dogma (e.g. in Agassiz' *Essay on Classification*, 1859), which Darwinism disallowed, though more in theory than in zoological practice. It was important, however, that in Darwin's day variability was recognised as a fundamental fact of life, and that the problem of the origin of species, still in essence unsolved, came to be regarded as open to scientific investigation and experiment. The limitations of the general Darwinian view were (1) that species were regarded as merely impermanent groups, each of which possessed a congeries of adaptive characters fitted to particular conditions of life (whereas we know of many specific characters which have not been shown to be of the nature of adaptations); and (2) that species were supposed to arise from other species by the transformation of large numbers by very gradual steps under the influence of natural selection (a theory which must be modified in the light of what is now known in regard to the frequent occurrence of discontinuous variations or mutations). From the dogma of the fixity of species the pendulum swung to an equally extreme view of their fluidity and of their linkage by intermediate gradations to other species. In the 20th century investigation has turned again to the stability and discontinuity of species, the general fact of interspecific sterility, and the non-utilitarian character of many specific characters.

See BIOLOGY, BOTANY, DARWINIAN THEORY, EVOLUTION, GENUS, HEREDITY, VARIATION, ZOOLOGY. See also Darwin, *Origin of Species* (1859); Haeckel, *Generelle Morphologie* (1866) and *Natural History of Creation* (1879); Spencer, *Principles of Biology* (1864-66); Wallace, *Darwinism* (1889); De Vries, *Species and Varieties* (1905); Bateson, *Materials for the Study of Variation* (1894); and *Problems of Genetics* (1913).—The species of Logic is originally suggested by Natural Species, and may be defined as a group of individuals agreeing in some common character and known by a common name; two or more species constituting a genus. The relation of species to the other logical elements of classification are treated at PREDICABLES and GENERALISATION. The great controversies as to the real existence of species and other universals are sketched at NOMINALISM.

Specific Density, the mass of any given substance contained in unit volume. On the centimetre-gramme-second system of physical units, since a cubic centimetre of water at standard temperature and pressure weighs 1 gramme, the density of water = 1, and water is the standard of density; and the specific density of a body is the number of grammes' mass per cubic centimetre. Since, according to the law of gravity, weights are proportional to masses, it is convenient to ascertain specific densities by ascertaining the specific gravities of the substances tested. For example, an English gallon of water weighs at standard temperature and pressure (62° F. and barometer 30 inches) 10 lb. avoirdupois; a gallon of ether weighs 7·2 lb.; the specific density of ether is therefore $7·2 \div 10 = 0·72$. Similarly, a gallon of strong sulphuric acid weighs 18·4 lb., and the specific density of sulphuric acid is 1·84. The specific densities of solids may be determined by the hydrostatic balance (see ARCHIMEDES, PRINCIPLE OF), which gives the weight of a quantity of water equal to that of the solid; or by using a 'specific gravity flask.' This is a flask marked distinctively at a certain level; the solid is put into this; the flask is filled with water up to the

TABLE OF SPECTRA

Showing the character of light obtained from various sources
as shown by a low-power glass-prism and spectroscope



mark, and weighed; the whole is then emptied and filled with water alone up to the mark, and again weighed. The two weighings give the data for ascertaining the ratio between the weight of the solid and that of an equal bulk of water. If the solid is acted upon by water, some other liquid of known specific density must be employed, and the calculation varied accordingly. If it be lighter than water, it is coupled with a piece of heavy substance whose weight and specific density are separately known, and the aggregate apparent loss of weight incurred by the combination on being immersed in liquid is found by the hydrostatic balance. Of this aggregate so much is due to the heavy substance and the remainder to the light solid. This gives data for calculating the specific density of the light solid. The specific density of a liquid is ascertained by simply comparing the weights of quantities of that liquid and of water successively made to fill the specific gravity flask up to the same marked level; or by comparing the apparent losses of weight incurred by a solid on being immersed in water and in the liquid respectively; or by the use of hydrometers or areometers. The areometer (*aráios*, 'thin,' and *metreō*, 'I measure'; Fr. *aréomètre* or *pèse-liqueur*; Ger. *Aräometer* or *Senkwage*) or hydrometer is a graduated instrument which floats in a liquid, without being wholly submerged, under the equilibrium of the weight of the whole body acting downwards, and the buoyancy of the liquid, equal to the weight of the part of the liquid displaced, and acting upwards. The specific density of a uniform cylinder, say of ice, floating vertically in water is the volume immersed ÷ the whole volume; and in liquids of different specific densities such cylinders would sink to different depths. But it is more convenient to use graduated hollow glass instruments weighted with mercury at one end to make them float vertically (see fig. 1). AB is graduated; C is a large bulb; D is a small bulb containing mercury, the quantity of which is so adjusted that the instrument sinks in water, say to the point W. If the liquid be heavier than water the instrument will not sink so far; the position of equilibrium in which the weight of the whole instrument is equal to the weight of the liquid displaced will be sooner reached; and, conversely, if the liquid be lighter than water the instrument will sink farther. Each instrument must be experimentally graduated by placing it in liquids of known specific densities. By varying the adjustment of the mercury a series of instruments may be made, serviceable in ascertaining the specific densities of liquids within particular ranges of density—e.g. instruments for sulphuric acid, milk, alcohol, &c. The delicacy of such an instrument depends on the bulb C being large and the stem AB thin. The chief modes of graduation are (1) Gay-Lussac's areometer or volumometer. In water the instrument



Fig. 1. stands at 100°. All the degrees are equal, and each = $\frac{1}{100}$ the volume of that part of the instrument which is immersed when it floats in water. If n be the numerical reading when the instrument is floated in a given liquid, the specific density of that liquid is $100 \div n$ —e.g. if the instrument stand at 80°, the specific density = $100/80 = 1.25$. (2) Baumé, for liquids heavier than water. Water at 17.5° C. = 0°; an aqueous solution containing 10 per cent. by weight of common salt (NaCl) at 17.5° C. = 10°; the scale is uniformly graduated; specific density = $146.8 \div (146.8 - n)$. (3) Baumé, for liquids lighter than water; 10 per cent. by weight salt-solution at 12.5° C. = 0°; water at 12.5° C. = 10°; specific density = $146 \div (136 +$

n). (4) 'Rational' Baumé, for liquids heavier than water; water at 15° C. = 0°; sulphuric acid, specific density = 1.842 = 66°; specific density = $144.3 \div (144.3 - n)$. (5) Cartier, resembles Baumé; for liquids lighter than water, 21° Cartier = 21° Baumé; otherwise 15 Cartier degrees = 16 Baumé degrees; specific density = $136.8 \div (126.1 \mp n)$. (6) Beck; pure water = 0°; specific density, 0.850 = -30°; uniform graduation; specific density = $170 \div (170 \mp n)$. (7) Twaddell, most used in England; water = 0°; graduation not uniform, but readings direct; specific density = $(1000 + 5n) \div 1000$ —e.g. a gallon of acid of 24° Twaddell weighs 10 lb. $\times \frac{1000 + 120}{1000} = 10 \text{ lb.} \times 1.12 = 11.2 \text{ lb.}$ (8) Tralles,

an alcoholometer scale used on the Continent, adjusted so as to show directly the volume-percentage of alcohol in alcohol and water. (9) Sikes, used in the British Customs and Excise; graduated so as to show how many volumes of water must be added to or taken from 100 volumes of the mixture under examination to reduce it to proof-spirit (a mixture whose density = $\frac{1}{2}$ that of water at 51° F.—i.e. 57.09° Tralles), the instrument being adjustable to different ranges of density by a set of movable weights. Instead of making the quantity of liquid displaced to vary, as in the above instruments, the displacement may be kept constant and the weight of the instrument varied. Fig. 2 shows Nicholson's areometer—a hollow brass case, BC; cups at A and D; a weight at E. Suppose it weighs 2000 grains; and let it sink in water to a certain mark between B and A when 500 grains weight is put in A. If it be now transferred to another liquid in which only 250 grains are required to make it sink to the same mark, the second liquid is lighter than water in the ratio of 2250, the whole weight of the apparatus, to 2500, its former whole weight; and its specific density is therefore $\frac{2250}{2500} = 0.9$. The same instrument may be used to find the specific density of small solids thus: put a little stone or gem in A; to make the apparatus sink to the mark say 440 grains are required; therefore the stone weighs 60 grains. Now put it in D. More weights, say 20 grains, must now be put in A; the 20 grains represent the apparent loss of weight in water; the specific density = weight in air ÷ apparent loss in water = $60/20 = 3$. By reversing D, which is perforated, the specific density of bodies lighter than water may be ascertained. Fahrenheit's areometer, the original form, differs from Nicholson's in having no platform or cup D. Rousseau's densimeter combines the two methods described above. It bears a cup or cavity at its summit. This is filled successively with various liquids; each induces a different amount of sinking. The instrument-maker has to do the preliminary graduation by the use of known liquids. Specific-gravity bulbs are also used; they are marked with numbers representing specific densities. Those which are too heavy sink; those which are too light float; the one exactly corresponding to the density of the liquid, if there be one, neither rises nor sinks. The most accurate method is that by the specific gravity flask. The specific density of a gas or vapour is determined (1) by weighing a copper flask when empty, when filled with the gas, and when filled with air, which method gives the density of the gas relatively to that of air, when proper corrections are made so as to compare the two gases at the same temperature and pressure; (2) by ascertaining the volume occupied by a given weight of the gas or vapour at a



Fig. 2.

known temperature and pressure; (3) by measuring the weight of vapour which can occupy a known volume, this being effected by putting liquid into a vessel of known capacity and heating until there is, at a known temperature and the atmospheric pressure, nothing but vapour in the vessel, then closing and weighing when cool. The last two methods are specially applicable to vapours rather than to permanent gases. It is often convenient, instead of taking the true specific density of a gas or vapour—e.g. that of air, the number of grammes per cubic centimetre of which is 0.0012932—to state its density as compared with air or hydrogen as a standard. In this way air is said to have a density = 1 or = 14.47, according as air or hydrogen is taken as the standard. The use of hydrogen as a standard is of special convenience in chemical calculations, for the densities of gases or vapours so measured are, as a rule, proportional to their molecular weights. The following are the specific densities of some common substances:

Air.....	0.0012932
Alcohol.....	0.80
Aluminium.....	2.56 to 2.67
Amber.....	1.08
Ammonia gas (= 0.589 × air).....	0.000762
Ammonia solution.....	0.88
Amorphous arsenic.....	4.71
Anthracite.....	1.4 to 1.7
Antimony.....	6.715
Arsenic crystals.....	5.73
Ash.....	0.84
Bismuth.....	9.9
Blood.....	1.04
Bone.....	1.6 to 2.0
Brown coal.....	1.2 to 1.4
Butter.....	0.94
Calcium.....	1.578
Cannel coal.....	1.16 to 1.27
Carbonic acid gas (= 1.524 × air).....	0.00197
Cast-iron.....	7 to 7.6
Chalk.....	2.45
Charcoal.....	0.3 to 0.5
Chlorine (2.4502 × air).....	0.00317
Clay.....	1.8 to 2.6
Cobalt.....	8.95
Copper.....	8.85 to 8.94
Cork.....	0.24
Cyanogen (1.806 × air).....	0.00234
Diamond.....	3.53 to 3.55
Dry peat.....	0.5
Eln.....	0.67
Flint.....	2.6 to 2.7
Glass.....	2.4 to 3.5
Gold.....	19.26 to 19.55
Granite.....	2.5 to 2.9
Honey.....	1.45
Human body alive.....	0.89
Hydriodic acid (= 4.44 times that of air or 64.11 times that of hydrogen)	0.00574

Hydrochloric acid gas (= 1.26 × air).....	0.00163
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Hydrochloric acid solu- tion at 32° F.....	0.908
Hydrocyanic acid gas (= 0.9476 × air).....	0.001225
Hydrogen (= 0.06926 × air).....	0.00008958
Ice.....	0.91674
Iridium.....	22.42
Ivory.....	1.8 to 1.9
Lead.....	11.37
Lignum-vita.....	1.33
Limestone.....	2.6 to 2.8
Liquefied oxygen.....	1.124
Lithium.....	0.5936
Loadstone.....	4.9 to 5.2
Manganese.....	7.2
Marble.....	2.5 to 2.8
Mercury.....	13.59
Milk.....	1.03
Nitric acid.....	1.517
Nitrogen (0.9713 × air).....	0.00126
Oak, English.....	0.97
Oil of cloves.....	1.03
Oil of turpentine.....	0.87
Oleasant gas (= 0.9784 × air).....	0.001265
Oxygen (= 1.1056 × air).....	0.00143
Platinum.....	21.1 to 21.7
Poplar.....	0.38
Potassium.....	0.86
Ruby.....	4.3
Sand in bulk, dry, about.....	1.5
" " wet.....	1.9 to 2.0
Silver.....	10.53
Sodium.....	0.972
Spanish mahogany.....	1.06
Steel.....	7.6 to 7.8
Sulphuric acid.....	1.854
Sulphuric ether.....	0.72
Sulphurous acid gas (= 2.24 × air).....	0.0029
Tin.....	7.29
Topaz.....	3.4 to 3.6
Wrought-iron.....	7.25 to 7.79
Zinc.....	6.86 to 7.21

Specific Gravity, the weight of any given substance as compared with the weight of an equal bulk or volume of water or other standard substance at the same temperature and pressure. See SPECIFIC DENSITY.

Spectacles, for the purpose of aiding the sight when impaired by age or otherwise (see EYE), are commonly said to have been invented during the 13th century. The merit is variously attributed to Alessandro di Spina, a monk who died at Pisa in 1313, and to Salvino degli Amati, who died at Florence in 1317; but spectacles seem to be referred to by the Arab writer Alhazen (11th century) and by Roger Bacon (c. 1214-94). In 1482 there were spectacle-makers at Nürnberg. At first spectacles were exceedingly clumsy, both in the lenses themselves and also in their frames; and very little improvement took place in them until the beginning of the 19th century, when light metal frames were introduced instead of the cumbersome horn mountings.

Until comparatively recently the progress made in regard to the production of ophthalmic lenses was wholly restricted to mechanical perfection, to external finish, and to careful selection of the finished product. Scientific progress, on the other hand, in regard to the construction of lenses, to their curvature and to their usefulness from a sight-correcting point of view, was entirely neglected, so that for almost a hundred years ophthalmic lenses were ground to the same general principles. This is all the more remarkable, as during this very period far-reaching inventions of much more complicated optical systems—microscopes, telescopes, prism field-glasses, range-finders, &c.—were made. But only in the beginning of this century were new ideas advanced upon the construction of ophthalmic lenses, which are admitted to be vastly superior to those previously employed. Deep-curved or toric lenses, both for spherical and astigmatic corrections, greatly widen the field of vision. This obviously is a great advantage, not only for general wear, but in those occupations such as accountancy, typing, drawing, and the many other spheres of work where the eyes have to keep moving about in various directions.

Continental firms took a foremost part in the introduction of perfectly homogeneous clear optical glass, and thus secured a large volume of the trade, but when the Great War broke out all such supplies were cut off. The United States at once seized the opportunity of filling the market and introducing its specialities in lenses and frames, many of which have retained their popularity. The British government, realising the absolute necessity of maintaining the production of optical instruments at least equal to those of the enemy, subsidised firms in Britain to manufacture optical glass under the best scientists and investigators, such as Sir William Crookes, with such success that Britain became entirely independent of foreign competition. Non-actinic glass, which, while allowing all the illuminating rays of the spectrum to pass to the eye, cuts off the injurious infra-red and ultra-violet, is in general use for users in bright light.

There are at present in vogue a large variety of spectacle and eyeglass mountings—rustless steel, dainty rimless, solid gold, beautiful tortoise-shell, rolled gold, and imitations in the various patterns—a preference being given to large lenses, round or oval.

Much more attention is now paid to the correction of defective sight. School children are examined by medical specialists. Opticians have undergone an exhaustive training and qualified themselves to undertake refraction corrective work as distinct from the treatment of disease. See EYE.

Spectrum. As explained under the article COLOUR, light emanating from any ordinary source is rarely if ever homogeneous. It is composed of rays of different wave-lengths, each of which if viewed singly would appear to have an appropriate colour. The general colour-sensation produced by such a heterogeneous ray can teach us very little concerning its composition. Not until we have formed its spectrum by appropriate means are we able to analyse it. A spectrum is in fact an image in which the component parts of a given ray of light are separated from one another so that each may be viewed singly.

Newton was the first who scientifically produced and studied the spectrum of sunlight. This he did by interposing a glass prism in the path of a ray which was allowed to enter a dark room through a small hole in the shutter. The arrangement is shown diagrammatically in fig. 1. Here the rays are bent out of their original course, SA, as they pass through the prism P; and on the screen, H, the

spectrum of colours is formed instead of the image A. Newton regarded the spectrum as being divisible into seven differently coloured spaces, which he called in order red, orange, yellow, green, blue, indigo, and violet. It is impossible, however, to settle precisely the exact boundary between any two of these fancied species of colour, which pass by insensible gradations one into another. As Newton clearly demonstrated, the spectrum is produced because the differently coloured constituents of sunlight have different refrangibilities, the red being refracted least of all and the violet greatest of all (see REFRACTION). If light of a particular refrangibility were absent or of less intensity than the other constituents gaps would appear in the spectrum. As a matter of fact such gaps do exist in the solar spectrum, and were first observed by Wollaston in 1802. In 1817 Fraunhofer, with much more perfect optical apparatus, measured the relative positions of a great number of these *dark lines*, and named the more important of them by the early letters of the alphabet. These are shown in

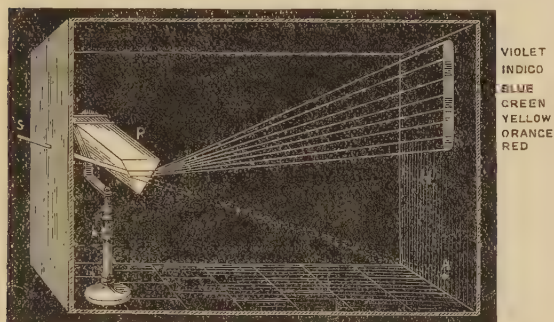


Fig. 1.

the first spectrum in the table of spectra. They are the standard lines with which it is usual to compare the lines characteristic of other spectra.

For the careful observation of these lines the spectroscope or spectrometer has been constructed. It consists essentially of a prism or train of prisms, P; a collimator, C, at the focus of whose lens, L, is placed a narrow slit, S, parallel to the edge of the prism; and a telescope, T, for producing a magnified image of the spectrum of the illuminated slit. Nearly all transparent refractory substances give similar spectra, although the dark lines may be somewhat differently spaced in the different cases. This arises from the fact that substances vary in

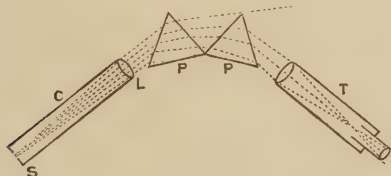


Fig. 2.

their dispersive as well as in their refractive powers (see DISPERSION). The optical value of the spectroscope is that it gives us the means of accurately determining the refractive indices of different substances for rays of definite wave-lengths. Now, although refrangibility depends on wave-length, being in general greater for the shorter wave, it does not depend upon it according to any simple or common law. Hence in prismatic spectra the characteristic lines are not spaced in accordance with any simple relation to the wave-lengths of the corresponding rays. If, however, we substitute for the

prismatic part of the spectroscope a diffraction-grating, we obtain a spectrum in which the rays are spaced according to a law of extreme simplicity.

A diffraction-grating is formed by ruling a series of fine lines on a glass or metal surface. For the production of a good spectrum it is necessary that the lines should be equidistant and so close that several thousands go to an inch. If the image of an illuminated slit be viewed by a telescope through or after reflection from such a grating, a remarkable appearance is presented. A central luminous line is seen, just as if no grating existed, and for some distance on either side the field is dark. But soon on both sides spectra appear, with their blue ends nearest the central line. Still farther to left and right secondary spectra appear, their blue ends overlapping the red ends of the primary spectra. These are followed by a third but fainter set, and so on. These successive spectra are due to the Interference (q.v.) of the rays emanating from the discontinuous wave-front which has been made so discontinuous at the grating. The absolute position and breadth of the spectra depend on the closeness of the lines of the grating; but the relative positions of the coloured rays in any spectrum depend only on the wave-lengths. Thus in the solar spectrum produced by a diffraction-grating Fraunhofer's lines are so distributed that their distances from the central luminous line above mentioned are proportional to the wave-lengths of the corresponding rays of light. This spectrum is accordingly called the Normal Spectrum. Compared with it, the ordinary prismatic spectrum is much crushed towards the red end and extended towards the violet end. A rough comparison is shown in fig. 3, the principal Fraunhofer lines being given in the two spectra, which are of the same total length.

Professor Rowland, by means of his concave gratings, or gratings marked on a concave cylindrical surface of speculum metal, produced remarkably fine spectra. Because of the slight concavity the grating focuses the spectrum clearly at a particular distance, so that the object-glass of the telescope may be dispensed with.

We have now to consider the significance of the dark lines in the solar spectrum. These gaps may be imagined as originating in two ways. They may be absent in the sunlight from the very beginning, or they may be absorbed by some substance through which the ray passes from the sun to the earth. As Brewster showed long ago, many of the lines are really due to absorption by the earth's atmosphere, and are more marked when the sun is low than when the sun is high. These lines which are certainly due to absorption by the earth's atmosphere are called telluric. Near the Fraunhofer D lines there exists a very remarkable group of lines known as the Rain-band. It is due to water-vapour in the air, and gets very dark as

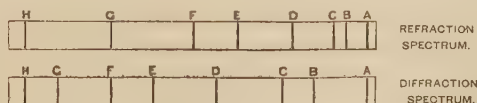


Fig. 3.

the humidity approaches saturation. The principal lines in the solar spectrum are, however, not telluric. Nor can they be explained as due to the absorptive action of the ether, inasmuch as the various spectra of stars, though broadly similar to that of the sun, differ from it and from one another greatly in detail. (Compare, for example, the spectra of Sirius and of the sun in the table.)

In short, solar and stellar spectra are very characteristic in the number and distribution of the lines which cross what is otherwise a continuous spectrum (see STARS). If then these lines are due to absorption, it must be absorption in the atmosphere enveloping each star or sun. That this is the true explanation of the dark lines has been for long regarded as established beyond a doubt.

Previous, however, to the discovery of the principle which lies at the basis of stellar and solar spectroscopy, the great variety of spectra given by different substances had been recognised. Some of these are shown in the accompanying table of spectra; and, as suggested by Talbot and Herschel in 1825, an obvious application of the prism is to the qualitative determination of small quantities of substances in minerals. In the accompanying coloured plate, the characteristic spectra of the vapours of some of the metals taken by themselves may be compared with the very different spectra of the sun, of nitric peroxide, and of Sirius; that of the nebula in Orion almost rivals in simplicity the visible spectrum of sodium vapour. The case of Thallium (q.v.) is of peculiar historic interest, since it was the observation of its very characteristic line spectrum which led to its discovery. Of even greater interest historically is the spectrum of sodium, which may be observed by burning common salt in a spirit-flame. Fraunhofer observed that the two bright yellow lines so characteristic of the sodium spectrum coincided in position with the double line known as D in the solar spectrum. A very careful test of this coincidence was made by Professor Miller, following upon which Stokes (in 1850) gave for the first time the physical explanation of the phenomenon—viz. that the Fraunhofer double D is produced by the absorptive action of sodium vapour in the sun's atmosphere. Foucault (in 1849) had already obtained an evident darkening of the D lines when the ray of sunlight was passed through the electric arc, which gave in its spectrum the bright sodium lines; but he failed to grasp the significance of the experiment. Ten years later Kirchhoff made a similar experiment, and to him we owe the complete statement of the principle on which spectrum-analysis is based. (For the important work of Balfour Stewart in this connection, see HEAT.) The principle is defined by Kirchhoff thus: the ratio of the emissive and absorptive powers for any given radiation is the same for all bodies at the same temperature. If we imagine the existence of an ideal *black body* which is at once a perfect absorber and a perfect radiator, we may, following Tait in his development of Stewart, express the principle in this wise: for any given temperature the emissivity of a radiating body is equal to its absorptivity. Here emissivity is the emissive power of the chosen body compared with that of the ideal black body; and similarly absorptivity is the ratio of the absorptive powers of the chosen body and the black body for the same radiation at the same temperature. Suppose we have a body A exposed to radiation r from a body B. If A were black the whole radiation would be absorbed. As it is, however, the body A will absorb only er , where e is the emissivity. Again, if R is the measure of the radiation which a black body at the temperature of A would radiate, eR will measure the radiation of A. Hence the amount of radiation which reaches us from A, and through A from B, will be $eR + (r - er) = r - e(r - R)$. Hence there will be a real resultant absorption by A as the rays from B pass through it if, and only if, r is greater than R —i.e. in accordance with experience, if B is at a higher temperature than A. The ultimate basis of the argument is the Second Law of Thermodynamics (q.v.); and it should be noted that

the principle fails to apply to cases of phosphorescence or fluorescence. Thus we conclude that the Fraunhofer lines in the solar spectrum are due to the absorptive action of the comparatively cool atmosphere of the sun upon the radiation which comes from the hotter interior parts. At the instant of a total eclipse of the sun, when the hot interior is screened off, the spectrum of the cooler but still self-luminous envelope is seen to consist of several bright lines. With the exception of one peculiar line in the yellow, these are all coincident in position with certain of the dark Fraunhofer lines. The most conspicuous of the lines that so become reversed are the four hydrogen lines. The δ line due to magnesium, the double D, and some of the iron lines have also been observed reversed at the instant of totality.

The identification of the dark lines in solar and stellar spectra with the bright lines in the spectra of the various elementary substances raised to a high enough temperature is one of the most important labours of the spectroscopist. A list of the elements which have been proved to exist in the solar atmosphere will be found in the article SUN. In fig. 4 a small portion of the sun's spectrum near the δ line is given, showing the identification of certain constituents of the sun's atmosphere with iron, magnesium, nickel, and calcium.

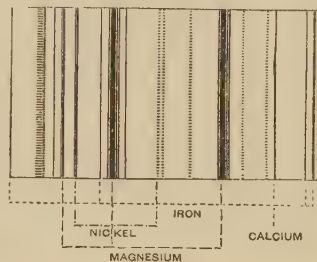


Fig. 4.

The character of the spectrum of a given substance changes with temperature and pressure. For example, although hydrogen, like all gases, gives at ordinary pressures a bright line spectrum with sharp thin lines, these lines become broader and broader as the pressure is increased, until at very high pressures the spectrum becomes almost continuous like that given by a glowing white hot solid. Thus we learn that a highly compressed gas at a high temperature ceases to give the discontinuous bright line spectrum so characteristic of it at low pressures. One tolerably safe conclusion to draw is that stars which all have continuous spectra crossed by dark absorption lines or bands consist of a highly condensed nucleus; whereas true nebulae, which show bright line spectra (see the table of spectra), are luminous because of the presence of glowing gas in a comparatively attenuated condition. In the case of Comets (q.v.) the spectrum is faintly continuous with bright lines crossing it—a mingling of solar reflected light with the proper gaseous spectrum of the comet itself. The planets give in like manner the spectrum of sunlight modified more or less by the absorptive character of their atmospheres.

If a ray of sunlight, or a ray from the electric or lime light, is passed through various liquids, very characteristic absorption bands are obtained across the otherwise continuous spectrum. For example, arterial and venous bloods give absorption spectra, which are readily distinguishable one from the other. The second spectrum in the plate is an absorption spectrum produced by passing the electric ray through peroxide of nitrogen. It shows the banded characteristics of such spectra.

A very remarkable application of spectrum-analysis is to the measurement of the rate of approach or recession of any heavenly body. If we are approaching a star the waves of light will

meet us at a somewhat quicker rate than if we were relatively steady with regard to it. That is, the waves of light will appear to be shorter—hence all the lines in the spectrum will be displaced towards the violet end. On the other hand, if we are receding from the star, the spectrum lines will appear to be shifted towards the red end. For example, in the spectrum of Sirius, the F line is very slightly shifted towards the red by an amount which is measurable in a fine spectroscope. The interpretation is that Sirius is receding from the solar system with a velocity of about 20 miles per second. Arcturus, on the other hand, is approaching our system with a speed of 55 miles per second. Similar displacements of lines are observed in the spectra of certain sun-spots, which are thereby proved to consist of downrushes of gas.

Throughout this article we have confined our attention to the *visible* part of solar spectrum. But this extends much further than is apparent to the eye. Below the red are the dark heat rays, whose presence or absence can be demonstrated by the appropriate means. Professor Langley has specially studied this region with the aid of rock-salt prisms and the Bolometer (q.v.), and has carefully measured the positions of the absorption bands. Captain Abney has, by use of a special preparation of bromide of silver, obtained photographs of the infra-red end of the spectrum, and has identified some of the absorption lines with lines in the spectra of metals of low melting points, such as sodium and calcium. Metals which volatilise at high temperatures do not seem to give lines below the red. Above the visible violet again are the invisible actinic rays. This upper part of the spectrum can be made visible by allowing it to fall upon some suitable fluorescent substance, such as uranium glass or a solution of sulphate of quinine. Photography, however, supplies us with a perfect method for obtaining visible images of the actinic spectrum. Indeed, by properly choosing the sensitive substance, we can now photograph any part of the spectrum from a radiation of nearly four times the wave-length of the red rays up to the highest actinic rays known to exist; and in the extended solar spectrum so obtained we find the same characteristics throughout—a continuous spectrum crossed by dark lines.

Of recent years great progress has been made in investigation of the optical spectrum (including the invisible neighbouring infra-red and ultra-violet), with the aid of diffraction gratings and optical appliances of high resolving power. It was known that in addition to bright lines there were in many instances bright bands which, as the density of the gas increased, broadened and seemed to merge in one another, producing a quasi-continuous spectrum, generally of a channelled or fluted appearance. Now these bright bands have been resolved into multitudes of bright lines crowding up to a limiting line or head, and reason has been shown for believing that they are due to undissociated molecules. The lines of a line spectrum (which have proved to be much more numerous and often much less simple than those shown in the coloured table of spectra) are due to the atoms themselves; when produced by a Bunsen flame or an electric arc they appear to be associated with removal of one electron from a neutral atom; when produced by the more violent action of an electric spark we have a spark spectrum, containing additional lines and apparently associated with the removal of a second electron. Now on registering and comparing the wave-lengths of the different bright lines in a line spectrum it is found (not without painstaking labour) that the whole system of bright lines can be unravelled into systematic series (generally four in number,

usually overlapping one another and differing from one another in appearance and in their behaviour, e.g., under absorption) of lines. The relations between the wave-lengths in each series and the relations between the different series are found to be expressible by comparatively simple mathematical formulæ; and reasoning upon these formulæ has thrown much light upon the structure of the atom. See Andrade's *Structure of the Atom* (1923).

Invisible spectra have been formed (compare CRYSTALLOGRAPHY, pp. 601-2) by X-ray radiations emitted by different substances. As X-ray radiation is an affair of the atom alone, not of the molecule, and indeed seems to depend only on the inner electrons of the atom, it follows that the X-ray spectrum is much simpler than the optical spectrum; there are no bands, due to molecules; there are usually three series of lines, and these do not overlap one another. The comparative simplicity of the X-ray spectrum renders it of great service in investigating the structure of the atom with the aid of Einstein-theory and Quantum (q.v.) conceptions (see Andrade, *op. cit.*).

See Schellen, *Spectralanalyse* (trans. 1885); Lockyer, *Spectrum Analysis* (2d ed. 1886); Landauer, *Spectrum Analysis* (New York, 1897); Kayser, *Spektroskopie* (1900); Marshall Watts, *Spectrum Analysis* (1904).

Specular Iron. See HAEMATITE.

Speculum Metal, an alloy used for the specula or mirrors of reflecting telescopes. The best is composed of 126 parts of copper and 58.9 of tin. It takes a fine polish and is not easily tarnished unless exposed to damp. Glass with a film of metallic silver deposited upon it is now taking the place of speculum metal for these mirrors. The silvered glass is equally serviceable and less costly. See TELESCOPE.

Spedding, JAMES, was born at Mirehouse, near Bassenthwaite, 26th June 1803, the younger son of a Cumberland squire. From Bury St Edmunds, where he was head of the school, he proceeded in 1827 to Trinity College, Cambridge, of which he became a scholar, and of which too at his death he had long been an honorary fellow. Still, brilliant scholar though he was, his degree was only a second-class in classics and junior optime. From 1835 to 1841 he held a post at the Colonial Office; in 1842 he accompanied Lord Ashburton (q.v.) to America as private secretary; and in 1847 he might, had he chosen, have become Under-secretary of State, with £2000 a year. But he had already devoted himself to the task of his life—'to re-edit Bacon's Works, which did not want any such re-edition, and to vindicate his character, which could not be vindicated.' So writes Edward Fitzgerald, the oldest of Spedding's many brilliant friends—Tennyson and Carlyle were also of the number—and he adds: 'He was the wisest man I have known; not the less so for plenty of the boy in him; a great sense of humour; a Socrates in life and death, which he faced with all serenity so long as consciousness lasted.' That death was in St George's Hospital, on 9th March 1881, Spedding having eight days before been run over by a cab.

His publications were *Works, Life, and Letters of Bacon* (14 vols. 1857-74); *Publishers and Authors* (1867); *Account of the Life and Times of Bacon* (2 vols. 1878); *Reviews and Discussions not relating to Bacon* (1879); *Studies in English History* (1881), in conjunction with J. Gairdner; and *Evenings with a Reviewer* (relating to Bacon, 2 vols. 1881). See the brief Memoir by G. S. Venables prefixed to the last, and also Fitzgerald's *Letters* (1889).

Speech. See ADAM, DEAF AND DUMB, DUMBNESS, LINGUISTICS, PHILOLOGY, PHONETICS, VISIBLE SPEECH, VOICE.

Speed, JOHN, antiquary, was born at Farrington in Cheshire in 1542, worked most of his days at London as a tailor, and died 28th July 1629, being buried in St Giles's, Cripplegate. All his life long he had been acquiring historical learning, and his extraordinary attainments at length gained him the acquaintance of Sir Fulke Greville and others, and hence opened up a door for the publication of the great works through which his name survives. These are *Maps* (54) of *England and Wales* (1608-10; incorporated into *The Theatre of the Empire of Great Britain*, 1611); *The History of Great Britain under the Conquests of the Romans, Saxons, Danes, and Normans* (1611). His theological writings are of no importance.

Speedwell (*Veronica*), a genus of plants of the family Scrophulariaceæ, distinguished by a four-cleft wheel-shaped corolla, with the lower segment narrower, two stamens, and a two-celled capsule. The species are very numerous, annual and perennial herbaceous plants and small shrubs, natives of temperate and cold climates in all parts of the globe. Some of them grow in wet ditches and in marshes, some only on the driest soils. They have generally very beautiful blue, white, or pink flowers. The number of British species is considerable, and few wild-flowers are more beautiful than the Germander Speedwell (*V. Chamædrys*), or the alpine species, *V. alpina* and *V. saxatilis*. A number of species are very generally cultivated in flower-gardens. The bitter and astringent leaves of the Common Speedwell (*V. officinalis*), one of the most abundant British species, found also in almost all the northern parts of the world, are in some countries used as a tonic, sudorific, diuretic, and expectorant



Common Speedwell
(*Veronica officinalis*).

medicine. They are also employed as a substitute for tea, as are those of the Germander Speedwell. *V. virginica* is called *Culver's Physic* in North America; it is said to be actively diuretic, and a decoction of the fresh root is violently cathartic and emetic. Brooklime (*V. Beccabunga*), superficially resembling watercress, is abundant in ditches, watercourses, and wet places in Britain, and common throughout the palaearctic region. Several of the shrubby species of *Veronica* of peculiar and ornamental character, natives of the mountains of New Zealand, are now plentiful, and prove perfectly hardy, in British gardens.

Speier, or SPIRES, the capital of the Bavarian Palatinate, stands on the left bank of the Rhine, 19 miles S. of Mannheim. The most noteworthy edifice is the Romanesque cathedral, built of red sandstone, which has had a very chequered history. Begun by Conrad II. in 1030 and finished in 1061, it suffered from fire in the 12th, 13th, and 16th centuries, and in 1639 was stripped to the bare walls and even set fire to by the French, who also exhumed and scattered the bones of eight German emperors

(from Conrad II. to Albert I.) who lay buried in its crypt. Reconstructed in 1782, it was again desecrated by the French in 1794, but was once more rebuilt in 1797-1822. The interior walls are covered with more than thirty large frescoes by Schraudolph; statues of the eight emperors by Fernkorn (1858) adorn the vestibule; and in front of the west façade is the ancient 'Domnapi,' or cathedral basin. The town itself was also demolished by the French in 1639, and having been rebuilt since that date has broad though irregular streets, but very few ancient buildings, except the gateway or clock-tower (*alta porta*), dating from before 1246, and a few fragments of the imperial palace (Retscher), in which several diets were held. The place, which has a museum and picture-gallery, never recovered its position, and the trade and manufactures—cloth, paper, tobacco, sugar, vinegar, machinery, shoes—are unimportant. Pop. 23,000. Speier was known in Roman times as *Augusta Nemeturum* and *Noviomagus*, but was known as *Spira* from the 7th century. Previous to that, however, it had experienced repeated disasters at the hands of the successive barbarian armies that swept westwards. The early emperors showed it considerable favour, and in the 13th century it became a free imperial city. Several imperial diets were held within its walls, especially that of 1529, at which the reformers first acquired the name of Protestants; and from 1513 to 1689 it was the seat of the supreme law-court of the empire. But the repeated devastations it endured in the Thirty Years' War and from the French (see above) ruined its prosperity. It was the capital of a department of France between 1801 and 1814, and in 1815 passed to Bavaria. In the early years of the 20th century, for the safety of the cathedral, important structural repairs from foundation to roof were carried out.

Speiss. This name is given to the product first obtained (an arsenide of the metal) when arsenical ores are smelted. See COBALT, NICKEL.

Speke, JOHN HANNING, an explorer of Africa, was born on 4th May 1827 at Jordans in Somersetshire, entered the Indian army when seventeen, and saw some active service in the Punjab. During peace he spent great part of his time in making shooting expeditions into the Himalayas, in the course of which he collected natural history specimens and did a good deal of route-plotting. In 1854 he joined Burton in an excursion into the Somali country, and barely got back with his life. Three years later the Royal Geographical Society sent out the same two travellers to search for the great equatorial lakes of Africa. Speke, whilst travelling alone, discovered the Victoria Nyanza, and was convinced that it was the head-waters of the Nile. In 1860 he returned in company with Captain J. A. Grant (q.v.; died 10th February 1892), and not only explored the western and northern shores of the large lake he had previously discovered, but followed the Nile far enough down its course to establish its identity with the great river of Egypt. Nevertheless his identification was disputed by Burton and others; and Speke was to hold a public discussion with Burton at the British Association meeting at Bath on 15th September 1864, when, on that very morning, he accidentally shot himself whilst out shooting near that city. He wrote *Journal of the Discovery of the Source of the Nile* (1863), and *What led to the Discovery of the Source of the Nile* (1864).

Spell. See INCANTATION.

Spelling is originally phonetic, its aim to convey to the eye the sound heard by the ear; but in modern English the usage of pronunciation has drifted far from the conventional forms established

by a traditional orthography, with the result that the present spelling of our written speech is to a large extent a mere exercise of memory, full of confusing anomalies and imperfections, and involving an enormous and unnecessary strain on the faculties of learners. The modern English alphabet consists of twenty-six letters, of which five are vowels, and of these not even the consonants are consistent in sound, as may be readily seen in the current pronunciation of such words as *give, gin; cent, cant; thin, this; cough, dough, sough, hic-cough, hough; loch, arch, patriarch*. Some again are superfluous, as *c, q, x*, their sounds being capable of being represented by other letters; while others may remain silent in pronunciation, as seen in *through, plough, debt, knell, write, lamb, malign, demesne*. Further anomalies appear in *walk, folk* as opposed to *malt, fault*; while a stranger series still appears in such words as *colonel, lieutenant, foreign, scent, island, scythe, scissors, ache, sceptic*. Again, the same vowel or diphthong meets us in such varying forms as the following (from Lounsbury's lists): the short *e* variously in *met, sweat, any, said, says, jeopardy*; the long *e* in *meet, mete, meat, machine, grief, receive, key, quay, people, ægis*. Again, take the varying forms of the same vowel-sound in *rude, rued, rood, routine, rheum, drew, shoe, move, bruise*; while on the other hand six different sounds have the same form in *sour, pour, would, tour, sought, couple*; and five in *heat, sweat, great, heart, heard*. Groups of words like *man, lane, ask, salt* on the one side, and *why, wine, eye, lie, or air, heir, eyre, ere, e'er* on the other, show equally a violation of the fundamental principle of all rational spelling—viz. that of representing every sound by an invariable symbol.

Examples enough have been given to demonstrate the utterly unscientific character of English spelling; it now remains to ask how this has originated, and whether any measure of relief from such a burden is practicable. It was only slowly that this modern uniformity became rigid, and we may dismiss as completely without foundation the defence put forward by pre-scientific philologists like Trench that the modern spelling is valuable as preserving an index to the derivation. Even if this were true, are we justified in paying so great a price for an end so little? But when we look at the facts we find that if the conventional spelling in some few cases preserves a hint as to the ultimate origin, as in *knave, debt*, it is far more often the case that it obscures the order of descent, or merely preserves some error, as in words like *island, comptroller, whole, could*. Again, the infallible writers for the press talk with indignation of being divorced from the tongue of Shakespeare and the Bible; but, as Sir James Murray says, the slightest glance at 17th-century orthography will show what an immense amount of spelling reform has been done since then. One of the most important spelling reforms in English was that made about 1630 when *u* was made a vowel and *v* a consonant, for up to that time these were only forms of the same letter having a position-rank like long *j* and short *s*. From the 14th century onwards a fashion grew of adapting the spelling of words to their supposed Latin originals, with what confusion to the real history of the words may be imagined from the accidental or capricious errors of sciolists innocent of scientific method. But generally speaking up to the 16th century English spelling was mainly phonetic like the present German. The old scribes allowed themselves large liberty in the forms they adopted, to which Chaucer refers in the well-known lines, 'and for there is so great diversite in English, and in writing of our tong.' The *Ormulum* is an interesting example of a consistent attempt at a

phonetic spelling. But as literature developed and the printing press began to assert its authority the spelling became more and more fixed, till at last it became quite stationary, while the pronunciation continued to go on changing without intermission until, as Sweet says, our present spelling does not represent the English we actually speak, but rather the language of the 16th century. This progress towards uniformity went on actively during the 17th century, but it was Johnson's *Dictionary* (1755) that gave universality to the currency. Meantime spoken language grew, and natural divergencies arose, resulting in the modern pronouncing dictionary, which Trench called with justice 'the absurdest of all books.'

Halliwell-Phillipps tells us Shakespeare spelt his name in some thirty different forms; the young Pretender writes of his father indifferently as *Jems* or *Gems*; Claverhouse, says Macaulay, spelt like a washerwoman; and the great Marlborough used the same freedoms as Thackeray's *Jeames* or the ordinary Englishman whose education stopped short for ever at the Fourth Standard. But we may remember that Will Honeycomb never liked pedantry in spelling, and spelt like a gentleman, not like a scholar. And we must not suppose that great as was Johnson's influence all his spellings have been accepted. His *musick, ambassadour, horror, cineter, waterfal, parsnep, skeptick, sack-cloath*, have disappeared; but some of his strange pairs of inconsistencies survive: *moveable* and *im-movable, chilifactory* and *chyle, bias* and *unbiased*. Webster in his 1828 edition gives us many original spellings, as *melasses, pretense*, all of which were swept away in the revision of 1864. Julius Hare and Thirlwall adopted such forms as *forein, sovereign, cherisht, preacht*, from one-sided considerations of philology; Ritson's habit of adding *-ed* for the preterite of all verbs was but one among many of the whimsical notions of a half-crazy antiquary; Pinkerton's vagaries are beneath notice; the usages familiar to readers of Dr Furnivall's 'fore-words' belong to quite another category, and might be commended altogether, but for the saving caution of Dr Sweet that 'nothing can be done without unanimity, and until the majority of the community are convinced of the superiority of some one system unanimity is impossible.' For spelling reform must proceed by a wise moderation, and Englishmen as yet are far from being ready for such elaborate systems as the Glossic of Ellis, the Romic of Sweet, and the other systems desired by phoneticians. But to these scholars the cause owes all the progress it has made, and their names will live in honoured memory when rational principles at last prevail over the tremendous forces of inertia and prejudice. It is hard to reason men out of beliefs they have never been reasoned into, and it may yet be long before our children are relieved of an unnecessary burden too heavy to be borne. That we can still read Chaucer and *Piers Plowman* despite Johnson's *Dictionary* should dispose of the one specious difficulty objected to reform; another—viz. that uniformity would confound such homonyms as *write, rite, right, and wright*—is answered by the fact that the identity of sound troubles us little in speaking, and would trouble us still less in reading, with the help of the context before us. Meantime the true path of progress might follow such wisely moderate counsels as those of Sir J. Murray: the dropping of the final or inflexional silent *e*; the restoration of the historical *-t* after breath-consonants; uniformity in the employment of double consonants, as in the American *traveler*, &c.; and the discarding of *ue* in words like *demagogue* and *catalogue*; the uniform leveling of the agent *-our* into *-or*, already so common in America; the making of *ea* = *ē* short into *e* and

the long *ie* into *ee*; the restoration of some, *come, tongue*, to their old English forms, *sum, cum, tung*; a more extended use of *z* in the body of words, as *chozen, praise, raize*; and the correction of the worst individual monstrosities, as *foreign, scent, scythe, ache, debt, people, parliament, court, would, sceptic, phthisis, queue, schedule, twopence-halfpenny, yeoman, sieve, gauge, barque, buoy, yacht, &c.*

An encouraging success is the improvement of German spelling, introduced in 1880, the chief features of which are the omission of all superfluous signs indicating the lengthening of a syllable, the substitution of *f* for *ph*, the determination of the sound of *s* hard and soft, the use of *sz*, the doubling of consonants, the retention of *h* as indicating vowel-lengthening only in root-syllables: *Akt, Armut, Elephant, tot, Irrtum, Wert*.

See PHONETICS, PHILOLOGY, ALPHABET, ENGLISH LANGUAGE.

Spelman, SIR HENRY, antiquary, was born in 1562, son of a gentleman of ancient family, at Congham in Norfolk. He was educated at Trinity College, Cambridge, whence he passed to Lincoln's Inn. He was high-sheriff of Norfolk in 1604, and was often employed in public affairs at home and in Ireland by James I. Knighted by the king, he retired in 1612 to prolonged private studies, and died in 1641. His ponderous *Glossarium Archæologicum*, of which he published A—L in 1626, was completed by his son, Sir John Spelman, and William Dugdale. His next great work, *Conciliorum, Decreta, Leges, Constitutiones in Re Ecclesiastica Orbis Britannici* (1639–64), he also left incomplete. His other works on Tithes, on Sacrilege, are no less learned, and exhibit his strong devotion to the Church of England. His *Reliquiæ Spelmanianæ* were edited, with a Life, by [Bishop] Edmund Gibson (1698).—His eldest son, SIR JOHN SPELMAN, inherited all his tastes and part of his learning. He was knighted in 1641, and died in 1643, author, besides other works, of a life of King Alfred (in Lat. trans. 1678; Spelman's Eng. original, edited by Thomas Hearne, 1709).

Spelt. See WHEAT.

Spelter. See ZINC.

Spēnborough, an urban district of the West Riding of Yorkshire, between Leeds and Huddersfield, and between Bradford and Dewsbury, was formed in 1917 by the union of Cleckheaton, Gomersall, and Liversedge; pop. (1921) 31,114.

Spence, JOSEPH, anecdotist, was born at Kingsclere in Hants, 25th April 1699. A sickly boy, he went to Eton, but in a short time left it for Winchester, thence passing to New College, Oxford, in 1720, of which he became a fellow in 1722. He took orders in 1724, three years later became professor of Poetry, and was presented to the rectory of Birchanger in Essex. He travelled on the Continent with the Earl of Middlesex, afterwards second Duke of Dorset (1730–33), again with Mr Trevor (1737), and Henry, Earl of Lincoln, afterwards Duke of Newcastle (1739–42). Before first going abroad he had published his *Essay on Pope's Odyssey* (1726), which procured him the lasting friendship of the poet. Almost from the beginning of their intimacy he began to record Pope's conversation and the incidents of his life, to which gradually many curious particulars were added gathered from the conversation of other eminent men. In 1736 he edited *Gorboduc*, and in 1737 became rector of Great Harwood in Bucks, and regius professor of Modern History. In 1747 he published his *Polymetis*, which is said to have brought him £1500, great part of which he spent on landscape-gardening at Byfleet in Surrey. In 1754 he became a prebendary of Durham. He was accidentally drowned at

Byfleet, August 20, 1768. He was a constant friend to Pope, Horace Walpole, Shenstone, and Lowth, and was noted for his large charity, a devoted love to his aged mother that rivalled Pope's own, and his kind patronage of such men as Stephen Duck, thresher and poet; Robert Hill, the learned tailor; Thomas Blacklock, the blind poet; and Robert Dodsley, footman before publisher.

His MS. collection of Anecdotes was given by his executors to the Duke of Newcastle, who did not approve of their being published. Some, however, reached the public through Warburton, Warton, Johnson, and Malone—in the case of the first two from Spence himself. Malone's edition (1820) was quickly superseded by that of S. W. Singer (1820; 2d ed. 1858), printed from the original papers, with notes and a memoir.

Spencer, a town of Massachusetts, 64 miles by rail W. by S. of Boston, with manufactories of boots and woollens. Pop. 6000.

Spencer, a family which has given several statesmen to the service of their country, was founded by the Hon. John Spencer, youngest son of the third Earl of Sunderland, by Anne, daughter and co-heiress of the great Duke of Marlborough. He inherited much property from his grandmother, Sarah, Duchess of Marlborough, and his only son, JOHN (1734–83), was made Earl Spencer in 1765.—GEORGE JOHN, second Earl (1758–1834), was First Lord of the Admiralty under Pitt's administration (1794–1801), the period of the great naval victories of Camperdown, Cape St Vincent, and the Nile. He retired when Addington became premier, and was famous as a munificent collector of rare books and the first president of the Roxburghe Club. The Spencer Library, dispersed under the hammer in 1881–83, brought £50,581. See his *Private Papers* (ed. Corbett and Richmond, Navy Rec. Soc., 1913 *et seq.*).—JOHN CHARLES, third Earl Spencer, better known under the courtesy title of Lord Althorp, was born in 1782, and educated at Harrow and Trinity College, Cambridge. He entered parliament in 1804 for Oakhampton, and became a junior Lord of the Treasury when in 1806 his father took office as Secretary of State for the Home Department in the Grenville-Fox ministry. He sat for Northamptonshire from this time till the Reform Bill, and in the Reformed parliament for the southern division of the county. He went out with the Whigs in 1807, and gave steady opposition during the long Tory reign thereafter. On the dissolution of the Wellington cabinet in November 1830 he became Chancellor of the Exchequer and leader of the House of Commons in the celebrated Reform ministry of Earl Grey. The Reform Bill was introduced by Lord John Russell, but the task of carrying the bill mainly devolved upon Spencer. In 1833 he brought in and carried the ministerial bill for reforming the Irish Church. In this memorable working session the curious statistician discovered that Spencer, who had, from his post of ministerial leader, naturally been the most frequent speaker, had addressed the House 1026 times, his speeches occupying 387 columns in the then *Mirror of Parliament*. When the Irish Coercion Bill was under consideration in the cabinet Spencer had opposed the clauses prohibiting public meetings, yet had given way rather than break up the ministry, but when the truth was elicited in debate by Mr O'Connell he resigned. He was considered and described by Earl Grey as his 'right-hand man,' and without his assistance the earl felt himself unable to carry on the government. The administration of Viscount Melbourne succeeded (July 1834), in which Spencer consented to resume his office. In November he was called by the death of his father to the House of Peers, which had the effect of bringing the Melbourne administration to an end. When the attempt of

Sir Robert Peel to carry on the government failed Spencer declined to take office again. He devoted his time to agricultural pursuits, became president of the Smithfield Cattle Club, and suggested the formation of the Royal Agricultural Society, of which he was elected president in 1838. He died at his seat, Wiseton Hall, Notts, October 1, 1845, without issue, and was succeeded by his brother. During his political career his simplicity of character and integrity of purpose obtained for him the appellation of 'honest Lord Althorp.' He was very little of an orator, but he had a clear and practical intellect, and his influence over the Reformed House of Commons was supreme. Lord Brougham dedicated to him his work on *Natural Theology*; and his *Dialogues on Instinct* are also supposed to be carried on with Spencer, to whose cultivation of philosophy in the midst of his political and agricultural pursuits the author bears friendly testimony. See *Memoir* by Sir Denis Le Marchant, Bart. (1876), Walter Bagehot's *Biographical Studies* (1881), and Ernest Myers' *Lord Althorp* (1890). —JOHN POYNTZ SPENCER, fifth earl, was born October 27, 1835, and was educated at Harrow and Trinity College, Cambridge. He had sat but a few months in the House of Commons for South Northamptonshire when the death of his father in 1857 sent him to the House of Lords. He was Lord-lieutenant of Ireland in 1868-74 and 1882-85; in 1880-83 and 1886 Lord-president of the Council; in 1892-95 First Lord of the Admiralty; and from 1902 to 1905, when his health broke down, Liberal leader in the House of Lords. He died 13th August 1910. He embraced Gladstone's Home Rule policy, having during his tenure of office at Dublin Castle come to the conclusion that coercion was a failure.

Spencer, HERBERT, who devoted his life to the elaboration of a system of philosophy that should be in harmony with evolution and the results of modern science, was born at Derby, 27th April 1820. His father was a schoolmaster in that town, and secretary of the Philosophical Society; and from him Spencer imbibed that love of natural science and wonderful faculty of observation so conspicuous in his works. The father was greatly interested in entomology; and Spencer himself used to collect, describe, and draw insects when a boy. Insurmountable aversion to linguistic studies put a Cambridge career out of the question, and at the age of seventeen he entered upon the profession of a railway engineer under Mr (afterwards Sir Charles) Fox, in London; but about eight years afterwards he gave up this profession, which lacked interest for him. He had already contributed various papers to the *Civil Engineers' and Architects' Journal*; and in the later half of 1842 he wrote a series of letters to the *Nonconformist* newspaper on 'The Proper Sphere of Government,' which were republished in pamphlet form in 1843. These letters imply a belief in human progress based on the modifiability of human nature through adaptation to its social surroundings, and maintain the tendency of these social arrangements 'of themselves to assume a condition of *stable equilibrium*.' From 1848 to 1853 he was sub-editor of the *Economist* newspaper; and at this time he developed the ethical and political consequences of the ideas he had already enunciated, and sought an independent basis for them. Hence his first important work, *Social Statics* (1850; abridged and revised, 1892). It is thus noticeable that Spencer's philosophical activity began with ethical and social questions. The conception of the evolution of man and society as determined by circumstances, and the idea that organic and social evolutions are under the same law, preceded the elaboration of those scientific ideas which, in the complete *System*

of *Philosophy*, are made to serve as their basis. The truth anticipated by Harvey and Wolff, but first put into definite shape by Von Baer—'the truth that all organic development is a change from a state of homogeneity to a state of heterogeneity'—is regarded by Spencer as the organising principle of his subsequent beliefs. It was gradually developed and applied by him in a series of articles contributed in the following years to the *Leader*, the *North British*, *British Quarterly*, *Medico-Chirurgical*, *Westminster*, and other reviews.

In these essays, especially those on *The Development Hypothesis* (1852), *Manners and Fashion* (1854), *The Genesis of Science* (1854), and *Progress: its Law and Cause* (1857), and in the volume of *Principles of Psychology* (1855), the doctrine of evolution began to take definite form, and to be applied to various departments of inquiry. The publication of Darwin's *Origin of Species*, in 1859, gave a wide basis of scientific proof for what had hitherto been matter of speculation, and first showed the important part played by natural selection in the development of organisms.

In 1864 Spencer published an essay on the *Classification of the Sciences*, in which he criticised Comte's serial arrangement of the sciences according to generality, and substituted for it a classification according to abstractness: (1) *Abstract Science*, treating of the forms (space and time) in which phenomena are known to us—logic and mathematics; (2) *Abstract-concrete Science*, treating of the laws of the factors of the phenomena themselves—mechanics, physics, chemistry, &c.; (3) *Concrete Science*, treating of the phenomena in their totalities (the laws of the products)—astronomy, geology, biology, psychology, sociology, &c.

Upon this scheme of the sciences Spencer had now been working for several years. As early as 1860 he had announced the issue of a *System of Synthetic Philosophy*, already in course of preparation, which, beginning with the first principles of all knowledge, proposed to trace how the law of evolution was gradually realised in life, mind, society, and morality. In pursuance of this comprehensive design Spencer had published *First Principles* (1862); *Principles of Biology* (2 vols. 1864-67); *Principles of Psychology* (2d ed. 2 vols. 1870-72); *Principles of Sociology* (3 vols. 1876-96); *Principles of Ethics* (2 vols. 1879). In the preface to the third vol. of the *Sociology* (1896) completing the *Synthetic Philosophy*, the author explained that the two volumes of the original design had expanded to three; a fourth (Linguistic, Intellectual, Moral, Aesthetic) must remain unwritten by reason of age and infirmity.

These works follow a different plan from his earlier writings. In his occasional essays already referred to he proceeded by means of observation and induction; and in them the law of evolution was the result of a generalisation. But the method of his *System* is deductive; though the deductions, large and small, are always accompanied by inductive verifications. Even the law of evolution only finds a place in it because it can be deduced from a higher and ultimate principle. Just as certain special sciences—mechanics, for example—have already entered into the deductive stage, so, in Spencer's *System*, completely co-ordinated knowledge, to which he gives the name of philosophy, becomes deductive. Hence the importance of determining what is the ultimate test of truth. This, according to him, is the mental inconceivability of the negation of the proposition by the individual thinker. The validity of this test is supported, according to him, by two considerations: first, because no other test is obtainable, and secondly, by the consideration

that mental inconceivability is the result of certain uniformities in our experience which are due to uniformities in nature. His appeal to this test, and the way in which he employs it, formed the subject of a controversy with J. S. Mill, and brings out the distinction between his method and principles and those of the empirical philosophy.

Metaphysically, Spencer's system is founded on the doctrine of relativity deduced by Hamilton and Mansel from Kant, but carried by him, as he says, a step further. Along with the definite consciousness of things known in relation to one another there is implied an indefinite consciousness of an absolute existence, in the recognition of which as inscrutable science and religion find their reconciliation. All definite consciousness or knowledge is of the manifestations of this unknowable power; and knowledge, completely unified, is philosophy. The data of philosophy are necessarily those organised components of our intelligence without which philosophising could not go on. 'Our postulates are: an unknowable power; the existence of knowable likenesses and differences among the manifestations of that power; and a resulting segregation of the manifestations into those of subject and object.' Within each segregated mass there are likenesses and differences involving secondary segregations. The modes of cohesion under which manifestations are invariably presented are called, when contemplated apart, space and time; when contemplated along with their manifestations, matter and motion. All these are traceable to experiences of that mode of consciousness whose reality is shown by its persistence—to force. By the 'persistence of force' is meant the unchanging quantity both of that mode of force which is revealed to us only by opposition to our own powers, and is not a worker of change, and of that mode which is a worker of change actual or potential, and is specifically termed energy. The persistence of force—i.e. the persistence of some cause which transcends our knowledge and conception—is the truth which all other truths imply, and from which they all (including the law of evolution) are derived. From the fact that force can neither arise out of nor lapse into nothing follows the uniformity of law. Force never disappears; it is only transformed. Motion follows the line of least resistance, and is perpetually reversed within limits—is rhythmical. So far of the factors of phenomena. The phenomena themselves must be under a law of the concomitant redistribution of matter and motion, which holds of every change. The law of the entire cycle of changes passed through by every existence is loss of motion and consequent integration—i.e. evolution, eventually followed by gain of motion and consequent disintegration—i.e. dissolution. In its complete shape the 'formula of evolution' is thus stated: 'Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite incoherent homogeneity to a definite coherent heterogeneity; and during which the retained motion undergoes a parallel transformation.' This law of evolution applies equally to all orders of phenomena—'astronomic, geologic, biologic, psychologic, sociologic, &c.'—since these are all component parts of one cosmos, though distinguished from one another by conventional groupings. So long as evolution is merely established by induction it does not belong to philosophy. It must be deduced from the persistence of force. And this can be done. For any finite aggregate being unequally exposed to surrounding forces will become more diverse in structure; every differentiated part will become the parent of further differences; at the same time, dissimilar units in the aggregate tend to separate,

and those which are similar to cluster together ('segregation'); and this subdivision and dissipation of forces, so long as there are any forces unbalanced by opposite forces, must end at last in rest; the penultimate stage of this process, 'in which the extremest multiformity and most complex moving equilibrium are established,' being the highest conceivable state.

The various derivative laws of phenomenal changes are thus deducible from the persistence of force, and it remains to apply them to inorganic, organic, and super-organic existences. The detailed treatment of inorganic evolution is omitted from Spencer's plan (which is, he remarks, even too extensive without it), and he proceeds 'to interpret the phenomena of life, mind, and society, in terms of matter, motion, and force.'

It is impossible to give here any but the most general idea of the contents of the volumes in which the law of evolution is applied to these different departments. It is not only made to account for the phenomena within each group, but also for the connection between one science and another. The researches of Darwin had accumulated ample material for showing the continuity of development, structural and functional, in plants and animals; and Spencer's view of biology, and the definition of life he proposes ('the definite combination of heterogeneous changes both simultaneous and successive in correspondence with external co-existences and sequences'), are meant to show its connection both with inorganic changes on the one hand and with mind on the other. Now, just as biology has to deal with the connection between phenomena in the organism, and as physical science treats of the connection between phenomena in the environment, so psychology has to do with the connection between these two connections. For this is said to be the objective aspect of what states of consciousness are subjectively. The functions dealt with by the psychologist are more special than those dealt with by the biologist; but they belong to psychology, not merely because they are more special, but also because they are the counterparts of the states of consciousness dealt with by the science of subjective psychology.

Objectively, an attempt is made to trace the evolution of mind from reflex action through instinct to reason, memory, feeling, and will, by the inter-action of the nervous system with its environment. Subjectively, mental states are analysed, and it is contended that all of them—including those primary scientific ideas, the perceptions of matter, motion, space, and time, assumed in the *First Principles*—can be analysed into a primitive element of consciousness, something which can only be defined as analogous to a nervous shock. These perceptions have now become innate in the individual. They may be called—as Kant called space and time—forms of intuition; but they have been acquired empirically by the race, through the persistence of the corresponding phenomena in the environment, and from the accumulated experiences of each individual being transmitted in the form of modified structure to his descendants.

This principle of heredity is one of the laws by which individuals are connected with one another into an organic whole; and we thus pass quite naturally to what Spencer calls super-organic evolution, implying the co-ordinated actions of many individuals, and giving rise to the science of sociology. Society, like an individual man, is shown to be an organism from the fact and laws of its growth, the nature of its activities, and the inter-dependence of its parts; though it is distinguished from the individual organism in this,

that it is discrete, while the latter is concrete: 'there is no social sensorium.' As societies progress in size and structure, they work on one another profound metamorphoses, now by war-struggles and now by industrial intercourse.

Assisted by a series of elaborate ethnographical charts (*Descriptive Sociology*) prepared under his direction, Spencer attempted to trace the development of human ideas, customs, ceremonial usages, and political institutions. The series continues under direction of trustees. The genesis of religion is traced to Ancestor-worship (see ANCESTORS, WORSHIP OF), or generally to worship of the dead. The notion of another life—from which the notions of gods and God are gradually evolved—is originated mainly by 'such phenomena as shadows, reflections, and echoes'—these being looked upon as indications of a 'double' or other self, which is not extinguished with the death of the first self. It is this fear of the dead which is the root of the religious control, just as it is the fear of the living which is the root of the political control. Ceremonies and institutions alike have their root in this fear of the stronger and submission to the conqueror. Thus, early communities being of the predatory or militant type, tended to centralised control; while industrial communities, which are now most frequent, should tend to free institutions and to the restriction of the sphere of government to the negative duty of preventing the interference of one individual with his neighbour's liberty. This principle of government—commonly expressed by the maxim *laissez faire*—is energetically enforced by Spencer, against the tendency of much recent legislation. A still higher type than the industrial is possible in the future, by inverting the belief that life is for work into the belief that work is for life; just as the industrial type inverts the belief that individuals exist for the state into the belief that the state exists for individuals.

The principles of morality are looked on by Spencer as the keystone of his system, all his other investigations being only preliminary to them. Ethics, he holds, has its root in physical, biological, psychological, and social phenomena, for by them the conditions of human activity are prescribed and supplied. The best conduct is that which most fully realises evolution—which promotes the greatest totality of life in self, offspring, and the race—the balance of egoism and altruism being attained by a compromise between these contending principles. The measure of life is said to be pleasure, but the Utilitarian school are at fault in assuming that the end (greatest happiness) is better known than the means to it (morality); and in ignoring the fact that accumulated experiences of utility have become consolidated in the superior races into a moral sense.

In the above summary it has been impossible to give any idea of either the strength or weakness of the proof by which this elaborate system is supported. In general, it may be said that its strength lies in the author's brilliant power of generalisation, his acquaintance with many departments of science, and his unsurpassed wealth of illustration. The wide knowledge which all his writings display of physical science, and his constant endeavour to illustrate and support his system by connecting its positions with scientific facts and laws, gave his philosophy great currency among men of science—more so, indeed, than among philosophical experts. At the same time, not only did the development and application he gave to the theory of evolution profoundly influence speculation and the developments of psychology and ethics, but he must also be regarded as one of the very few modern thinkers who have carried out the attempt to give a

systematic account of the universe in its totality. He died 8th December 1903; and his *Autobiography* (1904; supplemented in 1908 by the *Life and Letters* by Duncan) gives a remarkable picture of a life devoted to one great task.

Spencer's most popular works have been a small volume on *Education* (1861), which has been translated into many languages, and *The Study of Sociology* (1872), which points out to the unscientific reader the difficulties of a social science. He also wrote *The Man versus the State* (1884), and *The Factors of Organic Evolution* (1887). His occasional papers were collected and published in three volumes of *Essays: Scientific, Political, and Speculative*. An *Epitome of the Synthetic Philosophy*, by F. Howard Collins, was published with Spencer's authority in 1889 (1 vol.); there are criticisms of the system by Guthrie (1879 and 1882) and M'Cosh (New York, 1885); and the *Outlines of Cosmic Philosophy*, by John Fiske (2 vols. Boston, 1874), is based on Spencer's system. See also Fischer, *Über das Gesetz der Entwicklung* (1875); Michelet, *Spencers System der Philosophie* (1882), and *Spencers Lehre* (Leip. 1891); A. D. White, *Herbert Spencer: The Completion of the Synthetic Philosophy* (1897); Hector Macpherson, *Herbert Spencer, the Man and his Work* (1900); J. Arthur Thomson, *Herbert Spencer* (1906); H. S. R. Elliot, *Herbert Spencer* (1917).

Spencer, Sir Walter Baldwin, ethnologist, born at Stretford, Lancashire, in 1860, studied at Manchester and Oxford, and in 1887–1919 was professor of Biology at Melbourne. With F. J. Gillen he crossed Australia from south to north, and jointly they produced standard works on the natives: *The Native Tribes of Central Australia* (1899), *The Northern Tribes of Central Australia* (1904), and *Across Australia* (1912). As commissioner and chief protector of aborigines he reported in *The Native Tribes of the Northern Territory* (1914).

Spencer, William Robert, minor poet, was second son of Lord Charles Spencer, himself the second son of that Charles Spencer, fifth Earl of Sunderland, who succeeded as third Duke of Marlborough in 1733. He was born in 1770, was educated at Harrow and Oxford, held a Commissionership of Stamps, spent his last ten years in Paris, and died there in 1834. Among his children were Aubrey-George Spencer, Bishop of Jamaica, and George-John-Trevor, Bishop of Madras. He was long a fashionable writer of *vers de société* and such like, but his fashionable verse is clean forgotten, and his name lives alone in a few simple songs and ballads, the chief 'Beth Géler, or the Grave of the Greyhound.' Yet even these are but commonplace. His poems were collected, with a brief Memoir, in 1835.

Spencer Gulf, a deep inlet on the coast of South Australia, between Eyre's Peninsula on the W. and Yorke Peninsula on the E. It is 180 miles in length, by 90 in greatest breadth.

Spence's Metal is made by melting together a metallic sulphide, such as sulphide of iron, along with sulphur. The result is a grayish-black substance, without metallic lustre, which takes a good polish. It can be coloured to imitate bronze and other metals, and as it melts at 320° F. it can readily be cast into moulds from which it takes a sharp impression. It is used by dentists for moulding. Busts, medallions, &c., have been made of it, and it is also used like lead for the joints of pipes. It is but slightly acted on by acids. First made in 1879, it is more of the nature of a hard cement than a metal.

Spener, Philipp Jakob, an illustrious German reformer, and the founder of the movement known as *Pietism*, was born at Rappoltsweiler in Upper Alsace, 13th January 1635. Pious from his cradle, he studied at Strasburg, where in Johann Schmid he found his 'father in Christ.' Next he studied under the younger Buxtorf at Basel, afterwards

visiting Geneva, Stuttgart, and Tübingen. In 1663 he became a preacher at Strasburg, and three years later was transferred to Frankfurt, and here he laboured with the most devoted zeal to reawaken the dormant and mechanical Christianity of the day by constant catechising and earnest preaching based on Scripture and Christian experience. Yet Spenser was the very opposite of what is commonly called a mystic. The devotion which he sought to excite was not to show itself in transcendental ecstasies, but in acts of piety, humility, and charity. He had a strong aversion to formal theology, which he considered a hateful caricature of the free word of life; and he commenced in the year 1670, at his house, meetings for the cultivation of evangelical morality. Out of these grew the famous *collegia pietatis*, whose influence for good on the German character, in those days of stony and barren orthodoxy, cannot easily be overvalued. His earnest and plain-spoken *Pia Desideria* (1675) spread the movement far beyond the range of his personal influence, but aroused the enmity of many in high places. In 1686 he became court preacher at Dresden and member of the Upper Consistory. Here he infused new life into the theological teaching of the university of Leipzig, despite the opposition of Carpov and others; but, having in 1689 rebuked the Elector Johann Georg III. for his vices, he soon found his position so intolerable that he gladly accepted an invitation to Berlin to become Provost of the church of St Nicholas and consistorial inspector, offices which he retained to the end of his life. The Elector of Brandenburg encouraged his efforts after religious reform, and entrusted theological instruction in the new university of Halle to Francke, Breithaupt, Anton, and other disciples of Spenser—the later leaders of the pietistic movement. This excited great irritation in the theological faculties of Wittenberg and Leipzig, which formally censured in 1695 as heretical no less than 264 propositions drawn from Spenser's writings. Spenser died at Berlin, February 5, 1705, leaving behind a reputation for piety, wisdom, and practical Christian energy which all the excesses of the later pietists have not obscured. Indeed Ritschl (*Gesch. des Pietismus*) maintains that he himself was not a Pietist, having no part in their characteristic quietist and separatist instincts.

His writings are numerous; the chief are *Pia Desideria* (1675), *Das geistliche Priesterthum* (1677), *Christliche Leichenpredigten* (13 vols. 1677), *Des thätigen Christenthums Nothwendigkeit* (1679), *Klagen über das verdorbene Christenthum* (1684), *Evangelische Glaubenslehre* (1688), and *Theologische Bedenken* (5 vols. 1700-2). See J. G. Walch, *Religions-streitigkeiten der Lutherischen Kirche* (5 vols. 1730-39); the *Lives* by Hossbach (1828; 3d ed. 1861), Thilo (1841), Wildenhalm (1847; trans. by Wenzel, 1881), and Grünberg (3 vols. 1893-1906).

Spengler, OSWALD, German philosophical speculator, was born 29th May 1880 at Blankenburg (Harz), and studied mathematics and philosophy at the universities of Halle, Munich, and Berlin. After some years spent in teaching, he devoted himself to private study, and in 1918 achieved sudden renown by the publication of the first volume of his *Untergang des Abendlandes*, a book called by the author 'a new outlook on history and the philosophy of destiny.' Cultures, he held, are moved by an inherent destiny, and succeed one another by a process of waxing and waning, eventually dying away like individuals. The decline of our West-European culture gave him a subject for a voluminous but rough-hewn philosophy, which occasioned great interest and greater criticism among all classes in Germany after the war. A second volume of the *Untergang des Abendlandes* appeared in 1922, and

an English translation of volume i. (*The Decline of the West*) by C. F. Atkinson in 1926. Spengler's other works include *Preussentum und Socialismus* (1920), *Der Staat* (1924).

Spennymoor, a town of Durham, 4 miles NE. of Bishop Auckland, with iron-foundries and coal-pits; pop. of urban district, 18,000.

Spenser, EDMUND, one of the chief Elizabethan poets, was, as we learn from the *Prothalamion* (one of his minor poems), born in London, probably in East Smithfield near the Tower. From one of his *Amoretti* the date of his birth can with fair certainty be concluded to be 1552. As to his family, there are many indications that he was well connected, though his circumstances were poor. He speaks of himself as taking his name from 'an house of ancient fame,' and also of 'the noble familie, of which I meanest boast myself to be.' This noble family was that of the Spencers of Althorp. With the ladies of it he associates several of his poems. Thus in the dedication of *The Teares of the Muses* to the Lady Strange (in honour of whom in her old age it is interesting to notice Milton's *Arcades* was composed) he writes: 'The causes for which ye have thus deserved of me to be honoured (if honour it be at all) are both your particular bounties, and also some private bands of affinity, which it hath pleased your Ladiship to acknowledge.' But in what degree he was connected with the Althorp Spencers has not yet been ascertained; it seems clear it was not a close relationship. What is fairly certain is that the poet's branch of the family belonged to the neighbourhood of Burnley in east Lancashire. Possibly his father came from Hurstwood, near Burnley. Gabriel Harvey, an intimate friend of Spenser's, speaks of Lancashire as Spenser's county; and there is much corroborative evidence of that statement to be drawn from the poet's own works as well as from the Burnley parish registers. But, however 'good' his family, Spenser's father was by no means well-to-do. It is conjectured that he was at one time 'a free journeyman' in the 'arte or mysterie of clothmakinge.' It is certain that his pecuniary means were so limited that in the education of his son, or sons, he was glad of assistance, and that even with assistance the poet went up to the university as a 'sizar.' So from the beginning Spenser did not enjoy worldly prosperity; from the beginning the saying of one of his admirers applies: 'Poorly, poor man, he lived; poorly, poor man, he died.' Of his mother nothing whatever is at present known, except that her Christian name was Elizabeth (*Amoretti*, lxxiv.).

His life appears to have been spent in London till his going up to Cambridge in 1569. The publication of 'The Spending of the Money of Robert Nowell of Reade Hall, Lancashire, brother of Dean Alexander Powell, 1568-1580,' has informed us that he was sent to the Merchant Taylors' School, then newly founded. He is first mentioned in those accounts as one of six 'poor scholars' of the Merchant Taylors' School, to whom the generous squire gave stuff for gowns. Thus Spenser would be a pupil of Mulcaster, though it was certainly not from him he learned to write English—unless indeed Mulcaster's theory was a great deal better than his practice, the style of his *Positions* being singularly affected and discommendable.

The Merchant Taylors' School was directly associated with Pembroke Hall (now College) at Cambridge; and in May 1569 Spenser duly proceeded from one to the other. Nowell's beneficence still attended him. Both at 'his going to Pembroke Hall' and twice at least while there he received presents. And these with the benefits of a sizarship must have reduced his university

expenses to an amount which can have been no great burden to his father and family. As a scholar he does not seem to have specially distinguished himself at Cambridge. Perhaps, like Wordsworth two centuries later, he did not feel himself 'of that hour or that place.' There are traces of some friction between him and the authorities. But it is evident from his works that by the time he quitted the university in 1576 he had obtained a considerable acquaintance with both Latin and Greek literature. And he had made friends of note, who highly appreciated his genius; amongst them Gabriel Harvey and Edward Kirke.

And now what to do? He seems to have had no definite programme or prospect. He stayed for some time in the north (perhaps Lancashire), probably waiting on fortune. But this time was not all wasted; he had the experience of an unsuccessful love-suit; he pondered many questions of the day; and he perfected his metrical skill. The *Shepherds Calendar* was the result. And its publication in 1579 made an epoch in English literature. It was the first clear note of the great Elizabethan poetry. His contemporaries heard it with delight, and at once acknowledged its freshness and its charm.

In 1578 Spenser was secretary to the Bishop of Rochester. He had won the friendship of Sir Philip Sidney, to whom the *Shepherds Calendar* was dedicated. This friendship was one of the great events of his life (see *Astrophel, Ruins of Time*, &c.). In 1579 he entered the service of Sidney's uncle, the Earl of Leicester. And no doubt it was through Leicester's influence that in 1580 Spenser, long anxious for some employment or 'place,' was appointed private secretary to Arthur Lord Grey de Wilton, himself just appointed Lord Deputy of Ireland.

Ireland was thenceforward to be his home, little probably as such an issue of his secretaryship was expected, and eager as were his hopes and efforts to obtain some preferment in England. We cannot wonder that Spenser was ill content with his lot. The country was in rebellion when he arrived in it. The special mission of Lord Grey was to suppress the combined insurrection of the O'Neils in the north and the Fitzgeralds in the south, assisted by certain Spaniards who had lately fortified themselves at Smerwick in Kerry, a mission executed with a severity so merciless as to lead to his recall in 1582. Strange and fearful sights were presented to the young poet's eyes, of massacre, of desolation, of utter misery. The evil condition of things is vividly illustrated in Spenser's *View of the Present State of Ireland*—a work of ripe, however bitter, experience, and inspired by long and shrewd observation, written probably in the second decade of his Irish residence, and largely circulated in MS., though not printed till 1633. He strongly advocated the policy of strict repression and suppression. No wonder the natives loved Spenser as little as Spenser loved them. To this day, it is said, the peasants of Cork county remember him with detestation. However, it was in Ireland the unfortunate man was to pass his life, except for some two visits and a terror-stricken flight to England. Before his patron's recall he was already forming fresh connections with the country. In 1581 he was appointed Clerk in Chancery for Faculties. In 1584 he was already Deputy Clerk to the Council in Munster. Probably in 1588 he took up his abode at Kilcolman Castle near Doneraile, County Cork, though the grant of it and adjacent lands is dated 26th October 1591. He was certainly settled there in 1589, as we learn from himself in his *Colin Clout's Come Home Again*. His occupancy of

a part of the forfeited estates of the Earl of Desmond must have stimulated the native hatred towards him; and it was probably already keen. Certainly he did much to excite it further by the rigour with which he pressed his rights or supposed rights. Spenser was for the iron flail.

But all this time, amidst all these enmities and horrors, Spenser was going on with his great poem, which, as we know from a letter of Gabriel Harvey's, had been begun before he crossed St George's Channel. The ninth canto of the second book is the first passage that pretty certainly points to his being in Ireland; and all the rest of it that was written was written in Ireland. In his sonnet to Lord Grey he describes his great work as

Rude rymes the which a rustick Muse did weave
In savage soil far from Parnasso Mount,
And roughly wrought in an unlearned loome.

In an interesting account given by his friend Lodovick Brisket of a party assembled at his cottage near Dublin in or about the year 1586, Spenser is reported as mentioning that he had already undertaken a work of ethical purpose 'which is in heroic verse under the title of a *Faerie Queene*,' and that he has 'already well entered into' it. By the year 1589 the first three books were finished, and in that year were shown to Sir Walter Raleigh, whose acquaintance Spenser had probably made some years before (they had certainly met at Smerwick in 1580, if not earlier), and who at this time was in some sort a neighbour, he too having a share (a large one) in the Desmond forfeiture and residing just then at Youghal. Of Raleigh's visit to Kilcolman in 1589 and its result in a journey to England and the English court Spenser gives a charming account in his *Colin Clout's Come Home Again*, written immediately after his return in 1591, though not published till 1595, and then slightly revised that it might be in its allusions more nearly 'up to date.' He and his poem were warmly welcomed. In 1590 the three books were published, and there arose a demand for other works of his, which was presently met by the publication of *Sundry Poems*, nine in number, some probably of early composition (as *Protopopoeia* or *Mother Hubberds Tale*, and in the main *Bellay's Visions* and *Petrarch's*), others written quite recently (as *The Ruins of Time* and *The Tears of the Muses*). But no place was found for him at the court or in London. Lord Leicester and Sir Philip Sidney were no longer on the scene to support him; and so once more to Ireland.

However, immense fame was his, if nothing of official or pecuniary advantage; and he devoted himself anew to his great work. Its course was interrupted by another great love-passion, of which he describes the various stages from despair to hope and to triumph in his *Amoretti* and his *Epithalamion*. The lady's Christian name was Elizabeth, as we learn from one of the courtship sonnets; her surname is very plausibly conjectured to have been Boyle. His happiness overflows even into the *Faerie Queene*. In book vi. canto x. his lady-love is introduced as a fourth Grace, and is described with much rapture. Finishing now the second three books, and perhaps proudly accompanied by his bride, he paid another visit to England. In 1596 was published the second and last instalment of the *Faerie Queene*, except a fragment consisting of two cantos and two stanzas. To this year also belongs the publication of the great Platonic *Hymns*, the first and second written much earlier. For a time he was the guest of Lord Essex; and under his roof, once that of Lord Leicester, he composed what is probably his last complete poem, *The Prothalamion*, or a *Spousal Verse*. Even in this song of congratulation and

joy his anxiety and distress find expression. He speaks of himself as one

Whom sullen care,
Through discontent of my long fruitless stay
In Prince's Court, and expectation vain
Of idle hopes which still do fly away
Like empty shadows, did afflict my brain

(his emotion overpowering his grammar), and of his 'friendless case.' But again his suit obtained no success; and again he turned his face to the country, not of his choice, but of his necessity.

Meanwhile in that unhappy island a fresh storm had been gathering, and in 1598 burst furiously on the head of the unpopular occupant of Kilcolman. One of the first exploits of the new insurrection (that under Hugh O'Neil) was to fire Spenser's castle; and he and his had to flee for their lives. About the close of 1598 or the beginning of 1599 he reached London homeless, destitute, exhausted. On January the 13th (not the 16th, as is usually said; see John Chamberlain to Sir Dudley Carlton, January 17, 1599) he died at a tavern in King Street, Westminster, certainly in distressed circumstances, if not, as Ben Jonson stated to Drummond, and we would fain not believe, 'for lack of bread.' At least in his last resting-place he was happy; he was laid by Chaucer—by him who taught him his songs, as he was proud to say—in the south transept of Westminster Abbey. And, if admiration and fame were or are any compensation for his adverse fortunes, such compensation was and is his in no slight measure. His wealth of language, his fine sense of melody, his abundance of fancy, his ardent patriotism, his profound sympathy with all things lovely and of good report gave him at once and have retained for him a foremost position in English literature. It is his special and his supreme distinction to be known, and with good reason, as the 'Poet's Poet.'

See editions by Todd (8 vols. 1805), A. B. Grosart (10 vols. 1882-84), and De Selincourt and Smith (1910); the Aldine edition, with Life by Collier, and the Globe, with Memoir by Hales; Dean Church's *Spenser* and J. A. Symonds's *Sidney*; Craik's *Spenser and his Poetry* (1845); Sir J. Pope Hennessy's *Raleigh in Ireland* (1883); Dean Kitchin's *Faerie Queene* (books i. and ii.); Lowell's essay; Carpenter's *Reference Guide to Spenser* (1923); Osgood's *Concordance* (1915); Jack's *Commentary* (1920); Renwick's *Edmund Spenser: An Essay in Renaissance Poetry* (1925); Legouis's *Spenser* (1926).

Spermaceti is a waxy matter obtained mixed with oil from the head of the sperm-whale, *Physeter macrocephalus*. The mass obtained from an ordinary sized whale would fill twelve barrels. It is purified by draining off the oil and repeatedly washing with hot water and weak boiling potash-lye. It is in white, pearly, semi-transparent masses, somewhat unctuous to the touch, lighter than water, and melting a little above 38° C. It is insoluble in water, but soluble in ether, chloroform, &c. Medicinally it is no longer given internally, but it is an ingredient of many ointments, to which it gives a crystalline appearance. Chemically it is almost pure cetyl palmitate, but contains small quantities of other fats. See **WHALE**.

Spermatophyta. See PHANEROGAMIA.

Spermatozoa, the male reproductive cells of animals, the physiological complements of the egg-cells or ova. See EMBRYOLOGY, REPRODUCTION.

Sperm Whale. See **WHALE**, SPERMACETI.

Spessart, a German forest region mainly in Lower Franconia and north of the Main. The magnificent oak and beech woods are very skillfully managed.

Speusippus (c. 400-339 B.C.), an Athenian philosopher, who, after the death of his uncle Plato, became head of the Platonic school or Older Academy. Of his philosophical works, in which he

taught a doctrine differing but little from Plato's, nothing is left but titles and fragments.

Spey, a river of Scotland, rising at an altitude of 1500 feet above sea-level and running 107 miles north-eastward through or along the boundary of Inverness, Elgin, and Banff shires, until it falls into the Moray Firth at Kingston between Lossiemouth and Portknockie. The Dulnain and Avon are its principal tributaries. Apart from the salmon-fisheries at its mouth, above which comparatively few fish penetrate, the Spey is almost without value; nor can it generally be called a picturesque stream. It has in its lower course the swiftest current of all the large rivers in Britain, and is subject to sudden and violent freshets, resulting at times in disastrous inundations.

Speyer. See SPEIER.

Spezia, a great naval port of Italy, stands near the head of a deep and commodious bay on the west side of the peninsula, 56 miles S.E. of Genoa by rail. It was Napoleon I. who first recognised the suitability of this bay for the purposes to which the Italians, instigated thereto by Cavour, have now put it. An artificial breakwater (built in 1860), 2400 feet long, covers the entrance; whilst formidable batteries of the heaviest artillery (supplemented by torpedo appliances) bristle on the hills that overlook the bay and on the island of Palmaria that guards its entrance. Here the Italians have constructed the great national arsenal, and build their large warships, and have their ship-repairing yards and docks, and their naval victualling yards, store-houses, and so forth. Some of these, however, are at San Bartolomeo, on the opposite shore of the bay. There are also large barracks, a military hospital, schools of navigation, an iron-foundry, and manufactures of armour-plate cables, sail-cloth, and white-lead. On the shores of the bay are the private shipyard of Muggiano and the works at Pertusola, where much of the Sardinian lead is smelted. The adjacent country produces excellent olive-oil. The beauty of the bay and the lovely climate cause Spezia to be much frequented as a seaside resort. It was on the shores of this bay at Lerici that Shelley spent the last few months of his life, while at the town of Spezia Charles Lever was consul for ten years. The origin of the town is uncertain, but it was probably founded after the destruction of Luna. It contains nothing of artistic interest, except (in the museum) a number of strange menhirs, with rough representations of the human form, from the surrounding country. Pop. of commune (1921) 88,035.

Spezzia (or *Spetsai*; ancient *Pityussa*), a Greek island at the entrance to the Gulf of Nauplia. Area, 6½ sq. m. The town of Spezzia has a good harbour.

Sphacteria, the small island that closes in the bay of Navarino (q.v.).

Sphærosiderite, impure earthy or concretionary varieties of carbonate of iron. See CLAY-IRONSTONE, CHALYBITE.

Sphagnum, a genus of Mosses, whose spore-case is an urn closed by a deciduous lid, and its brim toothless, the calyptra irregularly torn. Several species are natives of Britain, and are common in bogs, from which they derive their popular name, *Bog Moss*. They are remarkable for the whitish colour of their leaves. They are very elegant plants. They often grow in considerable masses, absorbing water like a sponge, but becoming friable when dry. They contribute much to the formation of peat. Gardeners employ them in preference to other mosses for covering the roots of plants and keeping them moist, as they have in a high degree the property of absorbing moisture from the atmosphere. They have been

used as food and surgical dressings. The leaf-cells have a spiral structure and large pores in their sides. See MOSSES; and Braithwaite's *Sphagnaceæ* (1880).

Sphakia, a small port on the south coast of Crete, 60 miles SE. of Canea. The name of Sphakiots is, however, given to all the highlanders in the mountains to the north, who were distinguished for their bravery in anti-Turkish risings.

Sphene. See TITANIUM.

Sphenodon, or, **HATTERIA**, the representative of a distinct reptilian order—Rhynchocephalia—which in Permian and Triassic times included several genera. Now there is only one species—*Sphenodon punctatum*, or *Hatteria punctata*—the Tuatara



Fig. 1.—*Sphenodon* (*Hatteria punctata*).

of the Maoris. It was formerly abundant along the coasts of New Zealand, but is now restricted to a few small islands in the Bay of Plenty, both the Maoris and the hogs being blamed for its rarity. It is now carefully protected, and this may save one of the most interesting of 'living fossils.'

In appearance the *Hatteria* is like an Iguana; on the upper surface the general colour is 'dull olive-green spotted with yellow,' on the under surface whitish; the tail is compressed from side to side and dorsally crested, brittle and replaceable as in many of the genuine lizards. The maximum length of the animal seems to be about two feet, but smaller forms are commoner. Nocturnal in its

habits, the *Hatteria* lives in holes among the rocks or in small burrows, and feeds on small animals.

But the chief peculiarities of this old-fashioned reptile are internal, and cannot be stated except in technical language. The vertebræ are biconcave like those of most fishes, as is also the case in geckos among lizards and in many extinct reptiles. Some of the ribs bear uncinat processes as in birds and crocodiles. As in crocodiles there are 'abdominal ribs,' or ossifications in the fibrous tissue beneath the skin of the abdomen. The skull, unlike



Fig. 2.—Section of Pineal Eye of *Hatteria* (after Baldwin Spencer):

a, a connective-tissue capsule beneath the skin; *b*, the lens; *c*, the cavity of the eye; *d*, *e*, layers of the retina; *f*, blood-vessels; *g*, *h*, stalk.

that of any lizard, has an ossified quadrato-jugal, and therefore a complete infra-temporal arcade;

the quadrate is immovably united to pterygoid, squamosal, and quadrato-jugal; the pterygoids meet the vomer and separate the palatines. There are teeth on the palatine in a single longitudinal row, parallel with those on maxilla and mandible, and the three sets seem to wear one another away; there is also a single tooth on each side of a sort of beak formed from the premaxillæ.

It was in *Hatteria* first that Baldwin Spencer discovered what seems to be the secret of the pineal body. This structure occurs in all Vertebrates, except the very lowest, at the end of an upgrowth from the 'tween brain or optic thalami. Its import remained for long an enigma. But in *Hatteria* the pineal body reaches the skin on the top of the head, and retains distinct traces of an eye-like structure—for instance a complex retina. As the same vestigial hint of eye-structure has since been seen in several lizards, many naturalists are confident that the pineal body should be called a pineal or parietal eye, and regarded as a persistent vestige of a median, unpaired, upward-looking sense-organ. See PINEAL GLAND.

Near the living *Hatteria* the Permian *Palæohatteria*, the Triassic *Hyperodapeton*, and some other important extinct types must be ranked. Nearly allied too is the remarkable *Proterosauros* from the Permian. The development of *Hatteria* has been studied by Howes, Dendy, and others.

Sphenoid Bone. See SKULL.

Sphenophyllum, a fossil genus (Devonian to Trias) of slender plants with whorled leaves, forming with *Cheirostrobos* the *Sphenophyllaceæ*. See PTERIDOPHYTA.

Sphere, a surface of which every point is equally distant from a definite point known as the centre. It may be described by the rotation of a semicircle (or circle) about its diameter. From every aspect a sphere has the same appearance. Every plane section is a circle—a *great circle* if the cutting plane contains the centre of the sphere, a *small circle* in all other cases. The shortest line that can be drawn on the surface so as to join any two points must be an arc of the great circle passing through these two points. If *r* is the radius of the sphere its volume is $\frac{4}{3}\pi r^3$ and its surface is $4\pi r^2$. These are intimately related to the volume and curved portion of the surface of the circumscribing cylinder, whose height is equal to the diameter of the sphere. The volumes are as two to three, and the surface areas, so defined, are equal.

Spheroid is a species of Ellipsoid (q.v.), and is represented by the same equation. If an ellipse be made to revolve round one of its axes, the curved outline of the ellipse describes the spheroid. Should the major or longer axis be the axis of revolution the spheroid is said to be *prolate*, but if the minor or shorter axis, *oblate*. The Earth (q.v.) is very approximately an oblate spheroid.

Spherometer is an instrument for measuring the sphericity of portions of spherical surfaces—for example, lenses. It rests on three pointed legs, whose points form an equilateral triangle. Midway between these is a fourth leg, which can be screwed up or down as desired through a distance measured by the number of turns given to it. After the spherometer is adjusted on any spherical surface till the four legs are all in contact with the surface it is lifted on to a plane surface and the middle leg screwed up or down until the four legs all lie on the plane. Thus we measure the height of the segment whose base is the circle passing through the equilateral triangle mentioned above, and can by a simple calculation find the radius of the spherical surface. The instrument may also be applied to measure the thicknesses of plates small enough to be pushed within the legs.

Spherical Aberration. See LENSES, and MIRROR.

Spheroidal Condition of liquids is the name usually given to a series of very singular phenomena discovered by Leidenfrost (1715-94), but first carefully investigated by Boutigny (1858). Indeed one, at least, of those phenomena has been popularly known for a very long time, being the foundation of the rough practical method of determining whether or not a flat-iron is so hot as to be likely to singe the linen to which it is to be applied. The test consists simply in letting a drop of water fall upon the iron. The drop will either glance off the surface without wetting it or will spread over the surface and evaporate, according as the iron is or is not too hot.

The common experimental method of exhibiting the spheroidal condition is easily performed thus: A metallic disc, slightly concave, like a watch-glass, is heated by a lamp, and water is cautiously dropped on it from a pipette. If this be done before the disc is sufficiently heated the water boils almost explosively, and is dispersed at once in



vapour. But when the disc is hot enough the water remains suspended, as shown in the cut, above the surface; and the drop, when small, takes nearly the form of an oblate spheroid. The most curious fact connected with the experiment is that the water does *not* boil. In fact it evaporates so freely that the heat carried off from it, as latent heat, by the vapour which is constantly formed keeps its temperature somewhere about 206° F. only. *Boiling* water, dropped on a red-hot plate of metal, instantly assumes the spheroidal state, and is cooled six degrees below boiling. Other liquids, and even some bodies which are solid at ordinary temperatures, can be easily brought into the spheroidal state—the lowest requisite temperature of the disc being dependent on the boiling-point of the substance. A good example of a solid entering this state is furnished by dropping crystals of iodine on a hot platinum disc. It is not necessary that a metal plate be used. For example, a watch-glass will suffice for the experiment; but *hot* water must be dropped on it, else the glass will crack. Also we may obtain ether, and even water, in the spheroidal state over the surface of hot oil. The explanation of the phenomenon is to be sought for in the existence of a cushion of vapour between the hot plate and the drop. The high temperature of the plate causes a rapid evaporation of the lower surface of the drop. The vapour particles coming into contact with the hot plate are raised in temperature, that is, have their kinetic energy increased. They tend to rebound with increased energy back upon the drop, whose weight they are thus able to support.

An interesting illustration of the spheroidal state is the fact that the hand may be dipped for a short time with impunity into melted lead, and even into melted copper. The vapour instantly raised from the moisture of the skin prevents, so long as that moisture lasts, more than an endurable amount of radiant heat from reaching the hand, and also prevents direct contact.

Spherulitic Structure. See PETROGRAPHY.

SpheX, a genus of hymenopterous insects of the family Sphegidae, closely allied to the true Wasps (Vespidae). The SpheX wasps are solitary in habit, and there are no workers as in the social forms. The female hollows out, at the end of a long passage, three or four chambers, in each of which she deposits an egg and a store of food for the larva she will never see. The food consists of grasshoppers or other insects, and Fabre gives a minute account of the way in which the SpheX

attacks her victim, and, after a long and violent struggle, throws it on its back and stings it in the neck and between the thorax and abdomen, each time piercing a ganglion. The insect, completely paralysed, but alive, and therefore not liable to putrefaction, is then dragged to the mouth of the nest, where it is relinquished for a short time, while the wasp enters alone to see that all is right. So automatic is this habit of reconnoitring that if the grasshopper be removed to a little distance the wasp drags it back to the same spot and again enters alone. This was tested by the observer forty times in succession, and each time the wasp paid her preliminary visit of inspection. But, in proof that she is not wholly the slave of habit, it should be noted that when Fabre substituted a fresh grasshopper for the paralysed one she at once perceived the difference, and proceeded to attack and sting her recalcitrant victim. Four paralysed insects are placed in each chamber, which is sealed up as it is finished. When all are full the mouth of the passage is also closed, and the nest is abandoned. In many cases, at least, the mother-insect dies before her offspring emerge. See WASP.

Sphincter Muscles (Gr. *sphinkter*, 'that which binds tight') surround an opening or canal which, by their action, they are able to close or diminish in size. They are found round the mouth, the opening between the eyelids, round the pupil of the eye, the pylorus of the stomach, the outlet of the urinary bladder, and the anus. It is to the presence of these muscles that the higher animals owe the power of retaining for a considerable period the excrementitious matters collected in the bladder and rectum, and of discharging them at intervals, the sphincter muscles being, like those engaged in the process of respiration, mainly, but not entirely, under the control of the will.

Sphinx, a name (wrongly derived from a Greek word signifying the 'strangler'), applied to certain symbolical forms of Egyptian origin, having the body of a lion, and a human or an animal head. Various other combinations of animal forms have been called by this name, although they are rather griffins or chimæras. Human-headed sphinxes have been called androsphinxes; that with the head of a ram, a criosphinx; and that with a hawk's head, a hieracosphinx. Late forms have wings added at the sides; but these seem to have originated with the Babylonians or Assyrians. In the Egyptian hieroglyphs the Sphinx bears the name of *Neb*, or Lord, and *Akar*, or Intelligence, corresponding to the account of Clement that this emblematic figure depicted intellect and force. Others see in it the idea of resurrection, symbolised by the triumph of the dawn over the darkness of night. The idea that it allegorised the overflow of the Nile when the sun was in the constellations Leo and Virgo appears to be unfounded. In Egypt the Sphinx also occurs as the symbolical form of the monarch considered as a conqueror, the head of the reigning king being placed upon a lion's body, the face bearded, with the usual head-dress. Thus used, the Sphinx was generally male; but in the case of female rulers the figure has a female head and the body of a lioness.

The most remarkable Sphinx is the Great Sphinx at Gizeh (Giza), a colossal form hewn out of the natural rock, and lying about a quarter of a mile south-east of the Great Pyramid. It is sculptured out of a spur of the rock itself, to which masonry has been added in certain places to complete the shape, and it measures 172 feet 6 inches long by 56 feet high (Vyse, *Pyramids*, iii. 107). Immediately in front of the breast Caviglia found in 1816 a small naos or chapel, formed of three hieroglyphic

tablets, dedicated to the Sphinx, under the name of Haremkuh, or Harmachis, as the Greek inscriptions found at the same place call it—i.e. Horus on the Horizon. These tablets formed three walls of the chapel; the fourth, in front, had a door in the centre and two couchant lions over it. A



Great Sphinx at Gizeh.

small lion was found on the pavement, and an altar between its fore-paws, apparently for sacrifices offered to it in the time of the Romans. Before the altar was a paved causeway or dromos, leading to a walled staircase of thirty steps, repaired in the reign of M. Aurelius and L. Verus on the 10th May 166 A.D. In the reigns of Severus and his sons, 199–200 A.D., another dromos, in the same line as the first, and a diverging staircase were constructed, while some additions had been made to the parts between the two staircases in the reign of Nero. Votive inscriptions of the Roman period, some as late as the 3d century, were discovered in the walls and constructions; and on the second digit of the left claw of the Sphinx an inscription in pentameter Greek verses, by one Arrian, probably of the time of Severus, was discovered. In addition to these walls of unburnt brick, galleries and shafts were found in the rear of the Sphinx extending northwards. The excavations of M. Mariette in 1852 threw further light on the Sphinx, discovering that it was surrounded by a peribolos or outer wall; and showing that the head only was sculptured; and that the masonry of the belly was supported by a kind of abutment. To the south of the Sphinx Mariette found a dromos which led to a temple of the time of the 4th dynasty, built of huge blocks of alabaster and red granite. In the midst of the great chamber of this temple were found seven diorite statues, five mutilated and two entire, of the monarch Chafra or Chephren, which are fine examples of the oldest Egyptian sculpture. While the dignity and grandeur of the Great Sphinx have often attracted the admiration of travellers (see SCULPTURE), its age has always remained a subject of doubt; but it is generally considered to be a monument of at least the age of the 4th dynasty, or contemporary with the pyramids, though Maspero regards it as anterior even to Menes.

Besides the Great Sphinx, avenues of Sphinxes have been discovered at Sakkara, forming an approach to the Serapeum of Memphis and elsewhere. Sphinxes of a peculiar type, perhaps of the 12th dynasty or even earlier, have been found at Tanis,

and another of the same age is in the Louvre; while a granite Sphinx, found behind the 'vocal Memnon,' and inscribed with the name of Amenophis III., is at St Petersburg. An avenue of criosphinxes, each about 17 feet long, is still seen at Karnak, and belongs to the time of Amenhotep III., one of the last monarchs of the 18th dynasty. There is also an alabaster Sphinx, probably of Rameses II., found by Petrie at Memphis. This is the next in size to the Great Sphinx. Various small Sphinxes are in the different collections of Europe, but seldom are of any very great antiquity.

The Theban Sphinx of Greek legend, whose myth first appears in Hesiod (*Theog.* 326), is described as having a lion's body, female head, bird's wings, and serpent's tail, ideas probably derived from Phœnician sources. She was said to be the issue of Orthros, the two-headed dog of Geryon, by Chimæra, or of Typhon and Echidna, and was sent from Ethiopia to Thebes by Hera to punish the transgression of Laius, or, according to other accounts, by Dionysus or Ares (see *EDIPUS*). The Sphinx was a favourite subject of ancient art, and appears in reliefs, on coins of Chios and other towns, and often as a decoration of arms and furniture. In Assyria and Babylonia representations of Sphinxes have been found, and the same are not uncommon on Phœnician works of art.

Sphinx. See HAWK-MOTH.

Sphygmograph, an instrument for indicating changes of tension in the blood in an artery; practically a pulse-recorder. It was invented by Vierordt, and greatly improved in 1863 by Marey of Paris. When the instrument is applied to an artery a moving point traces a record on a band of paper moved by clockwork. A sphygmophone is a sphygmograph combined with a microphone. A sphygmoscope renders the pulsations visible. Dudgeon's sphygmograph is one of the most convenient and best known. The polygraph is a similar instrument by which simultaneous tracings can be taken from several vessels.

Spice Islands. See MOLUCCAS.

Spices (Lat. *species*, 'kinds'; in later Latin, kinds of goods, or produce in general; and then the most highly prized kind of goods, the aromatic productions of the East), aromatic and pungent vegetable substances used as condiments and for flavouring food. They are almost exclusively the productions of tropical countries. In ancient times and throughout the middle ages all the spices known in Europe were brought from the East; and Arabia was regarded as the land of spices, but rather because they came through it or were brought by its merchants than because they were produced in it, for they were really derived from the farther east. They owe their aroma and pungency chiefly to essential oils which they contain. They are yielded by different parts of plants; some, as pepper, cayenne pepper, pimento, nutmeg, mace, and vanilla, being the fruit or particular parts of the fruit; whilst some, as ginger, are the root-stock; and others, as cinnamon and cassia, are the bark. Tropical America produces some of the spices, being the native region of cayenne pepper, pimento, and vanilla; but the greater number are from the East.

Spicheren, or SPEICHERN, a village on the frontiers of Prussia and Lorraine, 2 miles S. of Saarbrück. Here on 6th August 1870 was fought a bloody

battle between the French and Germans, in which the former were defeated. See FRANCE, and the work on the battle by Major Henderson (1892).

Spider-crab. See CRAB.

Spider-fly (*Ornithomyia*), a genus of dipterous insects closely allied to the Forest-fly, but parasitic on birds, not on mammals. Thus, *O. avicularia* frequently infests the common fowl, the blackcock, and other birds in Britain. It is greenish-yellow, with smoke-coloured wings.

Spider-monkey, a name given to an American genus of Monkeys (q.v.), *Ateles*. These monkeys have no thumb, or it is rudimentary. They occur only in South America, Mexico, and Central America. The popular name has been given to them on account of their long, slender limbs. Like



Spider-monkey (*Ateles bartlettii*).

other New-World monkeys (Platyrrhini), they have a prehensile tail, and are naturally purely arboreal in habit. Although denizens of the tropical forests of the New World, they can, like the tropical apes of the Old World, endure a very considerable amount of cold. One species, *A. vellerosus*, lives in large companies in forests at a height of 7000 feet in Mexico. The Coaita is *A. paniscus*. About ten species of the genus are known.

Spiders (*Araneidae*) form an order within the heterogeneous class Arachnida. The name, which points to an older form, *spinther*, refers to the well-known spinning powers which these animals so cleverly exercise. They are found almost everywhere upon the earth, especially in warm countries, and are of much importance in checking the multiplication of insects. A few tropical forms, notably the bird-catching spiders, exceed two inches in length of body, but the majority measure only some fraction of an inch.

Structure and Functions.—The body is divided into two distinct parts—an unsegmented cephalothorax, bearing six pairs of appendages, and a soft unsegmented abdomen, at the end of which are the spinnerets. On the skin there are hairs of various kinds, some being specialised as sensitive structures. The colours, which are often very brilliant, are due in part to pigments, in part to the way in which the light is reflected from the hairs and skin. They vary with age and sex, with food and environment, and, as we shall see, are often of importance in courtship and in protective adaptations. Soon after the young spider is hatched it casts its cuticle, and this moulting is repeated at intervals until the full size is reached. It is prob-

able that the Attidæ moult from seven to eleven times before reaching maturity. As this moulting proceeds, the colour, which in young spiders is generally bright yellow or green, whitish or livid, gradually assumes tints and markings characteristic of the species.

There are six pairs of appendages: (1) the clawed chelicerae or falcæ, of which the last joint works against the second last and contains a poison-gland; (2) the leg-like pedipalps, the terminal joint of which is modified in the male for copulatory purposes; (3-6) four pairs of walking-legs, of which the foremost pair are much used as feelers. The embryo has four pairs of abdominal legs which abort. Near the anus are situated two, three, or four pairs of closely approximated spinnerets, and on each of these there are numerous 'spinning-spools,' out of which oozes the viscid fluid which hardens into the silken thread. A figure is given of the foot of the hindmost leg in the Garden Spider, showing the claws and spines, which are of use in drawing out the silken secretion. Among other external characters are the simple eyes, of which a variable number, most frequently eight, occur on the head; the openings or stigmata of the respiratory sacs or tubes; the opening of the reproductive ducts between the anterior stigmata; and (in the female) the adjacent but separate aperture or apertures of the receptacula seminis.



Fig. 1.—Foot of Garden Spider.

The nervous system conforms to the usual Arthropod type, consisting of a dorsal brain, a ring round the gullet, and a ventral nerve-cord; but the ventral ganglia are concentrated in a single ganglionic mass in the thorax, giving off nerves to the limbs and other parts.

As regards the senses of spiders, it seems that few have much power of precise vision. Some discern rapid movements of objects, but seem unable to see their cocoon though it be but a few inches off. The hunting Saltigrades, however, have been observed to stalk prey from a distance of 10 inches, but that this is regarded as exceptional shows how limited the ordinary power of vision is believed to be. In many cases it has been experimentally proved that spiders exhibit an apparent preference (perhaps dependent on sexual associations) for certain colours, and it is certain that the males of some kinds (e.g. Attidæ) display their bright colours before their desired mates. The limited nature of visual power is in great part compensated for by the exquisite delicacy of the sense of touch, for the lurking spinner feels rather than sees the insect tangled in its snare or web. Vibrations such as those caused by the whizzing of insects' wings or by a tuning-fork are propagated along the taut lines of the web and interpreted by the spider. According to some observers, the courtship is sometimes conducted in this telephonic fashion. This tactile sensitiveness seems to be in great part diffused over the body, but the hairs towards the ends of the legs are specially sensitive. We know little with regard to the sense of hearing in spiders. That some males, e.g. of Theridium and Mygale, are able to produce a stridulating noise, suggests that their mates can hear, but the evidence is not conclusive. Nor are the numerous accounts of spiders which descend chandeliers and the like to listen to music, for spiders often do this when there is no music, and are especially likely to do this of an evening, and it is difficult to abstract the influence of vibrations other than those of sound-waves. Many, however, believe that spiders

really hear, and it may be that careful experiments will prove that what are described as 'auditory hairs' on the palps and legs are really such. The sense of smell seems to be slight, though marked for certain strongly-scented substances, and there is a sensory structure, perhaps olfactory or gustatory, on the basal joint of the pedipalps.

All spiders are predaceous and feed on insects, which they entangle in their snares and webs, or stalk, or catch after patient lurking. In most cases they kill their prey with their poisonous fangs. The mouth is small, and behind the gullet there is a powerful suctorial region which acts as a suction-pump. From the mid-gut five paired out-growths extend into the bases of the pedipalps and legs. There are also large tubular digestive out-growths, and two excretory Malpighian tubes grow out from the hind-gut. The heart lies dorsally in the abdomen, and has three chambers with three pairs of valved openings. In one set (Tetrapneumones, e.g. the bird-catching Mygale; see BIRD-CATCHING SPIDER) there are four pulmonary sacs like those of the scorpion; in the great majority (Dipneumones) there are two pulmonary sacs and two main tracheal tubes.

The sexes are separate except in a few casual hermaphrodites, and the males are often fewer in number, always smaller in size, and usually more brightly coloured than the females. In most cases, as we shall afterwards see, the courtship is elaborate, and is often attended with considerable danger to the males. The fertilised egg segments peripherally, like that of insects, around a central core of yolk. A cocoon is usually formed around the eggs, and this is hidden or carried about by the female, who exhibits much maternal solicitude.

The fertility of spiders varies in different species within wide limits. Thus, as Mrs Peckham notes, one species may lay 800 or 1000 eggs, while another, equally common, lays only fifty. In the family Epeiridae *Argiope cophinaria* lays 500 to 2200 eggs, while *Tetragnatha laboriosa* lays only 34; in the family Attidae *Phidippus morsitans* lays about 180 eggs, while *Synageles pecata* lays only three. While the rate of multiplication is immediately dependent on the constitution of the different species, it also bears some relation to the rate of mortality, or, what comes almost to the same thing, to the efficiency of the protective adaptations by which spiders are saved from their enemies. Those with a low birth-rate are usually protected very efficiently, and have consequently a low rate of mortality.

In many cases female spiders are savage and quarrelsome, fighting with one another, and frequently destroying the smaller males when these offer them amatory attentions. 'Ridiculously small and weak in build, the males of many species can only conduct the rites of marriage with their enormous and voracious brides by a process of active manoeuvring, which, if unsuccessful, is certain to cost them their lives.' In a great number of cases, e.g. in at least two-fifths of all the species of Attidae, the males are more brilliantly coloured than the females, and that this is in part related to sexual selection is rendered almost certain by the observations of Professor and Mrs Peckham, who often worked four or five hours a day for a week in getting a fair idea of the habits of a single species. They describe among many species of Attidae the manner of the wooing, the cautious circling dances of the ardent males, the strange attitudes by which they display their charms of colour, the occasional wooing by vibrations of the web-lines, the captious irritability of the females, who often bring the courtship to a tragic end, the quarrelsomeness of rival males in presence of the females. 'The males vie with each other

in making an elaborate display, not only of their grace and agility but also of their beauty, before the females, who, after attentively watching the dances and tournaments which have been executed for their gratification, select for their mates the males which they find most pleasing' (see SEXUAL SELECTION).

Spinning-work.—On each of the spinnerets—of which in the majority there are six—there are numerous, usually sixty to seventy, 'spinning-spools,' out of which there flows a viscid secretion formed in the numerous internal glands. The resultant thread into which the secretion hardens, though of a delicacy hardly rivalled except by quartz fibres, is from the nature of its origin a complex structure. Its texture is not always the same; it may be covered with minute adhesive beads, or be stronger and unbeaded, or very light and filmy as in gossamer. In some spiders there is a special chitinous plate—called the cribellum—lying in front of the spinnerets and perforated by the ducts of numerous glands. 'Its presence is correlated with that of the calamistrum, a single or double row of long wavy hairs on the dorsal aspect of the second last tarsal joint of the fourth pair of walking-legs. One of the calamistra is rapidly vibrated over the cribellum, and draws out the secretion from the glands in the form of threads, used to strengthen the web, to assist in forming the cocoon for the eggs, and sometimes perhaps in making a domicile.'

The webs of spiders vary as much as do the nests of birds, but as a single example of their making we may take that of the Common Garden Orb-weaver

(*Epeira diademata*).

The spinner first lays down a number of firm foundation-lines, which may be disposed 'by hand' if the situation admits of this, but are more frequently blown fortuitously by air-currents. Having secured a number of these foundation-lines enclosing the area for the web, the spider forms the radii which intersect

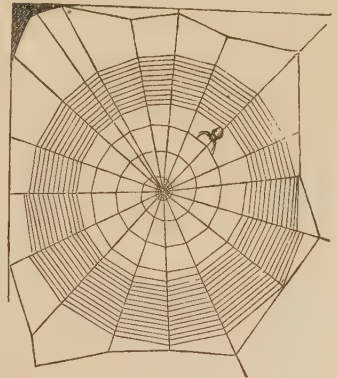


Fig. 3.—Garden Spider spinning her web.

(From 'Riverside' Natural History.)

in the centre. This done, she begins from the centre and stepping outwards in a wide spiral lays down the spiral scaffolding. Finally, beginning at the circumference and working inwards, the spider lays down the delicate viscid spirals on which the efficiency of the web depends. The primary spirals simply form a scaffolding, and are undone, in fact eaten up, as they are replaced. But the web of the garden spider is a comparatively simple case; we have to distinguish 'orb-webs,' 'ribboned orbs,' 'composite snares and sectional orbs,' 'horizontal snares and domed orbs,' 'unbeaded orbs and spring snares,' and so on, as Dr McCook, in his incomparable work on American spiders, has pointed out.



Fig. 2.—*Astia vittata*, male 'displaying his charms.'

(After G. W. and E. G. Peckham.)

No structures made by animals—not even the nests of birds, the homes of bees, the hills of the Termites—are more marvellous than the webs and snares of spiders. The framework is so delicate yet so effectively firm, so clever in its construction, so sensitive, we may almost say, in its mechanism, that we must rank it highest among works of instinctive art. Instinctive, for each species of weaver has its characteristic web, and there is no reason to suppose that the art of making this is the result of education. Yet the mode of construction is not rigidly fixed, but varies a little according to the site, according to the wind, and even, it is said, in relation to the abundance of insects in the neighbourhood. We see the strength of the web when it remains unbroken in the wind, and when it is laden with drops of dew, but sometimes it is much stronger than such sights suggest. Mosely tells how Willemoes Suhm on the *Challenger* expedition found a Glossy Starling (*Calornis metallica*) hopelessly entangled in a spider's web, and other naturalists relate the same of humming-birds and other small creatures. Thus a snake, nine inches long, has been found hanging in a web; and Dr McCook, whose carefulness as an observer is worthy of all praise, relates how a young living mouse was in some manner securely entangled in the snare of a spider, how the spinner, by means of silken threads two or three feet long, hoisted the mouse up four inches, and how the mouse after living for ten hours at length succumbed. A spider three-quarters of an inch in length has been seen to land a fish about three inches in length, but perhaps the raising of a mouse in a web is more wonderful. A. R. Wallace and other exploring naturalists also tell of spider-webs strong enough to be a serious obstacle to travellers in the woods, and in other reports fancy has magnified this strength tenfold. As to the intelligence involved in modifying the web in various conditions it is not easy to form an accurate estimate. On a long hedge we may see scores of webs disposed so as best to stand the stress of the prevailing wind, but we must remember that the foundation-lines of the web are in most cases wind-blown. Often in the geometric webs there are interesting irregularities which show that equal precision is not always attained. On the other hand fractured snares are sometimes mended by skilfully disposed trusses. Many observers have described cases where small stones were found hung from the web, as if to weight them against the force of the wind. But McCook maintains, and we would agree with him, that it is most likely that these stones have been raised from off the ground by the shrinkage of the web, and that the alleged advantage—which, if foreseen, involves a complex inference—is simply accidental.

The threads which the spiders spin are used not only in fashioning webs and snares, but in many different ways. Behind them, as they move where a footing is insecure, there trails a drag-line, perhaps the rudiment of all their weaving, and this is of special use when they drop from a height. Jonathan Edwards long ago (1716) observed that spiders in order to cross an unbridged gap will form a sort of swinging basket, and he also noticed their exceedingly strange habit of ballooning. Raising themselves on tiptoe and with upturned abdomen on some point of vantage, they allow long threads of gossamer to float out in the air until these acquire sufficient momentum to carry the spider aloft. In this way they have been known to cross considerable sheets of water. 'To this mode of diversion young spiders of several families are very much addicted, especially in the fine days of autumn. Sometimes the flying threads are excessively numerous, and on their descent cover every-

thing; they are particularly striking on hedges, and constitute, at all events, one of the causes of the phenomenon well known in the country as gossamer.' And again, the threads may help to form the cocoon for the eggs, or may be used to bind leaf to leaf and form a well-hidden nest.

Enemies and Protective Adaptations.—While spiders are the fatal enemies of many insects, they are in turn frequent victims. 'To feed the hungry maw of a stronger, more skilful, or more fortunate fellow Araneid; to be paralysed and entombed within a clay sarcophagus by a mother wasp, and serve as food for a growing waspling worm (see SPHEX); to be snapped up as a delicate titbit by birds, toads, and other creatures—these are some of the ways in which the spider meets its doom.' Among birds the chief enemies of spiders are the humming-birds, among insects the wasps. The ichneumon flies often lay their eggs—with destructive results—in the cocoons of spiders. Small monkeys prey upon spiders a good deal, and so do some insectivorous mammals. Between different kinds of hunting and running spiders there is much keen warfare.

Many spiders hide in crevices or in bivouacs of leaves which they roll up or bind together. McCook describes the nest of the Purse-web Spider (*Atypus abbotii*), a purse-shaped tube attached to the bark of trees, with the outer surface dark and covered with sand. The nests of the trap-door spiders have lids which fit accurately, and are covered with moss, earth, and lichen; in fact the nests of a great number of species believed to be trap-door spiders have never been found. In many cases the vibratory sensitiveness of the web is such that an approaching enemy finds the spider forewarned. When *Argiope cophinaria* has not time to drop from her web to the ground, 'she makes use of another power—she will render herself invisible. The web begins to sway backward and forward; the rapidity of the motion increases; the outlines become indistinct, and within a few seconds of the first movement spider, web, and all have vanished from sight! Others, such as *Pholcus atlanticus*, hang by the legs, and whirl the body rapidly with the same bewildering result.' Herbert Smith suggests that the sideways movement of the *Laterigradae* has a protective value, since the enemies are likely to allow for a forward movement of their prey. Many Epeiridae and other spiders drop to the ground when danger threatens, and remain motionless on a surface which they often resemble in colour. McCook seems inclined to regard this death-feint as a trick, not as fear paralysis or catalepsy. The cocoons are hidden in crevices, or covered with web and debris, or carried about by the mother—sometimes attached to the abdomen, sometimes in the jaws. For further examples of the thousands of protective habits, see the works of the Peckhams and Dr McCook.

Often the forms and colours of spiders have a protective resemblance to pieces of plants or to dead things. The species of *Uloborus* are like small pieces of bark; *Hyptioides cavatus* resembles a bit of dirt or the ends of the dead pine branches among which it lives; *Cyrtophora conica* is hardly distinguishable from the pieces

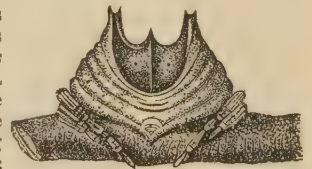


Fig. 4.—*Cerostriis mitralis* on a branch (after E. G. Peckham).

of light rubbish which it accumulates in its web; *Cerostriis mitralis* resembles a woody knot on the branch on which it rests; *Thomisus foka*, a species much dreaded in Madagascar, has a very strange,

crab-like form, and resembles in colour and general appearance the fruit of *Hymenaea verrucosa*, a tree common in the forests where this spider is found; *Drapetisca socialis* is very like the bark of birches and other trees on which it lives; among the



Fig. 5.
Gasteracantha rufospinosa,
female, mag. $2\frac{1}{2}$ diameters.
(After E. G. Peckham.)

Lycosidae there are scores of dull-coloured species that live on the ground; Dr McCook describes one form which has a tint like that of the water upon which it is constantly found; about a dozen species which live on leaves are recorded as protectively green; many Thomisidae are coloured like the flowers on which they await their victims; *Ornithoscatoides decipiens*, first described by Forbes, is, as its name suggests, most deceptively like

bird-excrement, so that the discoverer actually plucked the leaf on which the spider was resting, and looked at it for some moments before he discerned his captive. In short, what Wallace said about the leaf-like butterfly is often true of spiders: 'Size, colour, form, markings, and habits all combine to produce a disguise which may be said to be absolutely perfect.'

Again, there are spiders which are rendered inedible by an armature of spines and plates, and many of these (e.g. some Gasteracanthidae) are very brilliantly coloured. It is possible that their conspicuousness impresses their enemies with the fact that they are better left alone.

Lastly, there are spiders which exhibit a protective mimicry of animal forms. 'Spiders most commonly mimic ants,' E. G. Peckham says; 'but we hear also of their imitating beetles, snail-shells, ichneumon and horse flies. There is also a curious Madagascar species which looks exactly like a little scorpion, the resemblance being heightened by the habit of curving its flexible tail up over its back when irritated. Nearly all the species of Coccothestes and Homalattus resemble beetles; Cytarachne is like a snail-shell; *Synageles picata* and *Synemosyna formica* are good examples of those which have a mimetic likeness to ants.'

Classification.—Spiders of the Bird-catcher (Mygale) type differ from all the others in having four pulmonary sacs (Tetrapneumones). The Dipneumones, which form the vast majority, including several thousand species, are conveniently classified according to their habits whether sedentary or wanderers, and according to their spinning-work, this physiological classification being also justified anatomically. Another fact of some importance is the presence or absence of a cribellum. Thus we distinguish

	Sub-order—TETRAPNEUMONES.
	Tribe I.—Territelariae: Tunnel-weavers.
	Sub-order—DIPNEUMONES.
'Sedentary'	Tribe II.—Tubitelariae: Tube-weavers, including Ecribellatae and Cribellatae.
	Tribe III.—Retitelariae: Line-weavers.
	Tribe IV.—Orbitellariae: Orb-weavers, including Ecribellatae and Cribellatae.
'Wanderers'	Tribe V.—Laterigradae.
	Tribe VI.—Citigradae.
	Tribe VII.—Saltigradae.

Numerous extinct species of spiders have been obtained from Tertiary deposits, especially from amber. The oldest known form (Protolycosa) occurs in Carboniferous strata.

British Species.—Among the British species the following may be noted: The Common Garden

Spider (*Epeira diadema*), and other species of this genus; the House-spiders (*Tegenaria domestica* and *T. civilis*); *Agelena labyrinthica*, which makes large cobwebs, very abundant on heaths; the Water Spider (*Argyroneta aquatica*), which inflates its sub-aquatic dome-shaped web with air brought from the surface entangled among the hairs of the spider's body; the Green Crab-spider (*Sparassus smaragdulus*), whose young are fond of ballooning in autumn evenings; a few Wolf-spiders, such as *Lycosa piratica* and *Dolomedes fimbriatus*; *Salticus scenicus*, exceedingly common on walls and fences, and *Atypus sulzeri*, the only British representative of the Trap-door Spiders (see Systematic List: P. Cambridge, *Proc. Linn. Soc.*, xxx. 1875).

Relations to Man.—The wide-spread prejudice against spiders is not scientifically justifiable. We must admire their dexterity, their instinctive aptitudes, their intelligence, the beauty of their architecture, the elaborateness of their courtship (tragic as it sometimes is for the suitor), and their maternal care. Although there are countless tales of 'black spiders,' rarely preserved for identification, which are alleged to have given dangerously poisonous bites, this is not true except in regard to the famous Tarantula (*Lycosa tarantula*), and even the effects of its bite have been grossly exaggerated both by evil intention and credulous superstition. Of a not uncommon line-weaver (*Lathrodictus oculatus*), which has a very bad reputation as a venomous biter, one of the authorities on spiders says that he repeatedly allowed himself to be bitten and suffered no inconvenience. In fact, if we except the Tarantula, there are few spiders more dreadful than are fleas. In old medical practice a spider was sometimes applied to the wrist in cases of fever, and another custom of applying the web to staunch bleeding is still practised by schoolboys, who are happily ignorant of antiseptic precautions. The great value of spiders is the obvious one that they destroy so many insects; thus, McCook counted thirty-six mosquitoes on a single web.

See especially H. C. McCook, *American Spiders and their Spinning-work* (3 vols. Phila. 1890-94); Warburton in *Cambridge Natural History*, vol. iv. (1909); E. Blanchard, *Arachnides* (Paris, 1853-64); Sir E. Ray Lankester, article 'Arachnida,' *Encyclopædia Britannica* (1910); J. H. Emerton, *The Structure and Habits of Spiders* (Salem, 1878); Moggridge, *Trap-door Spiders* (Lond. 1872); G. W. and E. G. Peckham, *Observation on Sexual Selection in Spiders of the family Attidae* (Milwaukee, 1889); E. G. Peckham, *Protective Resemblance in Spiders* (Milwaukee, 1889); E. Simon, *Les Arachnides de France* (Paris, 1874-84); Thorell, *Europæan Spiders* (Uppsala, 1870); E. Simon, *Histoire Naturelle des Araignées* (Paris, 1901); J. H. Fabre, *The Life of the Spider* (trans. 1912); T. H. Savory, *British Spiders, their Haunts and Habits* (Oxford, 1926); Cecil Warburton, *Spiders* (Cambridge, 1912); J. H. Comstock, *The Spider Book*; R. A. Ellis, *Spiderland* (New York, 1912).

Spiegelstein. See BESSEMER, and IRON AND STEEL.

Spielberg. See BRÜNN.

Spielhagen, FRIEDRICH, German novelist, was born at Magdeburg on 24th February 1829, but passed all his youth at Stralsund. From the



Fig. 6.—The Garden Spider
(*Epeira diadema*).

gymnasium there he proceeded in 1847 to the universities successively of Bonn, Berlin, and Greifswald, afterwards settling at Leipzig in 1854 as a *docent*, at Hanover in 1859, and at Berlin in 1862, in the last two places till 1884 as a newspaper editor. His works, of which several have been translated into English, are some fifty in number, and include (besides poems, dramas, books of travel, translations, and short stories) *Problematische Naturen* (1860), *Durch Nacht zum Licht* (1861), *Die von Hohenstein* (1863), *In Reih und Glied* (1866), *Hammer und Amboss* (1868), *Sturmflut* (1876), *Uhlenhans*, *Quisisana*, *Faustulus* (1897), *Herrin* (1899), and *Freigeboren* (1900). Mostly 'novels with a purpose,' dealing with burning questions of the day, his best work has exceptional power and charm, in spite sometimes of portentous length; the sea interest is rare in German fiction. He died 25th February 1911. He published an autobiography in 1890 (2 vols.), and there are studies by Karpeles (1889) and Henning (1910).

Spigelia, a genus of plants of the family Loganiaceae, having a calyx glandular inside, a long slender valvate corolla, long filaments, and a capsule of two cocci, splitting around at the base. *S. marilandica*, often called Worm Grass and Carolina Pink, is a native of the southern United States, a perennial plant with a simple quadrangular stem. The root (Pink Root) is purgative, narcotic, and poisonous, but is a powerful vermifuge, and is very commonly employed in the United States. *S. Anthelmia*, an annual, native of tropical America, with very small purplish flowers, in spike-like racemes, possesses similar properties. The efficacy of both is, however, impaired by keeping; and they are apt to produce unpleasant symptoms when used as medicines. Other species are also known as poisons.

Spike, in Botany, that kind of inflorescence in which sessile flowers, or flowers having very short stalks, are arranged around an axis, as in the greater plantain, common vervain, common lavender, and some species of sedge. In rye, wheat, barley, darnel, and many other grasses there is a sort of compound spike—i.e. the flowers or fruits are arranged together in spikelets upon short stalks, which again surround the top of the culm in the form of a spike. The catkin, the spadix, and the cone may be regarded as varieties of the spike.

Spikenard, or NARD (Gr. *Nardos*), a perfume highly prized by the ancients, and used both in baths and at feasts. It was brought from India, and was very costly. The plant which produces it is the *Nardostachys Jatamansi*, a small plant of the family Valerianaceae, a native of the Himalaya, found at least as far south as the Deccan. The odour is not, however, generally agreeable to Europeans. Spikenard is popularly believed to have the power of promoting the growth and blackness of the hair, and to be an antidote for poisons. It is now more used medicinally than as a perfume. The aromatic hairy tap-root, which is from 3 to 12 inches long, sends up many stems with little spikes of purple flowers, which have four stamens. The name spikenard was given by the ancients to many perfumes used as substitutes for the true or Indian spikenard, some of which were derived from the roots of plants of the same family, the kind called Gallic or Celtic spikenard from those of *Valeriana celtica* and *V. salicina*, which are still used in the East for perfuming baths, and that called Cretan spikenard from those of *V. tuberosa* and *V. Phu*. All of these grow on the Alps and other mountains of the south of Europe, and the peasantry of Styria and Carinthia collect them from rocks on the borders

of perpetual snow. They are tied in bundles, and sold at a very low price to merchants, who sell them at a great profit in Turkey and Egypt, from which a proportion is transmitted even to India.

Spiking is the operation of quickly rendering a muzzle-loading gun useless, resorted to by troops compelled to abandon their own pieces or unable to remove those of the enemy which they have captured. The process consists in driving a cast-iron spike into the vent or touch-hole and then breaking it off short with a hammer. A spiking party of artillerymen always accompanied a storming party. To render a spiked gun again serviceable it was generally necessary to drill a fresh vent. Breech-loading guns are best rendered temporarily unserviceable by removing part of the breech mechanism.

Spilsby, a market-town of Lincolnshire, 19 miles by rail N.E. of Boston, stands on the edge of the Wolds. The church contains interesting monuments of the Willoughby family (1348–1610), and the market-place has a bronze statue of Sir John Franklin, a native of the town.

Spinach, or SPINAGE (*Spinacia*), a genus of herbaceous plants of the family Chenopodiaceae; dioecious, the male flowers consisting of a four-parted perianth, and four stamens; the female, of a two to three cleft perianth, and an ovary with four styles; the perianth hardening around the fruit as it ripens; the fruit an acheneum. Common Spinach, or Garden Spinach (*S. oleracea*), is in



Common Garden Spinach (*Spinacia oleracea*).

general cultivation for the sake of its young leaves, which are a favourite and wholesome vegetable, prepared either by boiling or by frying with a little butter. Two very distinct varieties are cultivated—Prickly Spinach, which has the leaves somewhat triangular and arrow-headed, and the fruit rough with prickly-like projections; and Smooth Spinach, or Round Spinach (*S. glabra* of some botanists), with the leaves more round and blunt, and the fruit smooth. Spinach is an annual. Its stem rises to the height of from 2 to 4 feet; the male flowers are in long spikes, the female in clusters close to the stem. After the stem begins to be developed the leaves become bitter and unfit for use. This bitterness appears also at an earlier period in dry weather or in poor soil; and the more luxuriantly spinach grows the better it is. It is sown in spring, and is ready for use in a very short time; or it is sown in autumn, thinned out, and used early in spring. The smooth spinach is very generally preferred for the former purpose, and the prickly kind for the latter; but a somewhat intermediate variety called Flanders Spinach, in the seed trade named Viroffley Spinach, is now

often used for both, being particularly esteemed for the large size of its leaves. The native country of spinach is not well known, but is believed to be some part of Asia, as the plant was introduced by the Arabs into Spain, and thence diffused over Europe. Another species (*S. tetrandra*) is cultivated and much esteemed in India. The name spinach is also given to a number of other plants of very different botanical characters, but the same bland and nutritious qualities, and used in the same way. New Zealand Spinach is *Tetragonia expansa*, a plant of the Aizoaceae, a trailing, succulent annual, spreading widely over the surface of the ground, and producing a great abundance of stalked ovate-rhomboid leaves. The young stems and leaves of this plant are much used in New Zealand, and have now come into very general use also in other parts of the world as a kind of spinach. It is cultivated in the middle and south of Europe and in Britain, succeeding well even in Scotland with the slightest aid of a hotbed in spring, and is found particularly useful in light dry soils, in which in summer it is difficult to maintain supplies of the common spinach. Patience Dock, or Garden Patience (*Rumex Patientia*; see DOCK), is called in Germany English Spinach, and was formerly much cultivated in England, but is now neglected.

Spinal Column and Spinal Cord. The spine or spinal column is the most important and characteristic part of the Skeleton (q.v.) of the highest division of the animal kingdom. It is composed of a series of bones placed one above, or in front of another, and called vertebrae; and hence these animals, having this distinguishing characteristic in common, are all included in the term *Vertebrates*. The vertebrae vary greatly in number in different animals, and even in members of the same class, and the number bears no apparent relation to the other organs of the animal. Moreover, in their shape they differ extremely even in different parts of the same spine, in accordance with their special functions. In man the number of vertebrae which collectively form the spinal column is 7 in the neck (cervical vertebrae), 12 in the back (dorsal vertebrae), 5 in the loins (lumbar vertebrae), all of which are capable of being detached from one another, and are termed *true* vertebrae; and 5 vertebrae which ossify together after birth and form the sacrum, and 4 or 5 similarly united forming the termination of the column, and constituting the bone called the coccyx, which are known as *false* vertebrae. However long or short the neck may be, every mammal has 7 cervical vertebrae, excepting the three-toed sloth, which has 9, and the sea-cow, which has 6. In the other regions of the spine no such uniformity exists. Each vertebra is attached to the two between which it lies by numerous strong and more or less elastic ligaments, and between each pair of vertebrae there is interposed a lenticular disk of fibro-cartilage, which acts as a buffer. By these arrangements the spinal column is rendered highly elastic, the communication of jars or shocks is prevented, and a very considerable general range of movement permitted, although the motion between any two adjacent vertebrae is slight. The elasticity of the column is further increased by the component vertebrae being arranged in curves instead of being placed perpendicularly. The curves should be exactly in the antero-posterior direction, any well-marked lateral deviation from the perpendicular being abnormal; but a very slight lateral curvature with the convexity to the right may often be detected in the upper and middle parts of the back, and is supposed to be dependent on the more frequent use and greater strength of the right arm as compared with the left. From their position they are termed

the cervical, dorsal, lumbar, and sacral curves. The dorsal and sacral curves have their concavities in front, and thus enlarge the spaces in which the thoracic and pelvic viscera are contained; the two other curves are convex anteriorly, and thus afford support to the parts above them. The upper three curves are so arranged that their cords are in the same vertical line in the erect position of the body, and this vertical line corresponds with the line of gravity of the head. The cause of these curves is to be sought for in the shape of the vertebral bodies, in that of the intervertebral substance, and in the individual's attitude or gait. They enable the spine to bear a greater vertical weight; it is calculated that nine times as great a vertical force is required to bend it as if it had been straight; and they facilitate the movements of the body, especially in the act of running. Similar curves are seen in the spine of other mammals (see ANTHROPOID APES), though the degree of curvature is liable to great variation. The lumbar curve, which has especial reference to the erect position, is always much less marked than in man, and is much less pronounced among primitive races than among Europeans. Further, all human beings acquire the cervical and lumbar curves subsequent to birth, whereas the dorsal and sacral curves are present at birth.

The vertebral canal formed by the apposition of the spinal foramina or neural arches, and containing and protecting the spinal cord, varies in its size at different parts of the column. It is largest in its antero-posterior diameter in the neck and loins (measuring at the last lumbar vertebra $\frac{3}{4}$ of an inch), where the antero-posterior movements of the spine are greatest, and where the cord is least closely attached to the vertebrae; while in its lateral diameter it is greatest at the atlas, where it measures nearly an inch and a half. A transverse section of the canal is nearly circular through the greater part of the back. The intervertebral foramina through which the nerves emerge vary in shape and position in different parts, but are always of sufficient size to prevent injurious pressure on the nerves during movement of the spine; and in the dorsal region, which is the ordinary seat of angular curvature, the nerves are so protected by bony arches that they may escape injury, even when the bodies of several dorsal vertebrae have been destroyed by ulceration.

The *spinal cord*, which occupies the whole extent of the vertebral canal in the early months of fetal life, extends in the adult from the foramen mag-

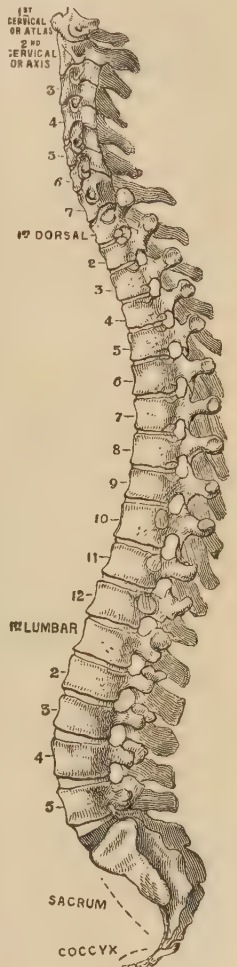


Fig 1.—Spinal Column

num to the lower edge of the first lumbar vertebra, and has an average length of 45 cm. Below this point it is continued as a narrow thread containing little nervous matter, the *filum terminale*. The cord is, like the brain, encased in a triple sheath of membranes, the pia, arachnoid, and dura mater, the last two of which are less closely opposed to the cord and the vertebral column than they are to the brain and the cranium. The cord is a somewhat flattened cylinder or column of a whitish colour. It is divided into two lateral halves by an anterior median fissure and a posterior median septum. The former is less deep but wider than the latter, which is merely a process of pia mater. From each side of the cord thirty-one pairs of spinal nerves arise, each by an anterior and a posterior root (see NERVOUS SYSTEM). The cord is not of uniform circumference throughout. There is a slight thickening where the brachial nerves, and another where the lumbar nerves, arise. These are termed the brachial or cervical and lumbar enlargements respectively. The nerve roots in the cervical and dorsal regions pass nearly

are of the multipolar type. They send a well-marked axis cylinder process into the anterior nerve root, and by their other processes are associated with fibres which descend from the cerebrum and from the posterior roots and other sources. In the posterior horn the nerve cells are mostly smaller, with short axons which end in the adjoining gray matter of the lateral and anterior horns. In the lateral horn, the cells are small and elongated, and form the *intermedio-lateral tract*; they are connected with the sympathetic system.

The white matter of the cord is composed of nerve fibres, united by a small amount of connective tissue. The fibres have mostly a longitudinal direction, with the exception of a small strand which crosses from one side to the other at the bottom of the anterior median fissure—the anterior white commissure. Each half of the cord is divided by the anterior and posterior roots into three columns, named anterior, lateral, and posterior. Though these look almost exactly alike, both to the naked eye and under the microscope, they can be divided into groups by the ‘embryological’ and ‘degenerative’ methods. The former is based on the fact that certain groups of nerve fibres obtain their myelin sheaths before others; the latter depends on the fact that if a nerve fibre is separated from its nerve cell, the separated part wastes or degenerates, while the part which is united to the nerve cell does not degenerate, although the nerve cell itself undergoes a degenerative change known as ‘chromatolysis.’ An injury to the spinal cord will thus show an *ascending degeneration* above the injury of sensory fibres whose cells of origin lie below the lesion, and a *descending degeneration* of motor fibres whose cells of origin lie above the lesion. The principal ascending tracts are: (1) The *postero-median* and *postero-lateral* tracts. These lie in the posterior columns and arise from cells in the posterior root ganglia. They pass upwards on the same side of the cord to the medulla oblongata, where they terminate in two large nuclei known as the *nucleus gracilis* and *nucleus cuneatus*. A second neurone, termed the *mesial fillet*, carries the impulses after decussating upwards to the optic thalamus of

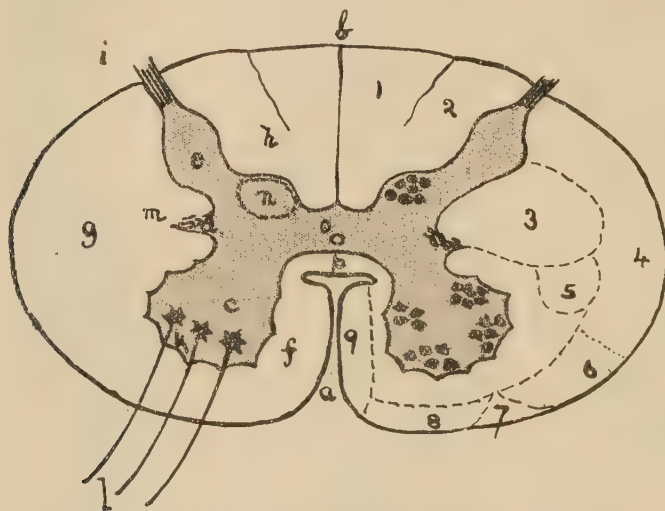


Fig. 2.—Diagrammatic Transverse Section of Spinal Cord.

a, anterior median fissure; b, posterior median septum; c, d, e, anterior, lateral, and posterior horns of gray matter; f, g, h, anterior, lateral, and posterior columns of white matter; i, posterior roots; j, anterior horn nerve cells; k, anterior nerve roots; m, intermedio-lateral tract; n, Clarke's column; o, central canal; p, anterior commissure; 1, postero-median tract (of Goll); 2, postero-lateral tract (of Burdach); 3, crossed pyramidal tract; 4, direct cerebellar tract (of Flechsig); 5, pre-pyramidal tract (of Monakow); 6, antero-lateral ascending tract (of Gowers); 7, bundle of Helweg; 8, antero-lateral descending tract (of Löwenthal); 9, direct pyramidal tract.

transversely outwards through the intervertebral foramina; but the lumbar and sacral nerves are directed downwards to attain their points of exit, in such a manner as to obtain the name of *Cauda Equina*.

The cord is seen to be composed of white and gray matter. On a transverse section the gray matter is found in the centre to present the appearance of a double crescent, concave outwards, with a commissural band between the two sides, so that the whole somewhat resembles the letter H. In the gray commissure is the *central canal*, which extends throughout the whole length of the cord and becomes continuous above with the fourth ventricle. The gray matter is divided into an anterior, a lateral, and a posterior horn. It is composed of a basis of connective tissue with a fine felt-work of nerve fibres and nerve cells. In the anterior horn, which becomes specially developed in the brachial and lumbar enlargements, the cells

of the opposite side. The connection with the post-Rolandic cortex is not yet identified. These fibres carry sensory impulses from the sensory end-organs to the cerebrum. (2) The *direct cerebellar* tract of Flechsig and the *antero-lateral ascending* tract of Gowers were once thought to be distinct, but are now known to be one tract (spino-cerebellar tract). They arise from the cells of Clarke's Column, a nucleus of large nerve cells lying at the base of the posterior horn, and enter the cerebellum without decussating by the inferior peduncle, except a few fibres which pass upwards and enter by the superior peduncle. (3) Numerous other smaller tracts pass upwards from the spinal cord to other parts of the brain stem. The principal descending tracts are: (1) The *crossed pyramidal* or cerebro-spinal tract, which arises from the Betz cells in the motor area of the cortex and passes downwards to decussate in the medulla and terminate in the spinal cord, where a connection is established with the motor

cells in the opposite anterior horn. A few fibres do not decussate, and form the *direct pyramidal* tracts which only pass as far down as the cervical region and finally decussate in the anterior commissure. (2) The *pre-pyramidal* or rubro-spinal tract arises in the red nucleus in the mid-brain, decussates close to its origin, and ends in the gray matter of the spinal cord. Injury to this tract results in involuntary movements such as in paralysis agitans. (3) The *antero-lateral descending* tract of Löwenthal lies at the anterior margin of the cord. It is continuous with the posterior longitudinal bundle, and ends directly round the cells of the anterior horn. The *bundle of Helweg* or olivospinal tract passes from the inferior olive to the cervical region of the cord. Its function is not yet known. (4) Other smaller descending tracts connect various parts of the brain with the spinal cord. (5) Other fibres connect different levels of the spinal cord together.

Functions.—The functions of the spinal cord fall into two categories—first, that of the gray matter, which consists of the conversion of afferent into efferent impulses, i.e. involuntary or *reflex action*; and second, that of the white matter, which is *conduction*. For each segment of the vertebral column there is a corresponding segment of the spinal cord with two pairs of nerves connected with it, one anterior or motor, and the other posterior or sensory, each of which is in relation at the periphery with definite groups of muscles and cutaneous areas, there being a true segmentation of the body surface as well as of the muscles corresponding to each spinal segment. The spinal cord thus represents a series of central organs which were originally independent, but have now fused, and their functions have mingled. What remains of their primary independence is confined to the simplest reflex acts, which are to be regarded as the elementary nervous process which underlies the most complex activities of the spinal system. The long conduction nerve tracts passing from the cord to the brain constitute so many intercentral reflex arcs, by means of which the spinal mechanisms of the higher vertebrates are brought into direct functional communication with the brain mechanisms. It is through these long conducting paths that, with the development of definitely conscious sensations and voluntary movements, the spinal cord ceases to be a collection of autonomous centres and becomes the instrument of the brain. At the same time it may also exhibit activity independently of the higher centres, and different reflex centres may be localised at different levels, as shown by the fact that the integrity of the cord is not essential for reflex action, an isolated segment being sufficient. If the gray matter of the cord be destroyed, all reflex action ceases.

Nearly all spinal acts present the character of reactions induced by external influences, and are adapted to adjust the organism temporarily to its environment. They have been divided into two classes—first, those where the sensory stimulus is injurious to the organism and the reflex aim is to remove the stimulus, or to remove the point of the body stimulated, i.e. they are defensive; and second, those where the stimulus is favourable to the normal development of useful functions such as walking. Reflex actions, however, although they depend on afferent excitations from sensory end-organs and elsewhere, as opposed to voluntary actions where the stimulus comes from the brain, depend also on influences from other portions of the nervous system which may moderate or depress their activity or may augment it, the former being termed *inhibition*, the latter *facilitation*. In man the brain normally exerts a marked inhibitory in-

fluence upon the spinal reflexes, and thus disease of the brain—e.g. apoplexy—results in an exaggeration of these reflexes by removing this inhibition. Disease of the spinal cord, if the lesion be transverse, produces loss of sensation and paralysis below the injury with loss of sphincter control, while circumscribed lesions may be localised by a study of the motor and sensory disturbances which they produce.

LITERATURE.—Alex. Bruce, *Topographical Atlas of the Spinal Cord* (1901); Villiger, *Brain and Spinal Cord* (1912; new ed. 1926, translated by Piersol); Sherrington, *Integrative Action of the Nervous System* (1906); Luciani, *Human Physiology* (vol. iii., 1915).

CURVATURE OF THE SPINE.—There are two main forms of this disease, which are due to different causes—viz. Angular Curvature or Pott's Curvature, and Lateral Curvature.

Angular curvature, which was first described by the famous surgeon Percival Pott (1713–88), and is hence often named after him, is due to disease of the bodies of the vertebrae and of the intervertebral discs. It usually takes the form of a tubercular disease of the bones, which become carious and destroyed, and of ulceration of the discs between them. The result is that the bodies of the diseased vertebrae give way and the column becomes bent forward on itself, while the spinous processes form a backward projection opposite the diseased part—hence the name angular curvature. This projection is most marked when the disease is in the dorsal region of the spine. If the disease is arrested the bones become firmly united, and the curve of the spine becomes permanent. In unfavourable cases abscesses may develop in the neighbourhood, and either press on the spinal cord or on the spinal nerves, or burrow in various directions, notably in the lumbar region (psoas abscess). The disease is often set up by an injury which may be severe, such as the falling of a heavy weight on the back, or in children may be some trifling twist or fall, such as may occur during rough play or from falling out of bed or from a chair. It most often occurs in delicate children with a tubercular family history, but it is by no means unknown in those whose family and personal history is quite unexceptionable, and it may even affect adults. Its early symptoms are often obscure, and consequently may be overlooked at a time when treatment is of most avail. There is at first little or no deformity, but there may be pain on percussing the spine of the affected vertebrae. There is also usually an avoidance of all movements which may lead to jarring of the spinal column or to painful pressure on the nerves. If the vertebrae of the neck are affected the child often supports its chin by the hands, and does not willingly turn its head round. Disease of the dorsal or lumbar vertebrae is generally indicated by cautious movements, especially in coming down a stair, the avoidance of stooping or bending, or sudden twisting of the body. A child will thus get down on its knees to pick anything off the floor rather than stoop.

The treatment requires to be both local and constitutional. It is always protracted for months or even years. The general treatment is mainly that required for strumous constitutions, such as codliver-oil, iron, hypophosphite of lime, &c. The local treatment involves absolute rest in the recumbent position in the early stage, with counter irritation over the spine in the neighbourhood of the disease. In later stages mechanical supports are also required to keep the vertebrae from pressing on each other. The kind of support needed varies with the region affected; one very valuable form for hospital practice consists in the application, during the suspension of the patient, of a

plaster of Paris jacket to the body. The more carefully rest in the recumbent position and mechanical support are carried out, the less, as a rule, will be the resulting deformity, the greater the prospect of avoiding complications and of obtaining permanent cure.

Lateral curvature consists in a twisting of the bodies of the vertebræ on each other round their vertical axis. It is sometimes a result of rickets, but is far more frequently developed in growing girls of feeble muscular development and general health, between the ages of ten and sixteen. It is produced in the first instance by the continued maintenance of asymmetrical positions of the body, such as by sitting sideways or cross-legged before a school-desk, or by carrying a weight on one arm. This curvature is usually to the right in the dorsal region with a corresponding twist to the left in the lumbar region. One shoulder, usually the right, becomes elevated, and the scapula projects, while the right side of the chest becomes rounded and the left side flattened. The lungs and liver become compressed and subject to disease, and the gait becomes awkward. This disease is due in the first instance to rotation of the bodies of the vertebræ on each other as the result of the irregular pressure. Later the ligaments and articular processes of the vertebræ undergo permanent changes, while the muscles may atrophy or undergo fatty degeneration. The ribs also become distorted, those at the side of the convexity of the curve bending at the angles, those at the other side becoming flattened.

The treatment of this form differs entirely from that of angular curvature. As the disease is due to the continuance of asymmetrical positions of the body, combined with muscular and general debility, general tonics, fresh air, and gymnastic exercise specially directed to the strengthening of the weakened muscles must be adopted. In the later stages, when the deformity has become more confirmed, mechanical supports may be required as an adjuvant to the above.

SPINA BIFIDA is a congenital malformation occurring perhaps more frequently than any other except hare-lip, and arising like it from arrest of development. It may be regarded as a congenital hernia of the membranes of the spinal cord through a fissure in the wall of the bony canal. A tumour is thus formed, which is usually of a roundish shape varying in size from that of an egg to that of an adult head, lying in the middle line of the back, fluctuating, and adhering to the adjacent vertebræ either directly or by a pedicle. The usual termination of the disease is death. As the size of the tumour increases, fatal convulsions ensue; or the skin investing the tumour may ulcerate and the contents escape, in which case palsy or convulsion produces death. Occasional cases are, however, recorded in which patients with this affection have survived till middle life. Surgical treatment has, until quite recently, been unsatisfactory; but with improved modern methods successful results have in many cases been obtained. Moderate support by means of a hollow truss, or a well-padded concave shield, may tend to keep the disease stationary; and any interference beyond this is, in the great majority of cases, unadvisable. For other diseases connected with the spine, see **MENINGITIS**, **MYELITIS**, **LOCOMOTOR ATAXIA**, &c.

Spinazzola, a city of Southern Italy, 30 miles SW. of Bari. It was the birthplace of Pope Innocent XII. Pop. 11,000.

Spindle-tree (*Euonymus*), a genus of plants of the Celastraceæ, a family of small trees or shrubs. The genus *Euonymus* has a lobed capsule and seeds surrounded by an aril, which in some of the species is remarkable for its brilliancy of colour.

The Common Spindle-tree (*E. europæus*), a native of Britain, chiefly of the southern parts, and of great part of Europe, is very ornamental when in fruit, and its aril is of a fine orange colour. It is a shrub rather than a tree. The wood is hard and fine-grained. It is used for the finer articles of turnery and for skewers. It was formerly used for making spindles, whence the name of the shrub. In Germany the shoots are bored for stems of tobacco-pipes. Charcoal made of it is much valued for crayons.

Spinel is a mineral composed chiefly of magnesia and alumina, and crystallising in octahedra. There are several varieties, which differ in chemical composition owing to isomorphous substitution, sometimes of the protoxides, but usually of the sesquioxides. *Spinel-ruby*, the typical spinel, is clear pink-red, and contains little or no iron; *Pleonaste* (*Ceylonite*), or *Iron-magnesia Spinel*, is dark green to black, containing iron; *Picotite*, or *Chrome Spinel*, is black, containing chromium oxide; *Gahnite*, or *Zinc Spinel*, is green to brown, containing zinc; *Hercynite*, or *Iron Spinel*, is black, and occurs massive, in this variety ferrous oxide replacing magnesia. Ruby spinel occurs as crystals imbedded in granular limestone, also with calcite in serpentine and in various crystalline schists, as also in the alluvial sands, &c. derived from the disintegration of these rocks. Pleonaste is an occasional constituent of eruptive rocks, and also of certain rocks which have undergone alterations from contact with eruptive masses. Picotite has been met with in basalt, but is more commonly seen in peridotite. Gahnite is of sparing occurrence in certain crystalline schists, while Hercynite is occasionally found in such rocks as granulite. The finer varieties of spinel are prized as gems—the red coloured ones being commonly called rubies. See **RUBY**.

Spinello Aretino, an Italian painter, was born at Arezzo about 1330, his father being a Ghibelline exile from Florence. The painter spent nearly all his life between his birthplace and his father's city, and died at Arezzo about 1410. His principal frescoes were done for the sacristy of the church of St Miniatus near Florence, for the *campo santo* (cemetery) of Pisa, and for the municipal buildings of Sienna (a series illustrating the Italian wars of Frederick Barbarossa), with several others in and near Arezzo. Spinello enjoyed a great reputation in his own day, being compared, and by some preferred, to Giotto, whose style his own in some respects resembles. Unfortunately his frescoes have mostly disappeared; and his panel and easel pictures, of which there are several in the galleries of Europe, do not equal his frescoes in excellence.

Spines. See **THORNS**.

Spinet. See **HARPSICHORD**.

Spinifex, a name given to grasses of two distinct genera. (1) The botanical genus *Spinifex*, in Ceylon, India, Japan, and Australia, has its spikelets massed in spiny heads, which when ripe break off and blow about over the sands. (2) In Australia the name is more commonly given to the genus *Triodia* or Porcupine Grass (*T. pungens*, *T. irritans*, *T. Mitchellii*, *T. Cunninghamii*), very coarse, hard, and spiny grasses, which grow in tussocks, and in some interior parts of Australia covers hundreds of square miles at a stretch. These grasses cannot be eaten by any animal, and as the clumps are three or four feet high they make travelling very laborious and painful.

Spinning is the art of twisting fibrous substances into rounded strands of yarn fitted for weaving, or for thread or rope making. To form such strands two operations are essential—(1) the drawing out of uniform quantities of fibre in a

continuous manner, and (2) twisting the material so drawn out to give it coherency and strain-resisting power. The earliest and for ages the only spinning apparatus was the spindle with the distaff. On the staff the prepared (carded or combed) material, wool or flax, was loosely wound, and it was held in the left hand or stuck in the belt of the spinner.

The spindle (fig. 1) was a smaller tapering rod, the rotation of which gave the twist, and around which the thread was wound as it was twisted. The twist was given by causing the spindle to rotate against the person, and allowing it to fall towards the ground whilst spinning around. To give the spindle increased momentum it was weighted with a whorl (fig. 1) of stone or metal, but as the weight of the yarn on it increased this make-weight was removed. A graphic description of this method of spinning is given by a Scottish rhymester of the 18th century.

To save their plaiding coats some had
Upo' the haunch a bonnet braid
Or an auld wecht or kairding skin
To rub and gar the spindle rin
Down to the ground wi' twirling speed
An' twine upo' the floor the thread.

Fig. 1.—Spindle and Whorl.

Simple as it is, the spindle has continued in use from prehistoric times to the present day: even in some outlying regions of the Scottish Highlands and Islands, Sir Arthur Mitchell reported that up to the date of his 'Rhind Lectures,' *The Past in the Present* (1880), yarn was still being made with it; and in India some of the exceedingly delicate yarn for Dacca muslins is made on the spindle. The first improvement on this simple apparatus consisted in fixing the spindle in bearings and causing it to rotate by a cord passed over a wheel. Next came the fitting on the spindle of a separate bobbin to receive the spun yarn, and this in effect constitutes the charka or spinning-wheel of the East, which has there been used from time immemorial, and also the 'muckle wheel,' the use of which continued in Scotland till recent times. This simple wheel was known in Europe as early as the 14th century, but the greatly improved small or Saxon wheel (fig. 2), with a treadle motion giving continuous rotation to the spindle and allowing the spinner to sit with both

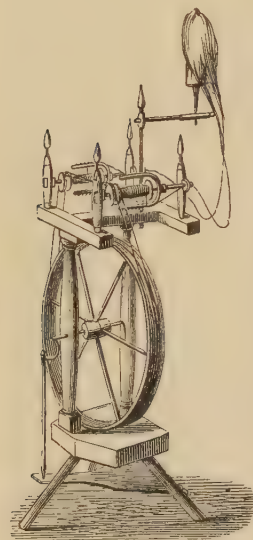


Fig. 2.—Two-spindle Distaff.

hands free, was not known till much later times. In the spinning-wheel in its improved form a bobbin or pirn with a separate motion was placed on the spindle (fig. 3), which had two bent arms, the flyer or flight, for winding the yarn on the bobbin. The bobbin and flyer revolved at different rates—the revolutions of the spindle giving the twists and the difference of rotation causing the winding on. In such wheels it was possible to have two spindles and pirns a little apart (the two-spindle wheel, fig. 2), with distaff-stand between them, and on

these the spinster produced thread with each hand. The introduction of mechanical spinning towards the end of the 18th century largely destroyed this domestic craft, though in the northern and western Highlands of Scotland, and also in the 'home-spun' industry of Ireland, yarn still continues to be made by the cottagers on the hand-wheel.

Invention of Spinning Machinery.—The series of inventions which overthrew hand-spinning may be said to have been begun by Lewis Paul in 1738, when he patented the important principle of drawing out and attenuating a sliver or loose coil of fibre by passing it between successive pairs of rollers revolving at increasing rates of velocity. This principle of drawing out fibres by accelerated motion was developed in the spinning-frame or throstle invented by Arkwright in 1767, and it forms a fundamental feature of all modern spinning machinery. About 1764 James Hargreaves at Standhill, near Blackburn, invented his spinning-jenny (fig. 4), an apparatus by which eight threads could be spun at once, and this was soon improved upon until eighty could be produced as easily. In this apparatus a number of large reels filled with thickish coils of fibre called rovings were set on upright fixed spindles, and the ends of such rovings were passed between two small movable bars of wood placed horizontally and under the control of the spinner, who could thus make them press more or less on the rovings, and consequently increase or decrease the draw upon them from the spinning-spindles, which were set in a row in the carriage or movable frame. These spinning-

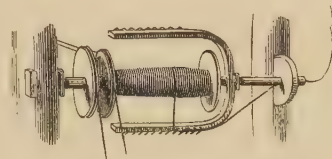


Fig. 3.—Spindle, Bobbin, and Flyer of fig. 2 on larger scale.

spindles gave the twist to the rovings when they were fully drawn out, and thereafter wound on themselves the twisted yarn by being moved in the frame towards the bobbins of roving whilst they continued to rotate. The principle of the jenny was important and, developed in the spinning-mule of Crompton in 1779, it is the basis of the second of the two great methods of machine-spinning now in use. Crompton's inventions, along with the improvements of Paul and Arkwright, constitute the basis of all modern 'frame' spinning, as Hargreaves's 'jenny' constitutes the basis of 'self-actor' spinning, whether adopted in the construction of cotton, woollen, or the class of worsted yarns prepared and spun on the French system.

Preparatory Treatment of Textile Fibres.—All textile materials require to undergo a measure of mechanical separation, blending, and re-amalgamation before a level yarn is producible by the insertion of twist or twine for converting a thick, loosely formed 'sliver' or 'roving' into a weavable thread. The objects of this preliminary treatment are: (1) The cleansing and freeing of the natural product—cotton, flax, jute, wool, 'waste' silk, &c.—of foreign matter; (2) the disentanglement and opening of the 'staple,' literally separating filament from filament; (3) for self-actor spinning—the re-grouping and re-combination of the fibres into a thin, gossamer-like web; (4) the division of this web into slivers or slubbings of corresponding weight and thickness throughout their length, and frictionally imparting to each a uniform rounded consistency; and (5) the attenuation of the slivers into yarns of the requisite diameter, simultaneously with the addition of twist. For frame-spinning, either prior to or following carding (2), varying with the staple selected and the structure

of yarn intended, the slubbings are repeatedly drafted and doubled, attaining in stages of work, and not in one operation, a roving in which the fibrous units are assorted and grouped in absolute line order.

In illustration, take the instance of cotton. Here the opening and partial cleaning of the matted

manner. From the carding-engine the fibre is delivered in a broad lap; but by passing it through a ring or tube it is compressed into a soft rounded coil or sliver. This sliver is taken to the drawing-frame, which consists of, say, four successive pairs of rollers, each pair in succession going at a greatly accelerated rate, so that the last pair may be going

six times quicker than the front pair. In this way a sliver is drawn out six times its original length, and six slivers fed in come out the thickness of one. This drawing out ultimately brings the slivers to a very uniform thickness, and places the fibres in a parallel order. It may be repeated many times, and thereby the fibres which lay together in the original strand may be drawn out to a great length. Thus, passing a sliver of one yard three times through the drawing-frame elongates it to $6 \times 6 \times 6 = 216$ yards, or four times passed through it is stretched out to 1296 yards. For fine yarns this drawing out frequently repeated may represent an elongation many thousand-fold. In the slubbing-frame comes the beginning of the spinning process, the sliver being here further drawn out and twisted sufficiently to enable it to be wound on a bobbin. The intermediate

frame draws out two slubbings to the thickness of one, again slightly twists it, and winds it on a bobbin. In the roving-frame the slubbing is drawn out further, slightly twisted, and wound on a bobbin.

Frame-spinning Machines.—Frame-spinning is done on the 'flyer,' the 'cup,' or the 'ring' principle. In the flyer, the roving bobbins, arranged in the upper and rear portion of the framework of the machine, deliver the rovings to a pair of back rollers, from which they are continuously transferred to a pair of front rollers. The differentiation in the surface velocities of these two sets of drafting rollers determines the extent to which the rovings are stretched in length and reduced in circumference. Leaving the front pair, the rovings are conveyed round the 'wings' of the flyer—revolving on the spindle positively driven—to the bobbin running on the spindle, which is made to rotate by the 'drag' of the flyer. As the bobbin increases in diameter it gains in weight, and its movement is thereby retarded. This maintains a constant length of yarn being wound up with the ever-changing dimensions, during spinning, of the yarn spool.

In the 'cup' and 'ring' frames the methods of roving delivery and of drafting are identical with the methods common in the 'flyer' practice. The spool now revolves with the mechanically driven spindle. Twist is developed by the yarn gyrating on the rim of the cup, from which it is distributed, layer by layer, on to the rapidly rotating bobbin. On the ring system, a small metal 'traveller' is made to turn on the edge of a circular plate by the yarn as it passes from the 'nip' of the rollers to the spool, the difference between the surface speed of the latter and that at which the yarn escapes from the rollers fixing the 'turns' per inch, or the amount of twist, inserted into the spun yarn.

Spinning on the Self-actor.—Self-actor spinning is carried out on two principles—first, by *spindle*, and, second, by *roller* drafting. In the former the slivers are taken from 'condenser' bobbins, horizontally placed in the fixed frame of the machine, and passed between a pair of pressure and feed rollers to the spindles. The latter are mounted on the carriage which travels away from and towards the frame and 'headstock'—control mechanism—successively. The process of spinning is intermittently performed. Thus the rollers com-

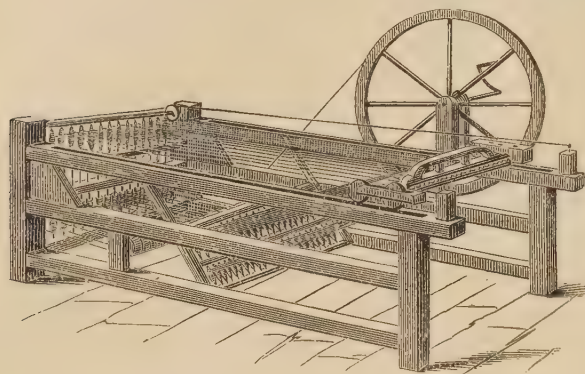


Fig. 4.—Hargreaves's Jenny.

fibres are secured by passing the material through two machines called respectively the opener and the scutcher. In these machines are cylinders revolving at a high rate of speed, with their surfaces studded with stout teeth which seize separate flocks of the fibre, and carrying it round, form a broad uniform teased mass which is called a lap. In the first of these machines it is also submitted to a

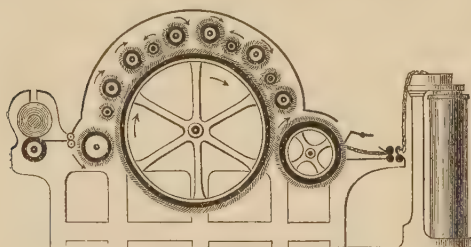


Fig. 5.—Sections of Carding-engine.

strong current of air which blows dust and dirt out of the cotton. From the scutcher a well opened and spread lap of the fibre is delivered to the carding-engine (fig. 5), in which a series of cylinders of various sizes, and rotating at different velocities, further open and tease the fibre. The cylinders are covered with teeth of fine wire (fig. 6) bent at about half their length, of which there may be from six

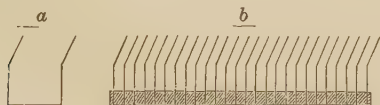


Fig. 6.

a, card wire; b, card setting.

to seven millions in a single machine. According to the direction in which the cylinders rotate, and the rate of their revolution, the wire points may meet each other, or the points and flat sides of the wires may meet and pass; and in this way certain cylinders lift the fibre from their neighbours and pass it on to others, so that the fibre is gradually teased, brushed, and spread out in a uniform

mence to deliver the slivers concurrently with the beginning of the outward traverse of the carriage. On a fraction of this being completed, during which the spindles are actively rotated, the motion of the rollers is suspended, the carriage, meanwhile, continuing to draw out or draft the threads, and the spindles to generate twist. The insertion of twine is further proceeded with for a brief period after the carriage has reached the end of its movement. Up to this stage all the threads have been held by the 'faller' wire on a line with the top of the spindles, preventing that rotation from winding up the yarn, and effecting twisting only. This done, the 'fallers' bring the yarn into such a relation with the spindles that—following their momentary reversal for removing any excessive degree of twine in the length of yarn approaching the spindles—they are again put into correct action for winding the yarn on to the 'cops' as the carriage returns to the headstock and bobbin frame. *Roller drafting* enables the rovings to be given out at a uniform rate from the start to end of the traverse of the carriage, with the development of a regular degree of twist. Final twisting, on the stopping of the carriage, and winding of the yarn on to the spools or 'cops,' are features common in the two practices. The application of spindle-drafting is in the manufacture of woollen and certain varieties of cotton yarn, while that of roller-drafting is in the spinning of yarns having a smooth and level formation.

Yarn Counts and Diameters.—Cotton yarns are spun in counts (hanks per lb.) ranging from 5's to 300's (=5 to 300×840—yards in a hank—per lb.); linen yarns in counts (leas per lb.) from 3's to 900's (=3 to 900×300—yards in a lea—per lb.); worsted yarns from 5's to 120's (=5 to 120×560—yards in a hank—per lb.); and woollen yarns from 1 to 48 skeins or from 1 to 48 yards per dram. The diameter of 300's cotton is $\frac{1}{16}$ inch, 120's worsted $\frac{1}{16}$ inch, and of 48 skeins woollen $\frac{1}{16}$ inch. Previous to the invention of the self-actor few spinners could make yarn of 200 hanks to the pound. At the same time the natives of India were weaving yarn of numbers ranging between 300 and 400. Lancashire spinners have produced yarn of 700 hanks per lb. for fine muslin goods, and, for testing machinery running and efficiency, yarn of a much higher count has been spun.

Spinola, Ambrosio, Marquis of, one of the greatest captains of his time, was born at Genoa in 1571. With his younger brother Frederick, already a soldier of fortune under Philip III. of Spain, he raised in 1602 a force of 9000 men, whom he maintained, like the old *condottieri*, at his own expense. In the same year he entered the Netherlands, serving at first under Mendoza. His first exploit was the reduction of Ostend, which the Archduke Albert had been besieging for more than two years. This spread his reputation over Europe, and led to his being placed at the head of the whole Spanish and Italian troops in the Netherlands. Now began a long struggle with Prince Maurice of Nassau, in which neither could gain any decided advantage over the other. The destruction of the Spanish fleet near Gibraltar induced the court of Madrid to conclude in 1609 an armistice for twelve years. At its termination the war began anew, and Spinola found himself once more pitched against his great opponent, who, however, died at the Hague in April 1625 without succeeding in raising the siege of Breda. The town opened its gates in the May of 1625, after having sustained a siege of ten months. This was Spinola's last achievement, his health now obliging him to resign the command. He had spent his whole fortune in the maintenance of his troops, but his pecuniary claims were shamefully neglected by the Spanish government, and his acute vexation at

this hastened his death, which took place in Piedmont, 25th September 1630.

Spinoza, Benedict (*Benedictus* being a translation of the Hebrew *Baruch*), one of the greatest philosophers of modern times, was born at Amsterdam on the 24th of November 1632. His parents were rich Spanish or Portuguese Jews, whose name (also spelt D'Espinoza and Despinoza) seems to have been derived from a village called Espinoza in León. They had their son diligently instructed in the Bible and its commentaries, and the Talmud; but after having mastered both, and imbibed the philosophical spirit of such commentators as Aben Ezra, he was allowed—the more readily that his sickly constitution unfitted him for a commercial career—to devote himself entirely to a life of study. Physical sciences and the writings of Descartes, to which he turned first of all, very soon drew him away from the rigid belief and practices of the synagogue; and Saul Levi Mortera, his Talmudical teacher, who had built the fondest hopes upon the genius of his pupil, was the first to threaten him with the direst punishment if he did not retract the rank heresies that he began openly to utter. Spinoza, after a time, entirely withdrew from the community of his brethren, who formally excommunicated him (1656). A fanatic even attempted to frighten him by an either real or feigned attack upon him as he left the synagogue one night. At that period the young truth-seeker made the acquaintance of the young and beautiful daughter of Van den Ende, his master in Greek and Latin, and fell passionately in love with her, but was rejected. From that time forth Philosophy became the sole aim and object of his life. In accordance with the teachings of the sages of the Mishna, Spinoza had, apart from his studies, made himself master of a mechanical craft; he had learned the art of polishing lenses, and this now became the means of his subsistence.

When twenty-eight years old he left Amsterdam, and went to Rijnsburg, near Leyden, then the headquarters of a sect of the Remonstrants or Arminians, known as Collegiants, with one of whom he lived; and there he wrote the *Abridgment of the Meditations of Descartes*, with an Appendix—the latter being the first draft, so to say, of his *Ethics*. The year following he removed to Voorburg, a suburb of the Hague, and shortly afterwards, yielding to the solicitations of his, by this time, numerous friends, he removed to the Hague itself. The Elector Palatine, Charles Louis, next offered him a vacant chair at the university of Heidelberg, with full 'liberty of teaching,' provided he would not say aught to prejudice the established religion—i.e. Christianity; but Spinoza declined the lucrative and honourable professorship. His small pittance was enough to satisfy his wants. Similarly he refused generous offers made to him by wealthy friends, like Simon de Vries, who intended to bestow a large sum of money upon him; all he could be prevailed upon to accept was a small annuity of a few hundred florins. An offer of a pension, on the condition of his dedicating a work to Louis XIV., he rejected with scorn. His domestic accounts, found after his death, show that he preferred to live on a few pence a day rather than be indebted to another's bounty. He died, forty-four years old, on the 21st of February 1677. Throughout his life of study, of abstemiousness, of bodily and mental suffering—for his constitution was no less undermined by consumption and overwork than his sensitive mind was wrought upon by the violent severance of all natural ties of affection, to say nothing of the misery of occasional want and of perpetual persecution—no complaint ever passed his lips. Simplicity and heroic forbearance, coupled with an antique stoicism and a child-

like, warm, sympathising heart, were the outstanding features of him who was nicknamed epicurean and atheist by his contemporaries.

Spinoza's philosophical system developed itself on the basis of Descartes (q.v.), who, dissatisfied with both the dogma and the scepticism around him, cleared the ground by first doubting everything, and then laying a new foundation in *Cogito, ergo sum*. Spinoza, however, took his 'I think, therefore I am' merely as a starting-point to establish not (as with Descartes) an unreconciled dualism of spirit and matter, but a pure Monism, of which the sole foundation is Substance—that which is in itself and is conceived through itself; with an infinite number of Attributes, of which thought and extension, or spirit and matter, are alone dealt with. Spinoza's one Substance, *causa sui*, he expressly calls God; yet this term is not to be understood in the ordinary sense, for Spinoza's God neither thinks nor creates. There is no real difference, he holds, between mind, as represented by God, and matter, as represented by Nature: they are One, and, according to the light under which they are viewed, may be called either God or Nature. The visible world is not distinct from him. It is only his visible manifestation, flowing out of him, who is the first fountain of life and essence, as a finite from the infinite, variety from unity—a unity, moreover, in which all varieties merge again. Extension and thought, which with Descartes had been two Substances, with Spinoza become Attributes—that which the mind perceives as constituting Substance. Extension is visible Thought; Thought is invisible Extension. And this explains the relation between body and mind, and the perfect harmony between them. The mind is the idea of the body—i.e. the same thing considered under the attribute of thought. Substance as thought falls into an infinite number of Ideas, and as extension into an infinite number of Bodies. These Spinoza calls Modes. The *modus* or *accidens* is only the varying form of Substance. Like the curling waves of the ocean, the modes have no independent existence; they are simply the ever-varying shapes of the Substance. Substance thus is the only really existing, all-embracing essence, to which belongs every thing perceptible to our senses, and every thing not perceptible. Thus, every thought, wish, or feeling is a Mode of God's Attribute of thought; every thing visible is a Mode of God's Attribute of extension. God is the 'immanent idea,' the One and All, the *natura naturans*; World, *natura naturata*, is one complex whole and one peculiar aspect of God's infinite Attribute of extension. The variety we behold in things is a mere product of our faulty conceptions, particularly of what Spinoza terms our 'imagination,' which perceives unity as a complex of multiplicity. The connection of things is the same as the connection of ideas; we attain the truth only when, looking away from the multiplicity of ideas and of things, we behold God *sub specie eternitatis*.

His system is mainly contained in his *Ethica*, which is not a treatise of Ethics, but a complete philosophy. The *Ethica* he deduces in a mathematical form, after the method of Euclid, but with a stringency much more apparent than real. Chief doctrines are: The absence of free-will in man—himself only a *Modus* dependent on causes without, and not within him. Will and Liberty belong only to God, who is not limited by any other Substance. Good and Evil are relative notions, and sin is a mere negative; for nothing can be done against God's will, and there is no idea of Evil in him. Utility alone, in its highest sense, must determine the good and the evil in our mind. Good, or useful, is that which leads us to greater reality, which

preserves and exalts our existence. Our real existence is knowledge. Highest knowledge is the knowledge of God. From this arises the highest delight of the spirit. Happiness is not the reward of virtue, but virtue itself; and this is to be attained by a diligent following in God's ways. Sin, evil, negation, &c. are merely things that retard and obstruct this supreme happiness. Spinoza's Pantheism was long regarded as 'the most iniquitous and blasphemous human invention,' and had few followers even in Holland. But in the 18th century it attracted the admiration of men such as Lessing, Herder, and Goethe, and became with Fichte, Schelling, and Hegel the acknowledged basis of much of modern German philosophy; even Schleiermacher spoke of Spinoza as 'pious, virtuous, God-intoxicated.'

Spinoza's principal works are *Renati Descartes Principia Philosophiæ More Geometrico Demonstrata* (1663); *Tractatus Theologico-politicus* (1670); *Ethica Ordine Geometrico Demonstrata*; *Tractatus Politicus*; *Tractatus de Intellectus Emendatione*; letters; and a Hebrew grammar; and, not published till 1862, *Tractatus de Deo et Homine*. The *Tractatus Theologico-politicus* contains an acute and rationalistic view of revelation. In his politics he has many points common with Hobbes. Spinoza's life was made by Auerbach the subject of a romance. There are editions of the works by Paulus (1803), Bruder (1846), and Van Vloten and Land (1883; 3d ed. 1914); translations by Elwes (1884), Hale White (1883; revised by Stirling, 1910), and others; and English books on him by Sir F. Pollock (1880), Martineau (1882), Caird (1888), Joachim (1903), Duff (1903), and Picton (1907); works in German by Sigwart (1839), Thomas (1840), Camerer (1877), Baltzer (1888), Freudenthal (1899), Meinsma (1909); in French by Saintes (1842), and Lévêque (1923); in Danish by Höfding (trans. 1925). Professor A. Wolf has edited a contemporary Life (1927), and his *Correspondence of Spinoza* is the beginning of a five-volume translation of the complete works.

Spinthariscopes, a simple little instrument consisting of a screen of sulphide of zinc with a minute fragment of radium salt held on the point of a needle above it, together with a lens through which to look at the glow resulting from the bombardment of the screen by the radio-active substance, and to analyse it into its constituent flashes or scintillations. See ATOM.

Spiræa, a genus of plants of the family Rosaceæ, and of the sub-family Spiræoideæ (in which the



Spiræa Aruncus, or Goat's Beard.

fruit consists of five or fewer capsular carpels). *Spiræa* has one or more follicular, many-seeded

carpels. The numerous species are herbaceous plants and low deciduous shrubs; of the herbaceous species two are natives of Britain, Dropwort (*S. Filipendula*) and Meadow Sweet or Queen of the Meadow (*S. Ulmaria*), both with interruptedly pinnate leaves and flowers in cymes. Dropwort is a native of dry upland pastures; it is tonic and fragrant; and its tubers, which are somewhat nutritious, have been ground and made into bread. Meadow Sweet is well known for the powerful fragrance of its flowers. A fragrant distilled water is prepared from them. A North American species (*S. tomentosa*), called Hardhack in the United States, is there used as a tonic and astringent. Many of the shrubby species are frequently planted for ornament.

Spiral Vessels. See STEM.

Spire, a very acute pyramidal roof in common use over the towers of churches. The history of spires is somewhat obscure, but there is no doubt that the earliest examples of anything of the kind are the pyramidal roofs of the turrets of Norman date. Those of St Peter's, Oxford (fig. 1), and Rochester Cathedral (fig. 2) are good specimens of



1, Turret, St Peter's Church, Oxford; 2, Turret, Rochester Cathedral; 3, St Mary's Church, Cheltenham; 4, Bayeux Cathedral, Normandy.

circular and octagonal pointed roofs, or spires in an embryo condition. Spires of this early period are much less acute than those of later date. The Early English style has spires of sharply pointed form over the larger towers. They are generally octagonal and what are termed broach spires—i.e. the slopes spring from the cornice of the tower without any parapet, and at the point where the square changes to the octagon there is a small set-off or separate roof (fig. 3). Sometimes the angles at top of towers were occupied with pinnacles or sloping masses of masonry, as at Bayeux Cathedral, Normandy (fig. 4).

In the Decorated style the spires were more ornamented, having generally a parapet and pinnacles at the top of the tower, crockets on the angles, and enriched windows. The spires of the Perpendicular and Flamboyant styles are still more enriched, with flying buttresses at the angles, &c. They are sometimes perforated, and the sides of the spire filled entirely with tracery. Such spires are common in Germany, those of Strasbourg and Freiburg on the Rhine being very fine examples, as also that of St Stephen's, Vienna. As in the later styles generally, the character and beauty of the spire give place to dexterity in masonry, and many examples exist of traceried spires more wonderful than beautiful (see GOTHIC

ARCHITECTURE). Spires are most frequently constructed of stone, but they are also occasionally made of wood, and covered with lead, copper, slates, or shingles. These are chiefly to be found in localities where stone is scarce. Among famous spires may be mentioned those of Ulm (530 feet), Cologne (q.v., 515), Rouen (of cast-iron, 487½), St Nicholas, Hamburg (482), Strasbourg (465), Chartres (q.v., 371), and Salisbury (q.v., 404), the highest in England, as St Mary's Cathedral, Edinburgh (275), is the highest in Scotland, and St Patrick's Cathedral, New York (328), in America. With these heights may be compared the Eiffel Tower (985 feet), the Washington obelisk (555), the Forth Bridge (361), and the domes of St Peter's at Rome (435) and St Paul's in London (404).

Spires. See SPEIER.

Spirifer, a genus of brachiopods. See the article CARBONIFEROUS SYSTEM.

Spirillum. See BACTERIA, GERM THEORY, CHOLERA, RELAPSING FEVER.

Spirit, a name of very general application to fluids, mostly of a lighter specific character than water, and obtained by distillation. Thus, the essential oil of turpentine is called Spirit of Turpentine; a looser usage extended the name to Spirit of Nitre (nitric acid) and Spirit of Salt (hydrochloric acid). But in a stricter sense the term spirit is understood to mean Alcohol (q.v.) in its potable condition.

Spirit, HOLY, or HOLY GHOST, or PARACLETE, the third Person in the Christian Trinity. The evolution of the doctrine has its roots in the Old Testament. The term 'Spirit' originally meant 'breath' or 'wind' both in Hebrew and Greek (*ruach* and *πνεῦμα*)—the invisible principle of life in man and the universe—so it came to denote the invisible Divine activity working in the world—or 'God in action.' In the Old Testament the development of the doctrine of the Spirit is parallel to the development of the conception of God. There is always an equation between the character of God and the character of the activity of the Spirit. In the earlier period, when Yahweh was conceived as the Lord of Hosts or the God of Battles, the Spirit endowed the heroes of Israel with courage and prowess in war. It fell upon Othniel (Judges, iii. 10) and Jephthah (xi. 29). The case of Samson is the best illustration of this stage of development. In Judges, xiv. 6, the Spirit endows him with strength to rend a lion; it enables him to smite 'thirty men of Ashkelon and take their spoil;' in xv. 13 it empowers him to rend the ropes with which the Philistines had bound him. Sometimes, too, the spirit which God sends is evil—e.g. 1 Sam. xviii. 10, 'an evil spirit from God came mightily upon Saul.' In the next period—the period of the great prophets—the Spirit was regarded as the source of Divine knowledge and inspiration. It was the action of the Spirit which enabled the prophets to know and reveal the will of Yahweh. From this time onward the conception of the Spirit became ethicised (Neh. ix. 20; Ps. cxliii. 10), and its function is mainly connected with the development of the spiritual life in the nation or the individual. Its activity is never, however, limited to the spiritual realm, because in the latest literature of canonical books, as well as in Apocryphal and Apocalyptic literature, we find that the Spirit is regarded (a) as the agent of God in the creation of the natural universe, and the power that actuates and energises it; (b) as the source of human genius, and the bestower of exceptional skill in art and handicraft (Exodus, xxxi. 3).

With the development of a pure monotheism and the abandonment of anthropomorphic conceptions, and the consequent sublimation of the idea of God,

more stress still came to be laid upon the action of the Spirit as the mediator between God and the world. Like the companion conceptions of the 'Wisdom of God' and 'the Word of God,' the Spirit was gradually personified and even hypostatized, though it cannot be said that it was actually differentiated from God in the Old Testament.

The New Testament carried the doctrine to a higher plane of development. The adjective 'Holy,' which only occurs twice in the Old Testament and four times in Apocryphal literature, becomes almost an inseparable epithet of the Spirit, being used between eighty and ninety times, thus marking the fact that the conception has become completely ethicised. It cannot be said, however, that the New Testament contains a uniform doctrine of the Holy Spirit. There are considerable divergences between the theological implications in the statements of John and Paul. In the epistles of Paul there is no clear distinction drawn between the Spirit of God and the Spirit of Christ; in fact, sometimes, as in 2 Cor. iii. 17 ('Now the Lord is the Spirit'), the two are identified. The absence of a doctrine of the Logos makes it necessary for Paul to ascribe to the Spirit the attributes and functions which the fourth gospel assigns to the Logos. Nor is the difference between the Johannine and the Synoptic conception less marked. In the Synoptic gospels the Spirit is active in the incarnation, the baptism, and the temptation of Jesus. According to the fourth gospel, the activity does not commence till after the crucifixion. In vii. 39 it is distinctly stated that 'the Spirit was not yet (given), because Jesus was not yet glorified.' The Spirit is represented as the Paraclete whom Jesus will send to comfort and encourage his followers. But in one particular the Johannine conception marks a great advance. The Spirit is always personal, as personal as God or Jesus himself. And though the personality of the Spirit is definitely assumed in the baptismal formula of Matt. xxviii. 19 and the benediction of 2 Cor. xiii. 14, yet the conception is nowhere so vivid and clear as it is in the fourth gospel. The function of the Holy Spirit or Paraclete in the fourth gospel is (a) to be the Spirit of truth, and guide men into the truth (xiv. 16, xvi. 13); (b) to bear witness to Christ (xv. 26); (c) to convict the world of sin, righteousness, and judgment (xvi. 8-10). Another function assigned to the Spirit by Paul is 'to make intercession for men' (Rom. viii. 26). The doctrine of the Holy Spirit did not become a subject of controversy in the early church, though it was necessarily involved in the Christological and Trinitarian debates in the 3d and 4th centuries. Montanism, however, attempted to give special prominence and emphasis to the doctrine of the Spirit, and in the conflict between Montanism and the Catholic Church the issue largely turned upon the interpretation of the action of the Spirit. 'The strength of the Montanists was,' as Gwatkin says, 'in their vivid belief that the Holy Spirit was a power that had not ceased to work spiritual wonders in the church.' They maintained that they were the prophets of a 'new dispensation'—the dispensation of the Spirit—which was to supersede the earlier Christian dispensation as that had superseded the Old Testament. But though Montanism emphasised an aspect of truth which, with the developing machinery of church organisation, was in danger of being forgotten, yet its exaggeration and excesses on the whole did more harm than good, and the reaction from Montanism involved the overshadowing of the doctrine of the Spirit altogether. There was only one controversy in which the doctrine of the Spirit became the centre of attack. In the 4th century the Macedonians, or Pneumatomachoi, while they were perfectly orthodox on Christology,

denied the consubstantial divinity of the Holy Spirit. The Macedonian movement, however, never assumed large dimensions. The battle in the 4th century ranged almost entirely around the person of Christ. The acceptance or rejection of the Nicene position on the one point almost always carried with it a similar attitude upon the other.

In later centuries the dispute about the 'Filioque' clause, as it is called, led to the final cleavage between the Eastern and Western Churches. The Nicene Creed describes the Holy Ghost as 'proceeding from the Father.' Gradually, however, the Western Church added to that formula, 'and the Son.' The additional clause made its first conciliar appearance in the acts of the third Council of Toledo (589). From Spain it spread into France, where it seems to have won general acceptance in the time of Charlemagne. The Greek Church at once began its protest. It regarded the new phrase as an unwarranted expansion of the statement in John, xv. 26. Successive popes became champions of the new clause, with the consequence that the tie between East and West, which had already been severely strained by other causes, snapped completely.

In recent times there has been a revival of interest in the doctrine. One of the most interesting signs of this revival is to be found in the publication of a volume of essays, entitled *The Spirit*, edited by Canon Streeter. These essays are an attempt to deal with the doctrine from the point of view of religious psychology and experience. The doctrine is regarded as representing the activity of God in human life, and as therefore affording a means of harmonising the immanent and transcendent sides in the Divine nature.

See older works by Heber, Hare, Hutchings, Smeaton, Candlish; modern by Streeter (ed.), Swete, Rees, Gunkel, Kahnis; also books on Biblical Theology—e.g. Old Testament: Schultz, Smead, Davidson; New Testament: B. Weiss, Holtzmann, Beyschlag, Feine.

Spirit-fresco. See MURAL DECORATION.

Spirit-level. See LEVELLING.

Spiritualism (as it were, 'the doctrine of the spiritual'), sometimes also called Spiritism ('the doctrine of spirits'), is the name applied to a great and varied series of abnormal or preter-normal phenomena purporting to be for the most part caused by spiritual beings, together with the belief thence arising of the intercommunion of the living and the so-called dead. The following is a definition given in the London *Spiritual Magazine*, for many years the best exponent of the subject in Great Britain: 'Spiritualism is a science based solely on facts; it is neither speculative nor fanciful. On facts and facts alone, open to the whole world through an extensive and probably unlimited system of mediumship, it builds up a substantial psychology on the ground of strictest logical induction. Its cardinal truth, imperishably established on the experiments and experiences of millions of sane men and women, of all countries and creeds, is that of a world of spirits, and the continuity of the existence of the individual spirit through the momentary eclipse of death; as it disappears on earth reappearing in that spiritual world, and becoming an inhabitant amid the ever-augmenting population of the spiritual universe.'

The movement known as 'modern spiritualism' is usually considered to have commenced in the year 1848, with certain mysterious noises and movements occurring in a house temporarily occupied by Mr Fox and family at Hydeville in the state of New York; and his two daughters, Margaret and Kate, aged twelve and nine years respectively, were the first individuals recognised as mediums, in whose presence the phenomena more particularly occurred. It must not be supposed that the phenomena them-

selves were at all new. Throughout all history there are records of similar occurrences. Such were the disturbances at the ancient palace of Woodstock in 1649; at Mr Mompesson's at Tedworth in 1661; at Epworth parsonage in 1716, in the family of Mr Wesley, the father of the founder of Methodism; the Cock Lane ghost in London investigated by Dr Johnson, Bishop Percy, and other gentlemen; the extraordinary occurrences in the house of Mr Jobson in Sunderland in 1839, which were investigated and published by Dr Clanny, F.R.S., and authenticated by sixteen witnesses, including five physicians and surgeons; and numerous less important cases recorded in the works of William Howitt, Robert Dale Owen, Dr Eugene Crowell, and many older writers. But none of these occurrences attracted much attention or led to any systematic investigation of the subject. What especially distinguishes the year 1848 is that it was the starting-point of a movement which has grown and spread continuously, till, in spite of ridicule, misrepresentation, and persecution, it has gained converts in every grade of society and in every civilised portion of the globe. Spiritualism is now to be found as frequently among the highest aristocracy as among the middle classes and the poor. It has its full proportion of believers in the foremost ranks of science, literature, and art, and in all the learned professions. In every European country, in America, and in Australia there are numerous periodicals which diffuse a knowledge of its phenomena, its teachings, and its philosophy; while it claims to have profoundly modified the teaching of some among our clergy as to the nature and purpose of the future life. These facts and characteristics broadly distinguish modern spiritualism as being very different from anything that has preceded it, and claim for it a respectful consideration.

When the knockings and movements of furniture were first heard and seen they were assumed to be due to some trick or other natural cause, and there was in every case and throughout the whole course of the movement a strong prejudice against any other explanation of them. When the Fox family could not detect this cause the neighbours were called in, but equally without result. It was soon observed that the more violent sounds or motions occurred in the presence or in the immediate vicinity of one or other of the little girls, and every precaution was taken against possible trick on their part. They were closely watched, were held hand and foot, were tied in bags or put to stand barefooted on pillows, but all in vain. The raps or loud knockings on doors or tables, on floor or ceiling, occurred just the same. But this was only a part of the phenomena. It was observed that the noises occurred at request, or as if in reply to observations. Then the alphabet was used, and questions were answered by raps at certain letters which, when written down, formed connected words and sentences. In this way the statement was elicited that the sounds were made by the spirit of a man who had been murdered in the house and buried in the cellar. After several explorations human bones with charcoal and lime were discovered there. Some confirmatory evidence as to this murder was obtained, and some of the previous dwellers in the house stated that they also had been disturbed by unaccountable noises. The excitement caused by these occurrences was so great that in order to satisfy the curiosity of visitors the Fox family were obliged to submit to public exhibitions and tests of the remarkable phenomena occurring in the presence of their children, and thus public mediumship began. But at the same time other mediums were discovered in different parts of the country, as if a special

development of this abnormal power were then occurring. A few of the more remarkable of these mediums may be here briefly referred to.

In 1845 an altogether illiterate youth, Andrew Jackson Davis, the son of a poor weaver and apprenticed to a shoemaker at Poughkeepsie, New York, began to exhibit remarkable powers as a trance speaker and a clairvoyant healer of diseases. During his trances he exhibited such extensive knowledge of subjects quite beyond his waking abilities or acquirements as to attract the attention of learned men, and under their auspices he delivered in New York 157 lectures which were afterwards published in a volume of 800 pages. These powers continued to be often exerted during a long life. One of his disciples was Thomas Lake Harris (q.v.), whose *Lyric of the Golden Age*, a poem of 384 pages, was dictated in ninety-four hours, and in the opinion of William Howitt deserves the praise that has been given it of possessing almost Miltonic grandeur. Just about the same time (1846-50) the Davenport brothers began to exhibit the remarkable physical phenomena that puzzled so many observers in every part of the world; and it was about the year 1846 that the celebrated medium Home, then thirteen years old, had his first vision of a boy friend, 300 miles away, who intimated to him that he had died three days before at a certain hour, which was afterwards found to be perfectly correct.

Nature and Range of the Phenomena.—In almost every case the medium is a person who in youth sees visions and hears voices which often communicate intelligence of distant and sometimes future events quite unknown to himself or family. Following such phenomena, and apparently to attract the attention of other persons, noises usually occur; sometimes voices are heard, and sometimes musical sounds. Then follow movements of material objects, either visibly or more often in the dark, or in such a way that the result only is seen. Rooms and even houses are sometimes shaken; bells sometimes ring violently without material cause; flowers, fruits, or other objects are brought from a distance into closed rooms, sometimes of particular kinds as desired at the moment by those present. Another curious phenomenon is the tying and untying of knots. Sometimes the medium is tied in such a manner that it is plainly impossible he could have so tied himself; sometimes when tied by other persons, and the knots and ends of the cords out of his reach, he is almost instantaneously released. Knots are sometimes tied on endless cords in a manner impossible by human agency, as in the experiments of Professor Zöllner.

A frequent phenomenon is the playing on musical instruments without human agency, as on an accordion held by the medium by one hand, and sometimes when held by spectators. Closed pianos are sometimes played on, while accordions or tambourines are, as it were, floated in the air and played upon at the same time.

Writing or drawing is often performed without human agency. Sometimes the writing occurs on papers held or thrown under the table, or when placed in locked drawers, or enclosed between slates tied or screwed together. Sometimes the writing thus obtained is in answer to questions which may be spoken or written, and either known or unknown to the medium. The drawings are of various kinds. Some are on slates with pencil or chalks, some on paper. Very effective drawings in crayons, water-colours, or oils are produced with extreme rapidity and under conditions which render normal human agency impossible. A Scottish medium was accustomed to produce small landscapes in oils on cards privately marked by the

witnesses and in total darkness, the result being seen with the paints still wet. These were usually effective and artistic works. In another case the space under a table was enclosed by a large shawl hanging to the ground. Marked cards were thrown underneath, and in from ten to fifteen seconds the drawings were complete. A number of these drawings were in the possession of the late Mr Benjamin Coleman, and were shown to the present writer. One in particular was on paper marked by Mr Coleman with two pin-holes by pins which were stuck through a small strip of paper which was kept as a proof of the identity of the paper so marked. The drawing that was made on this paper consisted of two birds holding a garland of flowers in their bills, and was so executed that the two pin-holes which had been made on the paper formed the eyes of the two birds, while their exact correspondence with the strip kept with the pins in it showed that the very paper Mr Coleman had so marked had been used. Lord Borthwick was present when these drawings were described, and confirmed Mr Coleman's account of them before the committee of the Dialectical Society in 1869.

One of the most striking of the physical phenomena is the levitation of the human body, which has occurred with many mediums, but has never been more thoroughly tested than with the late Mr Home. The extraordinary elongation of his body was also tested by many competent observers; while in his presence, as in that of some other mediums, heavy tables were often raised to a considerable height, or inclined at an angle of nearly 45°, without the numerous objects on the table, as books, glasses, lamps, &c., falling off.

A very marvellous phenomenon exhibited by Mr Home, and a very few other mediums, is the power of neutralising the action of fire, both in their own persons and in that of some of the spectators. Lord Lindsay (after 1880 Earl of Crawford) made the following statement before the Dialectical Society: 'I have frequently seen Home when in a trance go to the fire and take out large red-hot coals and carry them about in his hands, put them inside his shirt, &c. Eight times I have myself held a red-hot coal in my hands without injury, when it scorched my face on raising my hand. . . . A few weeks ago I was at a séance with eight others. Of these seven held a red-hot coal without pain, and the two others could not bear the approach of it.' Lord Adare, Mr Jencken, and several others saw Mr Home stir the fire with his hands and then put his face right among the burning coals, moving it about as though bathing it in water. Mrs S. C. Hall, the Earl of Crawford, and several others saw Mr Home place a large lump of burning coal on Mr S. C. Hall's head and draw up his white hair over the red coal. It remained there several minutes. After it was taken away it burned the fingers of some who attempted to touch it. A number of other persons of the highest character testified to similar occurrences with Mr Home.

Even more extraordinary, and still more remote from the normal powers of mankind, is the production of visible and tangible hands—which lift objects, and sometimes write, and then dissolve away—of faces, and even of entire figures, all under conditions which render imposture impossible. Both visible and invisible phantoms have had their objectivity proved by being photographed, and this has been done by experts who are above suspicion and under conditions which render the reality of the phenomena demonstrable. Both hands, feet, and faces of these phantom forms have produced moulds in melted paraffin, again under conditions which render imposture on the part of the mediums out of the question.

Yet another and final series of phenomena, which may be termed psychological or spiritual, are the seeing of spirits or spiritual forms invisible to others, hearing their voices, and by this means obtaining knowledge of circumstances occurring at a distance; or of facts unknown to any one present, but afterwards verified; or of future events which afterwards happen as predicted—of all of which there is ample evidence. Persons gifted with this power often give long and eloquent addresses, or have elaborate essays written through their hands, but without any conscious mental agency on their part; and it is from these communications that we acquire our most complete knowledge of the teaching and philosophy of modern spiritualism.

Some Characteristics of Mediums.—These numerous distinct classes of phenomena exhibit endless modifications in detail with different mediums, and there are several important considerations which are inconsistent with their being, to any considerable extent, due to imposture. In the first place, almost every medium exhibits his powers in youth or even in childhood without any opportunity of learning the methods employed by professional conjurers. In the second place, each medium exhibits considerable individuality, and rarely, perhaps never, offers an exact reproduction of the phenomena occurring with other mediums. In the third place, all the phenomena occur sometimes in private houses, to which the medium comes without any apparatus whatever. In the fourth place, every class of phenomena has occurred with unpaid mediums, as well as with those who make mediumship a profession. And lastly, many of the most remarkable mediums have submitted to elaborate and careful tests by scientific and intelligent observers with results wholly beyond the powers of professional conjurers.

Notable Investigators of the Phenomena.—In order to appreciate the important bearing of such investigations on the theory that the whole body of spiritualistic phenomena are due to delusion or imposture, a few of the best known of these inquirers must be referred to. Perhaps the earliest scientific investigator was Dr Robert Hare (q.v.) of Philadelphia, an eminent chemist, especially known for his invention of ingenious apparatus. He, like all other earnest and patient inquirers, began under the impression that he would be able to expose a delusion; but all his experiments and tests, with apparatus of his own devising, proved that he had to deal with a great reality. He accordingly tried to induce the legislature to appoint a committee to examine and report on the experiments, and failing to succeed in this published his results in a volume entitled *Experimental Examination of the Spiritual Manifestations*. Judge Edmonds, one of the most acute and painstaking of American lawyers, devoted years to a thorough examination of the phenomena, with the assistance of the most intelligent men of science and education among his acquaintance. He himself became a medium, as did his daughter; and this young lady, though possessing only the ordinary American school acquirements, was able when in a trance to speak many foreign languages, including modern Greek, and to hold conversations in them with natives.

Professors Mapes and Loomis, both chemists, assisted by two physicians and other friends, tested the Davenport brothers, and found that the phenomena occurring with them were in no way due to conjuring. This verdict was confirmed by many inquirers in England, among others by the late Sir Richard Burton, the last man to be imposed upon by conjuring, and to endorse it as reality. Yet he says, in a published letter, 'I have now witnessed four of the so-called dark séances.

These were all in private houses—one of them in my own lodgings. We rejected all believers, and chose the most sceptical and hard-headed of our friends and acquaintances, some of whom had prepared the severest tests. We provided carefully against all possibility of confederates, and brought our own cords, sealing-wax, tape, diachylon, musical instruments, and so forth. . . . Sparks of red and pale fire have fallen from the ceiling, sometimes perpendicularly, at other times crossing the room. Mr Fay's coat was removed whilst he was securely fastened hand and foot, and a lucifer match was struck at the same instant showing us the two gentlemen fast bound and the coat in the air on its way to the other end of the room. . . . I have spent a great part of my life in oriental lands, and have seen there many magicians. . . . I have read and listened to every explanation of the Davenport "tricks" hitherto placed before the public, and if anything would make me take that tremendous leap "from matter to spirit," it is the utter and complete unreason of the reasons by which the manifestations are explained.'

Among other investigators of known integrity and ability were Robert Dale Owen and Dr Robert Chambers, who investigated the phenomena with Kate Fox in New York, while the latter was the friend of Home, and wrote for him the introductory chapter and the appendix to his *Incidents of my Life*. Dr George Sexton, an earnest secularist teacher and lecturer, was converted by phenomena occurring in his own house and through mediums who were members of his own family or personal friends; and he afterwards investigated the materialisation phenomena occurring through Miss Cook. Mr Cromwell Varley, the electrician, tested the same phenomena by means of electrical apparatus. Dr Lockhart Robinson, after a long experience in the treatment of the insane, and having been a violent opponent of spiritualism as wholly founded on imposture and delusion, was converted by phenomena occurring in his own house in the presence of the American medium Squire. Professor Zöllner of Leipzig, in his work *Transcendental Physics*, has described the most marvellous phenomena occurring in his own study and under the strictest test conditions, in the presence of the medium Slade with some of his fellow-professors as witnesses. And we have Sir William Crookes, one of the first chemists and physicists in Europe, who for several years (from 1870 to 1874) devoted a considerable portion of his time to the investigation of the phenomena, and had the courage to make public these experiments and their results. With several different mediums, in his own house and subject to the conditions of scientific experiment, he satisfied himself of the reality of the whole range of the phenomena here briefly described. In 1889 he published his notes of seances with Mr Home, in the introductory observations to which he makes this important statement: 'Their publication will at any rate show that I have not changed my mind; that on dispassionate review of statements put forth by me nearly twenty years ago I find nothing to retract or to alter. I have discovered no flaw in the experiments then made, or in the reasoning I based upon them.'

The Value of these Phenomena.—In view of this long series of investigations by men of special training in science and of the highest reputation, spiritualists urge that the facts on which their beliefs are based are proved to be realities beyond all reasonable doubt. It may be asked, however, as many do ask, what is the meaning or the use of these strange phenomena? We feel no interest in moving furniture, floating bodies, fire-tests, or slate-writing. The answer is that a very large

number of minds these physical phenomena, however low and trivial they may seem, are the most effectual and often the only means of compelling attention to the subject, and this is more particularly the case with those imbued with the teachings of modern science. The moment such persons are really convinced that physical phenomena occur which they have always held and declared to be impossible, they see that there is something more in the matter than imposture or delusion, and further inquiry shows them that this class of facts constitute the mere outskirts of the subject. Almost all the agnostics and students of physical science who have become spiritualists—and they are to be counted by hundreds in every civilised country—have begun the investigation because they have been convinced that some of these lower physical phenomena are realities; and this fact is a complete answer to those who urge that such phenomena are trivial, degrading, and unspiritual. If they are so, it shows that men of the highest education and greatest knowledge are attracted by these very qualities.

The Teaching and Philosophy of Spiritualism.—But whenever we pass beyond these phenomena, and carefully examine the teachings and the philosophy to be found in the deliverances of automatic writers and trance-speakers, as well as in the normal writings of those who have long accepted and thoroughly assimilated these teachings, we enter upon a phase of the subject which no unprejudiced person will pronounce to be either useless or commonplace. The universal teaching of modern spiritualism is that the world and the whole material universe exist for the purpose of developing spiritual beings—that death is simply a transition from material existence to the first grade of spirit-life—and that our happiness and the degree of our progress will be wholly dependent upon the use we have made of our faculties and opportunities here. It is urged that the present life will assume a new value and interest when men are brought up not merely in the vacillating and questionable belief, but in the settled, indubitable conviction, that our existence in this world is really but one of the stages in an endless career, and that the thoughts we think and the deeds we do here will certainly affect our condition and the very form and organic expression of our personality hereafter.

As an example of the teaching of modern spiritualism as actually given through one of the most trustworthy mediums, the following passages from *Spirit Teachings*, by 'M.A., Oxon.' (W. Stainton Moses, 1883; memorial ed. 1898), must here suffice: 'As the soul lives in the earth-life, so it goes to the spirit-life. Its tastes, its predilections, its habits, its antipathies, they are with it still. It is not changed save in the accident of being freed from the body. The soul that on earth has been low in taste and impure in habit does not change its nature by passing from the earth-sphere any more than the soul that has been truthful, pure, and progressive becomes base and bad by death. . . . The soul's character has been a daily, hourly growth. It has not been an overlaying of the soul with that which can be thrown off; rather it has been a weaving into the nature of the spirit that which becomes part of itself, identified with its nature, inseparable from its character. It is no more possible that that character should be undone, save by the slow process of obliteration, than that a woven fabric should be rudely cut and the threads remain intact. Nay more; the soul has cultivated habits that have become so engrained as to be essential parts of its individuality. The spirit that has yielded to the lusts of a sensual body becomes in the end their slave. It would not be

happy in the midst of purity and refinement. It would sigh for its old haunts and habits. They are of its essence.'

'Immutable laws govern the results of deeds. Deeds of good advance the spirit, whilst deeds of evil degrade and retard it. Happiness is found in progress, and in gradual assimilation to the God-like and perfect. The spirit of divine love animates the acts, and in mutual blessing the spirits find their happiness. For them there is no craving for sluggish idleness, no cessation of desire for progressive advancement in knowledge. Human passions and human needs and wishes are gone with the body, and the spirit lives a life of purity, progress, and love. Such is its heaven. We know of no hell save that within the soul: a hell which is fed by the flame of unpurified and untamed lust and passion, which is kept alive by remorse and agony of sorrow, which is fraught with the pangs that spring unbidden from the results of past misdeeds; and from which the only escape lies in retracing the steps and in cultivating the qualities which bear fruit in love and knowledge of God.'

'We may sum up man's highest duty as a spiritual entity in the word Progress—in knowledge of himself, and of all that makes for spiritual development. The duty of man considered as an intellectual being, possessed of mind and intelligence, is summed up in the word Culture in all its infinite ramifications, not in one direction only, but in all; not for earthly aims alone, but for the grand purpose of developing the faculties which are to be perpetuated in endless development. Man's duty to himself as a spirit incarnated in a body of flesh is Purity in thought, word, and act. In these three words, Progress, Culture, Purity, we roughly sum up man's duty to himself as a spiritual, an intellectual, and a corporeal being.'

It is a very important fact that Sir William Crookes, F.R.S., at the conclusion of his address as president of the British Association in 1898, gave his testimony to the truth and importance of spiritualism in these weighty terms: 'Upon one other interest I have not touched—to me the weightiest and the farthest reaching of all.' And farther on he declares: 'I have nothing to retract. I adhere to my already published statements. Indeed, I might add much thereto.' These words may, perhaps, induce readers of this article carefully to peruse the *Researches* of one of the greatest physicists of his day before condemning modern spiritualism as a worthless subject of study.

See William Howitt, *The History of the Supernatural*; R. D. Owen, *Footfalls on the Boundary of Another World* and *The Debatable Land between this World and the Next*; Epes Sargent, *Planchette and The Proof Palpable of Immortality*; Eugene Crowell, *Primitive Christianity and Modern Spiritualism*; the London Dialectical Society report above mentioned; Crookes, *Researches in the Phenomena of Spiritualism* (1874-76); Wallace, *Miracles and Modern Spiritualism* (1874; new ed. 1896); Zöllner, *Transcendental Physics*; Myers, *Science and a Future Life* (1893), and *Human Personality and its Survival of Bodily Death* (1903); A. Lang, *Cock Lane and Common Sense* (1894); Frank Podmore, *Modern Spiritualism* (1902), and *The New Spiritualism* (1910); Sir Oliver Lodge, *Survival of Man* (1909), and *Raymond* (1916); Sir W. F. Barrett, *On the Threshold of the Unseen*; also the articles APPARITIONS, ANIMAL MAGNETISM, HALLUCINATIONS, HYPNOTISM, THEOSOPHY.

Spirochæte. See BACTERIA.

Spirogyra, a conjugating fresh-water alga with chlorophyll in spiral bands.

Spirometer. See RESPIRATION.

Spitalfields, in north-east London, derives its name from the *hospital* of St Mary, founded there in 1197 by Walter Brune and his wife Rosia. Silk-

weaving was established by French emigrants after the revocation of the Edict of Nantes (1685).

Spithead, a celebrated roadstead, and a favourite rendezvous of the British navy, is the eastern division—the Solent (q.v.) being the western—of the strait between the Isle of Wight and the mainland of England. It is protected from all winds, except the south-east, and its security gained it the sailors' name of the 'king's bed-chamber.' Here in 1797 the sailors of the Channel Fleet mutinied for more liberal pay and allowances, which were granted to them. Spithead has been strongly defended since 1864 by fortifications completing those of Portsmouth (q.v.). The 'Spit' is a sandbank stretching south from the Hampshire shore for 3 miles.

Spitsbergen is a group of Arctic islands lying about 400 miles N. of Norway and covering some 25,000 square miles. The chief islands are West Spitsbergen, North-East Land, Barents Land, Edge Island, Prince Charles Foreland, and the Wyches Islands or King Charles Land. With Bear Island, 130 miles S., these islands are known collectively in Norway as Svalbard. Spitsbergen is a much-dissected plateau rising to sharp peaks, whence the name, in the west, and comparatively flat-topped mountains farther east. The peaks generally average some 2000 feet, but Mount Newton in New Friesland is 5445 feet, Hornsund Tind, in the south, 4690 feet, and Mount Monaco on Prince Charles Foreland, 3450 feet. Glaciers occupy most of the valleys and generally reach the sea, but North-East Land alone has a true ice-cap. The coasts are much indented and long fjords penetrate the larger islands. The western coasts, owing to the influence of the North Atlantic drift, are generally clear of pack-ice, but the eastern shores, washed by a cold current from the Arctic Ocean, are usually difficult of access. The north coast is intermittently open and closed by ice. Climate is cold in winter, but frequently less cold than eastern Canada; in summer it is mild and not unlike that of the Shetlands. Vegetation is a scanty form of tundra, which may, however, be luxuriant in places. A creeping willow and a dwarf birch, a few inches high, are the only trees; for the rest the plants are saxifrages, buttercups, poppies, &c., and many mosses and lichens. There are 128 species of flowering plants. Reindeer, fox, and polar bear are found. Many sea-birds breed in summer, but the ptarmigan and snowy owl alone stay in winter. In the waters are seals, walrus, whales, and many fish. Spitsbergen was discovered by Barents, a Dutchman, in 1596, but probably had been sighted in 1194 by the Norsemen and named Svalbard. In the 17th century it was frequented by British, Dutch, and Basque whalers. Later it became the resort of Russian and afterwards Norwegian trappers. Although Britain and Holland made rival claims to Spitsbergen in the early whaling days, the question of sovereignty did not become an important issue before the discovery of valuable minerals in the end of last century. After several abortive conferences on the subject the sovereignty of Spitsbergen and Bear Island was assigned to Norway in 1920 by the Supreme Council. Norwegian control became effective in August 1925. The treaty safeguards the right of other nations in mining and trade. Spitsbergen is estimated to contain over 8,000,000,000 tons of coal of Carboniferous, Cretaceous, and Tertiary ages. This coal is being mined by Norwegian, British, Dutch, and Swedish companies. Mines on Bear Island have been abandoned. Mining camps exist in Advent Bay, Green Harbour, King's Bay, near Coles Bay, and elsewhere. The total export in 1925 was about 400,000 tons, to

Norway, Sweden, and Russia. Gypsum, asbestos, and zinc ore also occur. There is wireless communication with Europe and a summer postal service. Vessels cruising with tourists visit Spitsbergen every summer. The population of miners and hunters numbers about 2000.

See Sir M. Conway, *No Man's Land* (1906); Rudmose Brown, *Spitsbergen* (1920); G. Binney, *With Ski and Sledge on Arctic Glaciers* (1925), and *Norway Year Book*.

Spitteler, KARL FRIEDRICH GEORG, was born 24th April 1845 at Liestal, in the country canton of Basel, and studied law, then theology at Basel, Zürich, and Heidelberg. After spending some years in Russia as a tutor in a general's family, he returned home in 1879 and took up, first, teaching, then journalism. In 1892, however, he retired with his wife and family to Lucerne, where he died 29th December 1924. Spitteler's chief literary accomplishment is his great mythological epic, *Der Olympische Frühling* (1900-1903), displaying, as does most of his work, a rare originality of genius, and in parts carrying the mind back to Dante. The most influential impulse, however, he owed to French poetry. His other works include *Prometheus und Epimetheus* (1880-81), *Extramundana* (1886), *Schmetterlinge* (1886), *Balladen* (1895), several tales (*Friedli der Kolderi, Gustav, Konrad der Leutnant, &c.*), and *Meine frühesten Erlebnisse* (1914).

Spitz, or POMERANIAN DOG, the result of a cross from the Eskimo dog, the native dog of the Arctic regions. The spitz is about the size of the spaniel, with a sharp-pointed face and an abundant white coat sometimes of great beauty. Other colours are known, including black. It is comparatively common in the United States, where it is a favourite dog with Germans especially.

Splay. See CHAMFER.

Spleen. This organ, present in vertebrates from the fishes upwards, has no doubt very important functions to perform, but about these we know as yet very little indeed. In man it is about 5 inches in length, and is situated in the left hypochondriac region, adapted to the cardiac portion of the stomach (see figure at article ABDOMEN). Unlike the liver and pancreas, it has no duct and manufactures no juice, being connected with the rest of the body by its blood-vessels, nerves, and lymphatics: these enter the organ at its hilum and ramify within it. The spleen is invested by a capsule consisting chiefly of muscular tissue, and from this capsule muscular processes called trabeculae run into the interior of the organ supporting its delicate pulp. As one would expect from its structure, the organ can expand and contract, and this it does from a variety of causes—for instance, after a meal the organ expands, reaching its maximum in about five hours, then contracting again. In diseased conditions it may expand to many times its normal size, which would not be possible were its capsule of fibrous tissue like those of other glands. The blood-vessels enter the spleen, and the arteries become invested by curious masses of tissue called adenoid, and these little masses, the splenic corpuscles, are of about the size of millet seed, and quite visible to the naked eye on cutting open the organ.

If the spleen of a man or an ox be cut open it will appear of a soft pulpy consistence and deep crimson in colour, with little white patches, these splenic corpuscles, scattered through it. On putting the spleen under a running jet of water the soft spleen pulp infiltrated with blood will be washed away, leaving behind the tough capsule, the branching trabeculae, and the blood-vessels with

some of these splenic corpuscles attached to them. The blood-vessels end in the tissue of the spleen, and those that terminate within the splenic bodies do so in the usual way, passing into true capillaries. Within the spleen pulp, however, which forms the chief part of the organ, the arteries open directly into the loose tissue forming the pulp, so that the blood percolates through this before leaving the organ by the veins. The blood thus becomes intimately associated with this pulpy tissue, and becomes modified by it, as we shall see. It is highly probable that the chief use of the spleen is to modify the blood passing through it, and hence it is spoken of as a blood-gland, in contradistinction to a digestive gland, which pours its secretion into the digestive tract, and aids the processes which go on there. It is very probable that the spleen has the power of arresting and destroying the old worn-out red blood-corpuscles as they pass through it, for within the spleen itself evidence of their destruction is found in the large quantity ever present of iron and other bodies, which would result from their dissolution. Moreover there is strong reason for supposing that the active agents in this destruction are the cells present in the spleen pulp, some of which are generally found with bits of the red blood-corpuscles, and pigmented masses derived from them, within their bodies. But the spleen not only destroys blood-corpuscles; under some conditions it forms new corpuscles, and these enter the splenic vein, and are carried off in the general circulation. Most of these new corpuscles appear to be of the white variety, for an abnormally large number of these are by some observers found in the splenic vein; in early life, and under some conditions in adult life, the spleen appears to form red corpuscles also.

There is little doubt that in a general way the spleen is a blood-modifying gland, and in diseases such as splenic leucocythemia it becomes enormously enlarged, and produces large numbers of white corpuscles. In malaria it may become also enormously enlarged, forming the ague-cake. It may, however, be excised, even in the case of man, without producing fatal consequences, the lymphatic glands enlarging and the bone marrow undergoing changes, probably to enable them to compensate for the loss of the other organ.

The spleen was long supposed to be the seat of some of the less amiable emotions—envy, malice, &c.

Splenwort, any fern of the genus *Asplenium*. See FERNS, Vol. IV. p. 619.

Splenic Fever. See ANTHRAX.

Splicing. See KNOTS.

Splint is a bony enlargement on the horse's leg, between the knee and fetlock, usually appearing on the inside of one or both forelegs, frequently situated between the large and small canon bones, depending upon concussion, and most common in young horses that have been rattled rapidly along hard roads before their bones are consolidated. When of recent and rapid growth, the splint is hot and tender, and causes lameness, especially noticeable when the horse is trotted along a hard road. A piece of spongiopiline saturated with cold water should be applied to the splint, kept in position with a light linen bandage, and wetted with cold water or a refrigerant mixture every hour. Perfect rest must be enjoined for ten days or a fortnight. When the limb is cool and free from tenderness, the enlargement, which will still remain, may be greatly reduced by some stimulating applications, such as the ointment of the red iodide of mercury, the common fly-blister, or the firing-iron. For the splint-bones, see HORSE.

Splints, in Surgery, are certain mechanical contrivances for keeping a fractured limb in its proper position, and for preventing any motion of the ends of the broken bone; they are also employed for securing perfect immobility of the parts to which they are applied in other cases, as in diseased joints, after resection of joints, &c.

Ordinary splints are composed of wood cut to the size of the limb, and padded; pads are usually made of non-absorbent cotton-wool, bound lightly to the splints by loose-woven cotton bandages, by sheets, &c.; and the bony prominences of the limbs are further protected by nests of wool. The splints should be firmly bound to the limb with pieces of bandage, or with straps and buckles; care being taken that they are put on sufficiently tight to keep the parts immovable, and to prevent muscular spasm, but not so tight as to induce discomfort. Gutta-percha, sole-leather, or pasteboard, after having been softened in boiling water, may in some cases advantageously take the place of wooden splints. They must be applied when soft to the part they are intended to support, so as to take a perfect mould, and then be dried, stiffened, and, if necessary, lined. Perforated tin or aluminium is often used to form splints. An account of the more complicated kinds of splint required in certain cases, as Macintyre's Splint, Liston's Splint, &c., may be seen in any illustrated catalogue of surgical instruments.

The ordinary splint is now to a great degree superseded by immovable bandages, which consist of the ordinary bandage saturated with a thick mucilage of starch, with glue, or with water-glass (a solution of silicate of soda). As, however, these bandages require some hours to dry and become rigid, means must be used to counteract any displacement of the limb in the interval. On this account many surgeons prefer the plaster of Paris or gypsum bandage, which is applied in the following manner: the limb being protected by a layer of cotton-wool, a bandage composed of coarse and open material, into which as much dry powdered gypsum as possible has been rubbed, must be immersed in water for about a minute, and then rolled around the limb in a spiral manner, just as an ordinary bandage; after every second or third turn of the bandage, the left hand of the surgeon should be plunged into water, and smeared over the part last applied. When the whole has been thus treated, the exterior of the bandage should be smeared over with a paste of gypsum and water until a smooth surface and complete rigidity have been attained—a process not occupying more than about a quarter of an hour.

Split. See SPALATO.

Splügen, an Alpine pass in the Grisons, Switzerland, situated at an altitude of 6946 feet. It connects the valley of the Farther Rhine with that of a tributary of the Adda, and has been used for crossing the Alps since the time of the Romans. The existing road, 24 miles long and 14½ feet wide throughout, was completed by the Austrian government in 1823. It is protected against avalanches by several galleries and refuges.

Spodumene, a mineral consisting of silicate of lithium and aluminium, crystallising in the monoclinic system; hardness 6½–7; sp. gr. about 3·16. Some varieties rank as gem-stones.

Spohr, LUDWIG, composer and violinist, was born at Brunswick on 5th April 1784. His talent for music was shown early, and attracted the notice of the duke, who lent him valuable support in his studies. This patronage he justified by establishing a high reputation as a performer on the violin. In 1805 he was appointed music director at the court of Saxe-Gotha, but gave

up that post in 1813 to become music director of the Theater an der Wien at Vienna. There, however, he stayed only two years, and afterwards spent a similar period (1817–19) in a similar position at Frankfurt-on-the-Main. In 1820 he appeared in London, where he was received with great applause at the Philharmonic Society's concerts. On the recommendation of Weber, he was in January 1822 appointed Kapellmeister at the court of Hesse-Cassel, which post he continued to hold till 1857. He died on 22d October 1859. The best of his numerous musical compositions are the operas *Faust*, *Jessonda*, and *Zemira und Azor*; the oratorios *Die letzten Dinge*, *Des Heilands letzte Stunden*, and *Der Fall Babylons*; nine grand symphonies, the finest *Die Weihe der Töne*; fifteen very highly esteemed violin concertos; besides sonatas for violin and harp, fantasias, and rondos. *Die letzten Dinge*, or Last Judgment, is a very grand and attractive work; so also is *Der Fall Babylons*, first produced at a Norwich musical festival (1842). As a violinist Spohr deservedly ranks as one of the greatest amongst German masters of the instrument. His *Violinschule*, a manual for advanced violin-players, is almost indispensable for any student who aspires to mastery of technique as a performer.

See his Autobiography (Eng. trans. 1864), and biographies by Malibran (1860) and Schletterer (1881).

Spoils System. See JACKSON (ANDREW).

Spokane, a city of Washington, capital of Spokane county, is situated on the Spokane River and on several important railroads. The falls on the river are utilised for mechanical and electric power, and have added greatly to the importance of the town, which has many flour and lumber mills, foundries, machine-shops, car and furniture works, potteries, and is a great mining centre. In 1890 it was almost totally destroyed by fire, but quickly rebuilt, and has grown very rapidly. Pop. (1880) 350; (1890) 19,922; (1900) 36,848; (1910) 104,402; (1920) 104,437.

Spoleto (Lat. *Spoletium*), an archiepiscopal see of Umbria, is situated on a rocky hill, 88 miles by rail N. by E. of Rome. It is commanded by a citadel (now a prison) which dates from the Gothic period, and has a fine cathedral, built under the Lombard dukes, with frescoes by Filippo Lippi. The church of S. Pietro, outside the town, has a façade with curious sculptures of 1000 and 1200, and the churches of SS. Domenico, Gregorio, and Niccolò are all of interest. Almost contemporary frescoes depicting the murder of St Thomas a Becket have been discovered. At the cemetery is the old church of S. Salvatore (4th century) and close by is S. Ponziano (13th century). There is a good museum, and the whole town is very picturesque, and still mediæval in aspect. There are a large number of Roman ruins in and under the town in good preservation—a theatre, an amphitheatre, a bridge, a triumphal arch of Drusus and Germanicus, a temple, the house of Vespasia Polla, the mother of the Emperor Vespasian, &c. There are traces of two different enceintes—pre-Roman (?) and Roman. The aqueduct which supplies the city is Roman in origin, but was restored in 604 and 1364, to which latter date the whole of the present Ponte delle Torri belongs; the aqueduct is 270 feet high and 680 long. The ancient *Spoletium* had its origin in a Roman colony planted here in 242 B.C.; Hannibal (q.v.) was repulsed in an assault he made on the town (217 B.C.) after the battle of Lake Trasimene. It was an important position during the wars of the Vandals and the Goths; and under the Lombards it became the capital of an independent duchy, and its dukes ruled over great part of Central Italy. Having

been united to Tuscany, it was bequeathed by the Countess Matilda to the pope (1115). Spoleto has manufactures of woollens and hats. Pop. (1921) 28,289.

Sponges (*Porifera*), a class of animals whose type of structure is simpler than that of all the other multicellular forms or Metazoa. For the body of a sponge is not differentiated into organs; and tissues are only, as it were, in the making. Almost all are marine, occurring from the shore to the great depths. Except as embryos, they are always fixed to rocks, or in the mud, or upon seaweeds, or on other animals. Their sedentary life, the usual absence of any marked contractility, their frequently herb-like growth, and other characters, led early naturalists to regard sponges as plants; but their animal nature is at once evident when we examine into their internal structure and activities, or when we trace their development. Yet they remained puzzles for centuries. Peyssonnel regarded them as worm-nests, for were not worms found inside of them? Lamarck thought they were colonies of polypes, but the polypes were not to be seen. In popular classification they were ranked with seaweeds. A great step was made when, about 1820-25, Robert Grant observed the water-currents which pass in by minute pores all over the surface and pass out by the larger apertures. Since then our knowledge of sponges has been rapidly progressive.

If we examine a very simple sponge, such as *Ascetta*, we see a small vase-shaped body, fixed at its base, open at the apex.

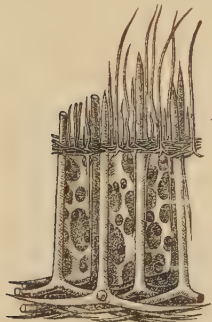


Fig. 1.—Section through wall of *Syvilla chrysalis*, showing needles, grapple-like spicules, and inhalant pores.

feed and refresh the body, the life of the sponge depends. Every Metazoon organism is 'a city of cells'—a sponge is peculiarly Venice-like. The currents are sustained by the activity of the internal flagellate cells, which by their ceaseless lashing draw the water inwards and drive it also outwards, and at the same time absorb food-particles which drift along in the current.

But few sponges are so simple as the vase-like *Ascetta*; we are familiar, for instance, with the complex 'horny' skeleton of the bath-sponge (*Euspongia*), or with the beautiful flinty framework of the Venus' Flower-basket (*Euplectella*); and an examination of the fresh-water sponge (*Spongilla*) of the lake or canal, or of the Mermaids' Gloves (*Chalina*) so often cast up half alive on the beach, convinces us that the structure of the soft parts is also relatively complex. Yet with the simple primitive cups the most complex forms are connected by a gradual series of steps, and simple cups they all are when very young. Let us consider briefly how the complication of structure is brought about.

(1) The vegetative character of sponges is shown by the prolific way in which buds grow out from the parent body. These buds may produce other buds, and the walls of neighbour buds may fuse; in this way there arise from an original sac-like form complex structures puzzling to those who seek logical clearness as to the nature of animal individuality (see fig. 3).

(2) In the simple Ascon type the internal cavity is lined by the characteristic Monad-like, 'collared,' flagellate cells. If this layer grow more

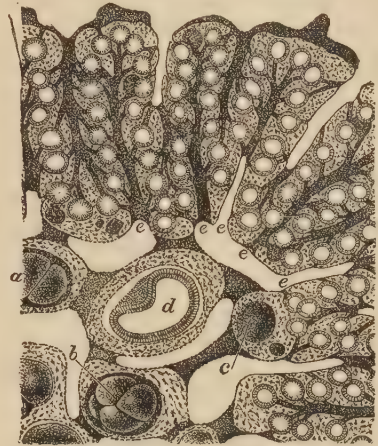


Fig. 2.—Section of part of a Sponge, *Oscarella lobularis* (after Schulze), showing afferent canals, flagellate chambers, efferent canals, internal cavities (e, e), segmenting ova (a, b, c, d).

rapidly than the outer strata it will naturally become folded into a number of side-aisles, and this is seen in the Sycon type of calcareous sponges, in which the characteristic collared and flagellate cells are restricted to a series of radial chambers around the central cavity. If a similar process of folding occur in the radial chambers the characteristic collared and flagellate cells become restricted to little flagellate ampullæ or chambers, which afferent canals from the surface enter, and from which efferent canals lead to the central cavity and thence outwards. This is the state of affairs in the Leucon type of calcareous sponges, and, with further complications, in the great majority of forms.

(3) Another seat of complication is the middle stratum. This is called the mesogloea in order to

emphasise the fact that in sponges, as also in Coelenterates, it has not the same definiteness as the middle layer or mesoderm which occurs in the Coelomata—that is, in most animals higher than Coelenterata. In the simple sponges the middle stratum is very simple, and always it seems to owe its units to

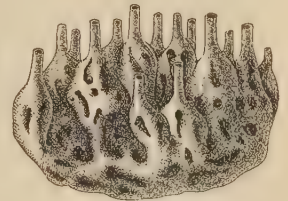


Fig. 3.—Figure of *Leucandra saccharata*, showing mode of growth by budding.

contributions from the inner layer. In more complex forms, however, the mesogloea contains a great variety of cells, some skeleton-making, others contractile, others like simple connective tissue, others full of pigment, others forming reproductive elements, and so on. In sponges the outer or dermal layer is relatively unimportant, though it may line the outer portions of the inhalant canals; the middle layer or mesogloea tends to show much

division of labour in its component elements; the inner or gastral layer consists of flagellate cells, either collared or flattened. There are serious technical difficulties in the way of calling the outer layer ectoderm and the gastral layer endoderm, as would be done in other Metazoa.

Life of Sponges.—Although sponges do not move, there is much motor activity in the lashing of the flagellate cells. Like many other passive organisms sponges are profoundly influenced by their surroundings, for their shapes vary according to the nature of their anchorage and the currents which play around them. Sensitiveness to stimulus is shown by the closure of the little superficial pores and sometimes even of the larger exhalant aperture or apertures. This closure is due to special contractile-cells in the mesogloea; no specialised nerve-cells have been detected. The food of sponges consists of microscopic organisms and particles of organic debris, which are borne by the water-currents, and caught by the flagellate cells, which, like so many Monads, swallow first and digest intracellularly afterwards. From the cells which feed, surplus nutritive material oozes to adjacent cells, or is passed to mobile amoeboid cells in the mesogloea. Useless debris is also got rid of by the collared cells. Respiration is of course effected by the currents of water which wash the cells, and some of the bright pigments, such as floridine, characteristic of many sponges, readily absorb oxygen. The green colour of *Spongilla* is due to partner-Algæ with chlorophyll.

Reproduction.—Sponges multiply, like many plants, by overgrowth and budding, but the buds remain continuous with the parent mass, though sometimes it happens that small portions are set adrift from a moribund body. As a sponge is but slightly differentiated, as a fragment is a fair sample of the whole body, we can understand the success with which the sponge-farmers bed out portions of sponge in suitable places, leaving them to grow to a size fit for use. But sexual reproduction also occurs in all sponges. The ova and spermatozoa are included in the mesogloea, originating from apparently similar cells. Both unisexual and bisexual forms occur, in rare cases within one species. The ova are fertilised by spermatozoa drawn in by the water-currents, and development proceeds through several stages before the embryo leaves the parent (see fig. 2).

The life-history of the fresh-water sponge, *Spongilla*, as told by Marshall, is one of interesting vicissitudes. In autumn the sponge begins to suffer from the cold and the scarcity of food, and dies away. But throughout the moribund parent clumps of cells combine into 'gemmules,' which are furnished with capstan-like spicules, and are able to survive the winter. In April or May they float away from the parental corpse, and form new sponges. Some of these are short-lived males, others are more stable females. The ova produced by the latter, and fertilised by the cells of the former, develop into another generation of sponges, which in turn die away in autumn, and give rise to gemmules. The life-history



FIG. 4.—Two stages in the development of *Sycandra raphanus* (after Schulze):

a, gastrula, towards end of free-swimming stage; b, section of embryo after it has settled down, showing the two germinal layers and the central cavity.

thus illustrates Alternation of Generations (q.v.).

Development.—The development of sponges varies

considerably in the different types, but we may sketch that of a calcareous sponge. The fertilised ovum divides completely, and forms a hollow sphere of in part flagellate cells, which escapes from the parent into the water. In the course of a short free-swimming life the ball of cells becomes invaginated, and forms a two-layered gastrula. This fixes itself, mouth downwards. But pores soon appear through the walls; the internal cells which had meanwhile lost their lashes regain them; an exhalant orifice is formed by rupture at the apex; a middle stratum is derived from the inner layer and begins to form spicules: the young sponge is made.

Classification.—One of the oldest and most convenient classifications of sponges is that which distinguishes three main sets according to the nature of the skeleton:

- (1) **CALCISPONGIÆ**: with spicules of carbonate of lime, including *Ascon*, *Sycon*, and *Leucon* types. The purse-like *Grantia compressa* is common on British shores.
- (2) **SILICISPONGIÆ**: with spicules and threads of silica—e.g. the Venus' Flower-basket (*Euplectella*); the likewise deep-sea Glass-rope Sponge (*Hyalonema*); Mermaids' Gloves (*Chalina oculata*), with a fibrous as well as a flinty skeleton; the common Crumb-of-bread Sponge (*Haliclondria panicea*); *Clione*, which bores in oyster shells; *Suberites domuncula*, which grows round a whelk shell inhabited by a hermit-crab; and the fresh-water *Spongilla*.
- (3) **CERATOSPONGIÆ**: with a framework of spongin or sponge-stuff and no proper spicules—e.g. the Bath-sponge (*Euspongia*), which thrives on some of the Mediterranean coasts.

To these may be added a few, probably degenerate, forms which have no skeleton at all (*Myxospongiæ*)—e.g. *Oscarella* (or *Halisarca*) *lobularis*.

History.—Sponges, as we should expect, occur in very ancient strata; remains of a flinty form (*Protospongia*) have been found in Cambrian strata. In succeeding ages they are almost always represented. Remains of calcareous forms are almost confined to one peculiar set of large forms (*Pharetronæ*) in Devonian and several succeeding epochs. Professor Franz Eilhard Schulze—the greatest authority on sponges—divided the sponge branch of the genealogical tree into three: the calcareous forms to one side, the siliceous *Hexactinellida* with triaxial spicules to the other, and between these the other flinty sponges whose spicules have four axes (*Tetraxonina*) or only one (*Monaxonina*), and the horny sponges without any spicules. It is generally allowed that the sponges are quite distinct from the *Cœlenterates*, and that they are somewhat degenerate and divergent descendants of the primitive Metazoa.

Relation to other Organisms.—Sponges are living thickets in which many small animals play hide-and-seek. Polypes, worms, and some other animals are often found associated with sponges, using them partly for shelter, partly as browsing-grounds. From the appetite of larger animals sponges are doubtless in great part saved by their spicules, and their frequently offensive taste and odour. Some sponges are borers, and others smother forms of life as passive as themselves. Several crabs are masked by growths of sponge, and within several sponges minute Algæ live in constant partnership.

Several species of *Euspongia* are in use for economic purposes. Two species are brought from the Levant, and one (not much inferior) from the West Indies and coast of Florida. The trade in sponge is very considerable; it is carried on chiefly by Greeks, Sicilians, Tripolitans, Tunisians, and Bahama Islanders. The Levantine boats find their chief employment on the coasts of Crete, Barbary, and Syria. The sponge is obtained by diving, the diver taking down with him a flat piece of stone of a triangular shape, with a hole drilled through one of its corners; to this a cord from the boat is attached, and the diver makes it serve to guide him to particular spots. When he reaches the grow-

ing sponges he tears them off the rocks, and places them under his arms; he then pulls at the rope, which gives the signal to his companions in the boat to haul him up. The diving-bell and diving-dress are sometimes made use of. The Greeks of the Morea, instead of diving, obtain sponges by a pronged instrument; but the sponges thus collected are torn, and sell at a low price. The best sponges are obtained on detached heads of rock in eight or ten fathoms of water.

The sponges of the West Indies are larger and coarser. The sponges are torn from the rocks by a fork at the end of a long pole. To get rid of the animal matter they are buried for some days in the sand, and then soaked and washed. Sponge-culture has been tried off Florida and elsewhere.

The domestic uses of sponge are familiar to every one. It is also of great value to the surgeon, not only for removing blood in operations, but for checking hemorrhage. Burnt sponge was once a valued remedy for scrofulous diseases and goitre; but iodine and bromine, from which it derives all its value, are now administered in other forms. The heads of drumsticks for playing the timpani are covered with sponge.

See the account of sponges by Sollas in the *Cambridge Natural History* (1906); the article in Lydekker's *Zoology* (1900); Haeckel, *Die Kalkschwämme* (1872); *Challenger's Reports on Sponges*, by Haeckel, Poléjaeff, Schulze, Sollas; Vosmaer, 'Die Poriferen,' in Bronn's *Thierreich*; Bowerbank's *British Spongiade*; Hinde's *Fossil Sponges*.

Spongilla, a genus of Sponges (q.v.) inhabiting fresh water.

Spongy Parenchyma, a loose tissue forming the inner part of the under side of a leaf. It is full of intercellular air-spaces, which communicate with the atmosphere through stomata in the epidermis. Above it is ordinarily a layer of palisade-cells.

Spontaneity. See NERVOUS SYSTEM, WILL.

Spontaneous Combustion is a phenomenon that occasionally manifests itself in mineral and organic substances. For some facts connected with the spontaneous ignition of mineral substances, see PYROPHORUS. Ordinary charcoal does not undergo combustion in air below a temperature of 1000°, but in some states, especially when impregnated with oil, it is liable spontaneously to acquire a temperature which may lead to unexpected combustion. There have been many instances of the spontaneous ignition of coals containing iron Pyrites (q.v.) when moistened with water. The pyrites which most readily give rise to spontaneous combustion are those in which the protosulphide is associated with the bisulphide of iron; and these occur among the Yorkshire coals and in some kinds of South Wales coal. Sulphur has no tendency to spontaneous combustion, but Dr Taylor refers to an instance that came to his own knowledge, in which there was reason to believe that the vapour of bisulphide of carbon in an india-rubber factory was ignited by solar heat traversing glass. Phosphorus, when in a dry state, has a great tendency to ignite spontaneously, and it has been observed to melt and take fire (when touched) in a room in which the temperature was under 70°. The ordinary lucifer-match composition is luminous in the dark in warm summer nights, which shows that oxidation, and therefore a process of heating, is going on. Hence large quantities of these matches kept in contact may produce a heat sufficient for their ignition. 'I have seen them ignite,' says Dr Taylor, 'as a result of exposure to the sun's rays for the purpose of drying.'

In organic substances, apart from the accidents that may result from the admixture of strong nitric

or sulphuric acid with wool, straw, or certain essential oils, which, if they occur, are immediate and obvious, there are many cases in which, 'without contact with any energetical chemical compounds, certain substances—such as hay, cotton and woody fibre generally, including tow, flax, hemp, jute, rags, leaves, spent tan, coconut fibre, straw in manure-heaps, &c.—when stacked in large quantities in a damp state, undergo a process of heating from simple oxidation (eremacausis) or fermentation, and after a time may pass into a state of spontaneous combustion' (Taylor). Cotton, woollen articles, hemp, tow, and flax impregnated with oil, when collected in large quantity, are specially liable to ignite spontaneously; and the accumulation of cotton-waste, used in wiping lamps and the oiled surfaces of machinery, has more than once given rise to accidents, and led to unfounded charges of incendiarism. Dr Taylor relates a case in which a fire took place in a shop 'by reason of a quantity of oil having been spilled on dry sawdust.' According to Chevallier, vegetables boiled in oil furnish a residue which is liable to spontaneous ignition. The great fire at London Bridge in 1861 was referred to the spontaneous combustion of jute in its ordinary state; but Dr Taylor remarks that this is wholly incredible, and from experiments which he made for the defendants in the case of Hepburn v. Lordan (1865), and on other grounds, he holds that there is even no evidence of moist jute undergoing spontaneous combustion. Dry wood is supposed by Chevallier and some other chemists to have the property of igniting spontaneously. Deal which has been dried by contact or contiguity with flues or pipes conveying hot water or steam at 212° is supposed to be in a condition for bursting into flame when air gets access to it; and the destruction of the Houses of Parliament, and many other great fires, have been ascribed to this cause; but it appears that some amount of charring is necessary, and that on slight cooling a considerable quantity of oxygen is absorbed from the air, which induces a sufficient rise of temperature to set up spontaneous combustion. In a case recorded in the *Annales d'Hygiène* for 1841, MM. Chevallier, Ollivier, and Devergie drew the conclusion that a barn had caught fire from the spontaneous combustion of damp oats which were stored in it. No such cases are known to have occurred in Great Britain. See also FIRE and GUN-COTTON.

Spontaneous combustion of the human body is supposed to have occurred in a number of recorded cases, of which one of the earliest was that of Mme. Millet at Reims in 1725, and one of the most notable that of a man found burning in bed in 1847 (*Gazette Médicale*, 4th September 1847). Some of the alleged cases have been traced to wilful burning after murder; some are plainly incredible; the remainder, with the exception of the 1847 case, which remains unexplained, can all be traced to the destruction of the bodies of intoxicated brandy-drinkers, near an open fire in winter, with no one present and no evidence forthcoming as to the time occupied in the combustion, or as to the circumstances, other than intoxication, preceding the combustion. Liebig discusses the subject in his *Letters on Chemistry*, and concludes that, while a fat dead body charged with alcohol may perhaps burn, a living body, in which the blood is circulating, cannot take fire under any circumstances.

For further details the reader is referred to Graham's 'Report on the Cause of the Fire in the Amazon,' in the *Quarterly Journal of the Chemical Society*, vol. v. p. 34; to the article 'Combustion' in Watt's *Dictionary of Chemistry*, vol. i.; and to the elaborate chapter on this subject in Taylor's *Principles and Practice of Medical Jurisprudence*. For spontaneous combustion

in the human body, see the articles thereon in the *Medical Encyclopædias*; the preface to Dickens's *Bleak House*; Liebig's *Letters on Chemistry*; Dupuytren's *Leçons Orales*; Taylor's *Medical Jurisprudence*.

Spontaneous Generation is a term applied to the real or imaginary development of lowly organisms from non-living matter. The facts are that when organic substance is exposed to the air it putrefies, and at the same time living animals—maggots, infusoria, and others, according to the nature and conditions of the substance—appear in it. The question is, whence do the living animals come; from the organic stuff or from germs present in it or in the air? There is a further question—what is the cause of the putrefaction; is it an ordinary process of slow oxidation or is it caused by the living organisms? If the dead organic matter can give rise to life, then we know something of the mode of origin of life upon this planet, for we can make solutions of inorganic salts that will support life, and might therefore also give origin to it; if not, then we are entirely ignorant as to that origin. For many years no one has doubted but that, if one is careful to exclude all germs from the organic stuff, no life can proceed from non-living matter, even if it has once formed part of some living organism and is in the most complex state in which such matter is known to us. The matter is therefore one of historic interest chiefly. As long ago as 1870 Huxley, in his presidential address to the British Association, was able to say that it appeared to him, within certain limitations, that the doctrine of Biogenesis, that life proceeds from life only, was victorious along the whole line. These limitations were, he said, that if he could have been a witness of the early stages of the earth's history, when the physical and chemical conditions were different from those that now hold, he would have expected to see the evolution of living protoplasm from non-living matter. As these limitations are still often thought inconsistent, and as by other people the denial of spontaneous generation seems inconsistent with a belief in evolution, it will be well to quote Herbert Spencer's reply to a critic who urged objections on this ground of inconsistency. In his *Principles of Biology* (vol. i., Appendix, 1868) he says, 'I do not believe in the "spontaneous generation" commonly alleged, and so little have I associated in thought this alleged "spontaneous generation," which I disbelieve, with the generation by evolution, which I do believe, that the repudiation of the one never occurred to me as liable to be mistaken for repudiation of the other. That creatures having *quite specific structures* are evolved in the course of a few hours, without antecedents calculated to determine their specific forms, is to me incredible. Not only the established truths of Biology, but the established truths of science in general, negative the supposition that organisms having structures definite enough to identify them as belonging to known genera and species can be produced in the absence of germs derived from antecedent organisms of the same genera and species. If there can suddenly be imposed upon simple protoplasm the organisation which constitutes it a *Paramecium* I see no reason why animals of greater complexity, or indeed of any complexity, may not be constituted in the same manner. In brief, I do not accept these alleged facts as exemplifying evolution, because they imply something immensely beyond that which evolution, as I understand it, can achieve. In the second place, my disbelief extends not only to the alleged cases of "spontaneous generation," but to every case akin to them. The very conception of spontaneity is wholly incongruous with the conception of evolution.' On the other hand he says, 'Granting that the forma-

tion of organic matter and the evolution of life in its lowest forms *may* go on under existing cosmical conditions, but believing it more likely that the formation of such matter and such forms took place at a time when the heat of the earth's surface was falling through ranges of temperature at which the higher organic compounds are unstable, I conceive that the moulding of such organic matter into the simplest types must have commenced with portions of protoplasm more minute, more indefinite, and more inconstant in their characters than the lowest Rhizopods—less distinguishable from a mere fragment of albumen than even the Protogenes of Professor Haeckel. The evolution of specific shapes must, like all other organic evolution, have resulted from the actions and reactions between such incipient types and the environment, and the continual survival of those which happened to have specialities best fitted to the specialities of their environments. To reach by this process the comparatively well-specialised forms of ordinary infusoria must, I conceive, have taken an enormous period of time.' Again, 'That organic matter was not produced all at once, but was reached through steps, we are well warranted in believing by the experience of chemists. Organic matters are produced in the laboratory by what we may literally call *artificial evolution*. Chemists find themselves unable to form these complex combinations directly from their elements, but they succeed in forming them indirectly by successive modifications of simpler combinations.' We may say then that it is certain that living organisms, large enough to be visible with the help of a microscope and definite enough in form and structure to be classified with other known genera, do not grow at present from non-living matter. But it is not therefore certain that protoplasm or living matter may not be so formed in extremely small quantities, too small to be visible and of simple or no structure, but yet sufficiently complex in composition to serve as food for other and more highly developed animals. Whether this be so or not, Huxley and Spencer in their time and nearly all biologists since have been agreed in believing that in past time molecules of simple matter by some series of reactions became aggregated until a matter, sufficiently complex and sufficiently unstable to be called living matter, was formed, whilst there is no evidence that any such generation is taking place at present. When conditions on this planet became favourable, protoplasmic substance presumably came into being. The origin of protoplasm was in all probability the result of a combination of circumstances that never occurred before in the history of the earth, and which has never happened since.

History.—It must always have been a matter of common experience that many articles of food are apt to become mouldy and to putrefy if kept too long. Associated with mould and with putrefaction are various sorts of low forms of life. The ancient philosophers never doubted that these were generated in the matters in which they made their appearance. Indeed, all men believed this until past the middle of the 17th century. But in 1660 in Italy, in those days the home of learning, Francesco Redi published his *Esperienza intorno alla Generazione degl' Insetti*. He was no theorist, but a careful experimenter. Here, said he, is meat; if I expose it to the air in hot weather, in a few days it putrefies and swarms with maggots; but if I protect similar pieces of meat by covering them with fine gauze, then, though they still putrefy, not a maggot makes its appearance. From this experiment it becomes obvious that the maggots are not generated in the meat, but that the cause of their formation is something that is kept away by fine gauze. This something can be easily shown to be

blowflies, for these, attracted by the meat, swarm near it and lay their eggs on the protecting gauze, eggs from which maggots are shortly hatched. Now this is the principle of the whole matter; keep away all living things which might come to the meat and the meat will not create any living things, will not even putrefy if one kills any living animals or germs of animals that may be in the meat. The protecting gauze must be fine enough, that is all. Redi of course was accused of controverting Scripture, because of the story of the bees which were said to be generated in the carcass of the lion. But his doctrine of Biogenesis flourished for a century. Indeed when, through the development of the microscope, the numerous provisions for the production of germs were made known, the hypothesis of Abiogenesis, that life could come from what was not living, appeared absurd. Leeuwenhoek (q.v.), 1632-1723, is remarkable as being the first man to demonstrate existence of unicellular organisms. During the 18th century the microscope was greatly improved. The animalcules (infusoria) which in a few days will swarm in any infusion of organic matter became visible, and Needham, on theoretical grounds, doubted whether Redi's generalisation, 'no life without antecedent life,' held true for these lowly forms of life. He put his doubts to the test. He argued that if the infusorial animalcules came from germs, then the germs must exist either in the substance infused or in the water used to make the infusion or in the air that touches both of them. The life of all germs is destroyed by heat. If, therefore, the infusion be boiled, any germs present will be killed; and then if the infusion be shut off from the air no more germs can get into it. Now, if after this treatment animalcules still appear in the infusion they will have been generated from the infused substance or from the water; but if they do not appear, then Redi's dogma will be true for infusoria. He therefore boiled and corked infusions of various substances, and in every case after a longer or shorter time animalcules appeared and flourished. Needham was associated in much of his work with Buffon. The French naturalist had a theory of life to which Needham's experiments lent support. Life, he thought, was the indestructible property of certain molecules, which he described as 'organic molecules.' All living organisms, he said, are built up of such molecules; death is nothing more than their dissociation. When they are thus set free they take the form of infusorial animalcules. It is necessary to distinguish this theory, which is so ingenious, from the theory of Abiogenesis, the antithesis to that of Biogenesis, which supposes that life may and does arise from non-living matter.

But the theory of Buffon, and especially the experiments of Needham, which lent it support, did not seem satisfactory to Spallanzani. He saw two sources of error—first, the germs present in the infusion might have escaped death through not having been boiled long enough; and secondly, the corks, perhaps, were not perfectly effective, and air containing germs might have got into the flask and infected the infusion. So he too prepared infusions; but he boiled them for three-quarters of an hour, and then fused the necks of the flasks. He found after this treatment that the infusions remained perfectly free from living organisms for as long as he chose to keep them. It might seem that this must be the end of the whole matter; but the event proved otherwise. This time it was the chemists who reopened the discussion. Oxygen was discovered, the theory of respiration was begun, and it was proved that a supply of free oxygen is one of the conditions of life and also of putrefaction. So it

was possible that Spallanzani's infusions did not produce life either because the 'organic molecules' were altered in some way by being boiled, or because they were unable, owing to the absence of oxygen, to live. So the experiments had to be repeated in such a manner that the organic matter was not altered, and so that there was sufficient oxygen. Schulze and Schwann in 1836 took up the matter. They carefully boiled their infusions, and then supplied air; but they made it pass through red-hot tubes first, so that any germs present in it would be burned. In these conditions no animalculæ appeared in the infusions; but if they were exposed to air which had not been heated then animalculæ appeared in abundance. Therefore boiling does not injure the vitality of the 'organic molecules,' if there are such, and there is only one possible objection to the conclusions drawn from such experiments, if they be properly conducted, and that is that what the red-hot tubes destroy is not germs, but something else that may be non-living and yet essential to life. Now about this time Cagniard de la Tour discovered that fermentation, like putrefaction, is always accompanied by the presence of minute living creatures. Common yeast, for instance, is a mass of minute plants. When it was suggested that the living creatures not only accompanied but actually caused the processes of fermentation and putrefaction, the chemists, led by Liebig and Berzelius, laughed the idea to scorn. But in 1843 Helmholtz ingeniously separated a putrescent from a putrescible fluid by a membrane, so that the products of putrefaction could mix with the putrescible matter; but that did not in consequence putrefy. Therefore it followed that the cause of putrefaction must be either a colloid—indiffusible stuff—or a solid. In 1854-59 Schroeder and Dusch cleared up this point by experiments which were simply refinements upon the original ones of Redi; instead of using a screen of gauze to keep off blowflies they used a screen of cotton-wool, a screen with meshes so fine that not even the tiny germs can pass through them. They boiled infusions, and while the steam was coming off freely they plugged the neck of the flask with cotton-wool. Now this plug did not keep away oxygen, nor did it in any way heat or alter the air that passed to the fluid, as the red-hot tubes of Schulze and Schwann had done, and yet no animalcules appeared in the boiled infusion screened by cotton-wool. It is therefore proved that the cause of putrefaction and fermentation and the origin of the living forms that accompany these processes must be small particles that exist in the air.

But in 1859 Pouchet published his *Hétérogénie*. He once more raised clouds of doubt. It seemed evident to him that spontaneous generation was one of the means that nature employed for the reproduction of living beings. If, he said, all putrefaction is the result of life present, as germs, in the air, then the air in which we live would have almost the density of iron! About this time Pasteur took the matter up, although advised by his friends, in view of the difficulty of the subject, not to do so; at least, said Dumas, do not spend too much time over it. But in 1862 he published a paper *On the Organised Particles existing in the Atmosphere*. He had collected the floating dust of the air and examined it with a microscope. He saw that much of it actually consisted of organised particles, and on his sowing these in suitable sterilised infusions there grew from them rich crops of animalculæ. He also showed that these germs of life were not universally diffused in the air. He opened his sealed flasks in the pure air of the Mer de Glace. Only one out of twenty such flasks thus opened became filled with life; while eight out of twenty opened

in the air of the plains did so, and all of them did so if opened in the air of towns. These researches of Pasteur were necessary before Lister could have brought his system of antiseptic surgery to a successful issue; while he himself, as is well known, did great work upon the relations of these forms of life to many industries and diseases. The germs of the air were then studied by Cohn, shown by him to be bacteria, and the basis of a sound knowledge of them was laid. In 1869 Tyndall hit upon a very precise method of determining the absence or presence of dust particles in the air, a method much more searching than that furnished by the most powerful microscope. He was experimenting in another direction, and had need of air free from dust. He noticed that such matter (dust) passed easily through liquids. A beam of light shows the presence of dust particles in the air by the reflection that occurs from the surface of such. Tyndall showed that whenever dust was present the putrefaction occurred sooner or later, when it was absent it did not. Tyndall's apparatus was a box with glass sides, into the bottom of which the mouths of flasks penetrated, the lower parts being outside the box, so that the contained infusions could be boiled. A beam of sunlight was allowed to pass through the box; it showed the presence of dust in the air in a way with which every one is familiar. The inside of the box was then coated with glycerine, and the whole was kept as still as possible. After some time the dust particles sank to the floor of the box, and stuck to the glycerine, and a beam of sunlight passing through was quite invisible, there not being anything to reflect it. The infusions were then boiled for a long time, and then allowed to cool, after which they might be kept for months without putrefying or showing any signs of the presence of life. Here all the conditions of the infusions were natural, save that there was no dust in the air above them. In the dust of the air therefore are solid germs of life. The opponents of the doctrine of Biogenesis had long made objection to it, saying that 'if true then the air must be thick with germs; now this is absurd, therefore the doctrine is untrue.' An argument this that shows that a *reductio ad absurdum* is not always a proof.

See BACTERIA, BATHYBIUS, LIFE, PROTOPLASM, PUTREFACTION; and Haeckel's *Natural History of Creation*.

Spontini, GASPARO LUIGI PACIFICO (1774-1851), Italian composer, was born at Majolati in the March of Ancona, and studied at Naples. In Paris his one-act opera, *Milton*, attracted notice; and the grand opera *La Vestale* (1807) was greeted with enthusiastic acclaim, and was adjudged the prize of 10,000 francs instituted by Napoleon. An equally warm reception was accorded to *Ferdinand Cortez* in 1809. In the following year Spontini was appointed director of Italian opera at the Odéon. *Olympia* (1819) was less successful. In 1820 Frederick-William III. summoned him to Berlin. There he remained more than twenty years, though during the greater part of the time it was only court influence that supported him against the enmity of the Berlin public and of the Prussian press. Spontini was jealous of Weber, and was by nature quarrelsome and vain; but as a musician he entertained the loftiest aims, possessed true artistic taste, was grandiose in his conceptions, and breathed the spirit of genuine melody into his compositions. In Berlin he wrote three other grand operas—*Nourmahal* (1822), *Alcidor* (1825), and *Agnes von Hohenstaufen* (1829), his greatest work. Dismissed by Frederick-William IV. in 1842, he gradually withdrew into private life. See monograph by Robert (Berlin, 1883), and Grove's *Dictionary of Music*.

Spontoon. See PIKE.

Spoonbill, a family of birds, *Plataleidae*, allied to the *Ibididae*, and more distantly to the storks, and distinguished by the remarkable form of the bill, which is long, flat, broad throughout its whole length, and much dilated in a spoon-like form at the tip. The species are not numerous, but are widely distributed; the birds, are, however, becoming scarce owing to the drainage of their native haunts. The only European species is the White



Spoonbill (*Platalea leucorodia*).

Spoonbill (*P. leucorodia*), till the 17th century nesting in Britain, but now only a visitor. This bird was known as the Shovelard or Shovelar, while the duck now known as the Shoveler was then called the Spoonbill. In Northern Europe the Spoonbill is uncommon; it breeds in Holland, in the south of Spain, and the Black Sea district. Eastward in summer it ranges to India, Ceylon, and northern China; it is resident in North Africa. In South Africa it is represented by another species, *P. tenuirostris* or *cristata*. It is gregarious, but its nesting habits vary in different countries; in Holland the nests are made of reeds, and placed on the mud among rushes; in Slavonia on the submerged branches of willows; and in India on trees. It is about 32 inches long. Its colour is white, slightly tinged with pink; the bill and legs are black. A curious convolution of the windpipe, in the form of a figure 8, is found on dissection in the adult spoonbill, but does not exist in the young. The flesh of the spoonbill is said to be tender and of good flavour. The spoonbill is easily tamed, is quiet and inoffensive, and feeds readily on any scraps. The Roseate Spoonbill (*P. ajaja*) is an American species, and the only one; very abundant within the tropics, and found in the most southern parts of the United States. It is nearly equal in size to the White Spoonbill, which it resembles in its habits. It is a beautiful bird, with plumage of a fine rose-colour, deepest on the wings; the tail-coverts are crimson. *P. regia* or *melanorhynchus* and *P. flavipes* are found in Australia.

Sporades. See ARCHIPELAGO.

Sporadic (Gr. 'scattered') is a term applied to any disease that is commonly epidemic or contagious, when it attacks only a few persons in a district and does not spread in its ordinary manner.

Spore. This is a general name used for the asexual and sexual reproductive bodies produced by plants and animals, but applied more particularly to those of plants. The simple word spore is commonly qualified by some prefix indicative of origin, development, or behaviour. The older terminology given in ignorance of these principles was slowly modified as discovery

progressed; hence a considerable nomenclature of old and new terms has arisen to the perplexity of students. Individual spores are generally invisible to unaided vision, being commonly less than $\frac{1}{25}$ inch in longest diameter. Some, indeed, even 100 times smaller than that. Certain multicellular spores, however, like the macrospores of *Selaginella*, are visible to the unaided eye, and in former eras there were giants the size of a pea, or even of a hazel nut. Each unicellular spore consists of a particle of protoplasm, a nucleus and a supply of food substance, all enclosed within a protective covering which may be excessively thin or relatively very thick. This covering may be smooth or covered with warts, prickles, reticulations, or otherwise ornamented externally. The usual shape of spores is spherical or elliptical, others are attenuated, even needle-like, while a few are irregular in outline. The majority are immotile, but many are endowed with locomotive power, swimming in water or even creeping on soil. Various methods of production and development may be found in articles mentioned below. In certain Algae and Fungi spores normally asexual may become sexual in an unusual environment, and the converse may occur. Because asexual spores and female spores when fertilised commonly reproduce the organism, they are often regarded as the seeds of cryptogams, an assumption due to misapprehension of form and function, and confusion of analogy with homology. The seeds by which all normal flowering plants are reproduced are not comparable with spores. A seed differs vastly from a spore in that it contains an embryo plant, although in a condition of latent life. A seed is the product of a fertilised female spore, the embryo from which suspends its activity at a certain stage; by which time it has been supplied with a store of nutriment for beginning future development; its spore-case, too (not spore-coat), having become modified into the protective seed-coat. One or more such seeds is contained in the ripened ovary, the whole, botanically speaking, forming the fruit. Among the lower plants and animals the spores are often cast into the surrounding element to live or perish. The higher organisms, however, provide their female spores with a protective chamber for early development, the spore then being variously termed oospore, egg or ovum, &c., and in due time the infant plant (the seed), or the baby animal is introduced to the arena of the world. The fertilised spore of a cryptogamic plant grows into a new being without an arrest of energy in the embryonic condition, consequently its embryo needs neither the store of nutriment nor the protective case of the seed. A survey of the existing and fossil plants and animals, from lowest to highest types, with regard to the gradual advance afforded for the protection of the female spore forms an exceedingly interesting study.

Many Thallophytes are reproduced, through perhaps several generations, by asexual spores which, in the various species, may arise in different ways receiving thus divers names. In most of the higher Thallophytes sexual spores are also produced either in regular or irregular succession with the asexual spores. The sex spores, again, receive a variety of names which emphasise some peculiarity. In many cases asexual spores produce plants which bear only sex spores, the female spore of which after fertilisation develops into a plant producing only asexual spores, the rhythm of alternating generations being thus maintained. In other cases, particularly in flowering plants and mammals, the fertilised female spore produces an organism which gives origin to sex spores again, so that alternating generations are, at least, not so evident.

In the body cells of plants and animals there exists a governing portion termed the nucleus. This organ consists chiefly of exceedingly minute, often rod-like, bodies called chromosomes which are supposed to be the chief vehicles of inheritance. Every plant and animal possesses its own specific number of chromosomes for its nuclei. Now as the sex cells are off-growths from certain body cells, one would suppose the former to contain the same number of chromosomes as the latter. Were this the case the number of chromosomes would be doubled at every generation that was the product of their union. To overcome this difficulty the chromosomes of the sex cells (the spores) are halved in number, so that in the fusion of male and female spores the normal body number is restored to the resulting embryo. One reason for difficulty in obtaining hybrids between certain different species of organisms is that they possess a difference in number or character of chromosomes. With the higher plants and animals the necessary reduction of chromosomes usually occurs during the production of the sex spores themselves, but this is by no means the general law among the lower plants and animals, for with them the reduction may occur at a period in the life-cycle of the organism entirely remote from the formation of the sex spores, and even in a different individual. Thus among the ferns reduction occurs during the formation of the asexual spores, which are produced in spore-cases on the underside of the fern frond. These spores having half the number of chromosomes, compared with those in the body cells of the fern plant, give origin to prothalli whose body cells, having the reduced number, produce sex cells without further chromosome reduction.

In the red sea-weed *Polysiphonia fastigiata* there are male, female, and neuter individuals concerned in the life-cycle, all morphologically alike except that each bears a different kind of spore: in horse-tails also three individuals but all different morphologically, the neuter horse-tail plant and the male and female prothalli: in ferns but two individuals, the neuter fern plant and the bisexual prothallus: in flowering plants only one individual, as the two sex individuals have become reduced to microscopic proportions and exist as parasites upon the neuter, which is the ordinary plant. This ascent of the neuter generation to the position of dominant partner in the life-cycle of organisms has been partly in response to the stimulus of hunger, and partly to the stimulus of providing more effectually for its offspring.

See BACTERIA, ALGÆ, FUNGI, MOSSES, LIVERWORTS, FERNS, FLOWERS, OVULES.

Sporophyte, the spore-bearing or asexual generation in plants, that is, in flowering-plants and ferns what we recognise as the plant itself; while in Bryophytes the gametophyte is the 'plant,' the sporophyte growing upon it. See GENERATIONS (ALTERNATION OF), MOSSES, LIVERWORTS, FERNS, &c.

Sporozoa, a class of parasitic Protozoa, more or less equivalent to the Gregarinida (q.v.), including many very important forms, such as those which cause malaria and silkworm disease. See Minchin, in Lankester's *Treatise on Zoology*, Part I. (1903); Doflein, *Protozoen als Parasiten und Krankheitserreger* (1901); Brumpt, *Parasitologie* (1910).

Sports. See ATHLETIC SPORTS, CRICKET, CURLING, CYCLING, FOOTBALL, FOX-HUNTING, GOLF, ROWING, TENNIS, &c.

Sports, BOOK OF, was the name popularly given to James I.'s Declaration in 1618, that on Sundays, after divine service, 'no lawful recreation should be

barred to his good people, which should not tend to the breach of the laws of his kingdom and the canons of his church'; some Puritan authorities in Lancashire having caused much discontent (and strengthened the Roman Catholic cause) by illegally suppressing the customary recreations of the common people. The sports specified were dancing, archery, leaping, vaulting, May-games, Whitsun-ales, morris-dances, and the setting up of May-poles. Among the excepted unlawful sports were bear-baiting, bull-baiting, bowling, and interludes. Persons not attending church were prohibited from joining in the sports, nor was any one allowed to go out of his own parish for that purpose, or to carry offensive weapons. By republishing this Declaration in 1633, and enforcing with great severity the reading of it by the clergy in their churches, Charles I. and Laud excited among the Puritans a degree of indignation which contributed not a little to the downfall of the monarchy and the church. In 1644 the Long Parliament ordered all copies to be publicly burned. See L. A. Govett, *The King's Book of Sports* (1890).

Spotted Fever. See MENINGITIS.

Spottiswoode, JOHN, Archbishop of St Andrews, son of John Spottiswoode, Superintendent of Lothian, was born in 1565. He was educated at the university of Glasgow, and at eighteen succeeded his father as parson of Calder. In 1601 he attended the Duke of Lennox as chaplain on his embassy to France, and in 1603 King James to London. Soon after he succeeded James Beaton as Archbishop of Glasgow, but was only consecrated in London in 1610. As Moderator of the General Assembly at Glasgow in 1610 he laboured to confirm episcopal government, and he forced the Perth Assembly (1618) to sanction the five points of discipline known as the Perth (q.v.) Articles. He was translated to the see of St Andrews in 1615. He officiated at the coronation of Charles I. at Holyrood in 1633, and in 1635 became Chancellor of Scotland. He reluctantly entered into the king's unwise measures for the introduction of a liturgy into Scotland, and naturally became hateful to the Covenanters. The king compelled him to resign the chancellorship in 1638, and that same year the Glasgow General Assembly deposed and excommunicated him. Spottiswoode died at London, 26th November 1639, and was buried in Westminster. His chief work is the well-known *History of the Church of Scotland* (1655; 3 vols., ed., with a Life, by Bishop Russell for the Spottiswoode Society, 1849-51).

Spottiswoode, WILLIAM (1825-83), mathematician, born in London, was educated at Harrow and Balliol College, Oxford. He took a first-class in mathematics in 1845, and later both the junior and senior university mathematical scholarships. For some time he lectured at Balliol, and in 1846 he succeeded his father as the head of the great printing-house of Eyre and Spottiswoode. Although throughout life an energetic man of business, he found time for much original work in abstract mathematics and experimental physics; as well as for travels in Eastern Russia (1856), Croatia and Hungary (1860), and for a large hospitality at his houses both in London and at Sevenoaks.

Spottsylvania Courthouse, a small village of Virginia, 55 miles N. by W. of Richmond, the scene of one of the most desperate and sanguinary battles of the civil war. On 10th May 1864, during the Wilderness campaign, Grant attacked Lee in his earthworks, and was repulsed with dreadful slaughter; yet on the next day he wrote to the secretary of war, 'I propose to fight it out

on this line, if it takes all summer,' and on the 12th repeated the assault, when Hancock's corps carried and held the 'bloody angle' (see HANCOCK). The next morning Lee, unable to bear his share of the heavy losses, withdrew within an inner line of entrenchments, and on the 20th Grant, having failed to dislodge him, moved round his flank towards Richmond.

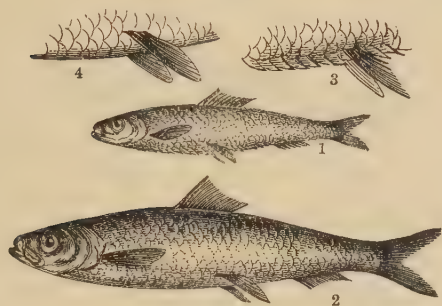
Sprain, or **STRAIN,** is a term employed in Surgery to designate a violent stretching of tendinous or ligamentous parts with or without rupture of some of their fibres. Sprains are very frequent in all the joints of the upper limbs, especially in the wrist and the articulations of the thumb. In the lower extremity the ankle is the joint by far the most frequently affected; and this is accounted for anatomically by the small size of the articular surfaces, the great weight the astragalus (the bone presenting the lower articular surface) has to support, and the unyielding nature of the leg bones. In slight sprains of this joint the ligaments are only stretched or slightly lacerated, but in more severe cases they may be completely torn through. Sprains of the ankle are sometimes mistaken for fractures, and *vice versa*; and the two injuries may co-exist. The pain and swelling sometimes make an accurate diagnosis difficult, especially if the patient is not seen for some time after the accident; and if any doubt exists the case should be subjected to X-ray examination, which shows the presence of any fracture or crack in the bone, and indicates the necessity for more thorough treatment; the treatment proper for a fracture will also suit a sprain well, and a severe tearing of ligaments is sometimes as disabling as a fracture of the bone. Sprains of the knee are not uncommon, and are characterised by great swelling from effusion of fluid within the joint. Sprains of the back are not unfrequent accidents, e.g. among miners, and are the most serious of any, but in most cases it may be anticipated that after confinement in bed for two or three weeks, and with proper treatment, the patient will be able to walk, although he may feel stiffness and pain for several weeks longer.

The best treatment of a sprain depends chiefly upon the time that has elapsed since the injury. If the patient is seen before swelling has occurred the application of cold by means of ice-bags or running water, especially if a thin india-rubber bandage is previously applied, does much to control the swelling and the pain. At a later stage, if the pain be severe, warm applications (hot water, hot fomentations, or poultices) are generally very soothing; or lead and opium lotion may be employed. Where the swelling is very great a light elastic bandage gives relief. When the pain is not very intense the joint may be enveloped in a large quantity of cotton-wool, and gently but very firmly bandaged. It is important not to keep the injured joint too long at rest. As soon as the pain has subsided massage and gentle movements should be commenced; the patient should not be allowed to use the limb himself till these can be quite freely borne. In sprains of the back rest is the main requisite; and a belladonna plaster is both soothing and affords support; a supporting jacket may have to be worn for some time in severe cases.

Amongst horses sprains or strains are very common, owing to the severe exertions required of them, often whilst they are young, and unprepared for such work. Various muscles, ligaments, and tendons are liable to strain, but none more frequently than the large tendons passing down the back of the legs. In slight cases cold water continuously applied for several hours gives relief; but in all serious cases diligent fomentation with water about the temperature of 100° F. is preferable;

or the injured part may be swathed in a thick woollen rug, kept constantly moist and warm by frequent wetting with the hot water. Perfect rest is essential, and in order to ensure the relaxation of the large tendons of the horse's limbs he may in bad cases be put in slings for several days. Blisters, hot oils, firing, and all such irritants are on no account to be used until the inflammation abates and the part becomes cool and free from tenderness. Such remedies are then useful for causing the reabsorption of swelling, and perhaps also for invigorating the weakened part.

Sprat (*Clupea sprattus*), a fish of the family Clupeidae, very abundant on many parts of the British coast, and elsewhere in the northern parts of the Atlantic. It is smaller than the herring, being only about five inches in length when full grown, but much resembles it. It is, however, easily distinguished by the serrated belly, and by the position of the fins, the ventral fins beginning immediately beneath the first ray of the dorsal fin, and not beneath the middle of it, as in the herring



Sprat and Herring :

1, sprat; 2, herring; 3, belly of sprat; 4, belly of herring.

and pilchard. Another easily observed distinction is the want of axillary scales to the ventral fins, which both the herring and pilchard have. The dentition is also different, and on this account Valenciennes constituted for the sprat and a number of other species the new genus *Harengula*, characterised by having teeth on the jaws, tongue, palatines, and pterygoids, but no teeth on the vomer. The herring has teeth on the vomer. The sprat has only forty-seven to forty-nine vertebrae, whilst the herring has fifty-six to fifty-eight. The eggs are pelagic, like those of the pilchard. Perfectly ripe sprats are only found in the sea, to which they repair for the purpose of spawning, not, however, wandering very far from land. At Plymouth they spawn from December to May, on the east coast of Scotland in May or June. The young are found, with young herrings, in estuaries, and are taken in large numbers to be consumed as Whitebait (q.v.). Sprats abound especially on the coasts of Norfolk, Suffolk, Essex, and Kent in November and several following months. Drift-nets are used for the capture of sprats off the coast of Kent, but the usual instrument for the purpose is the stow-net worked from a moored boat in estuaries and tide-ways. The stow-net is a large bag-net suspended between two horizontal beams beneath the boat, and about a fathom from the bottom of the water; ropes from the ends of the upper beam enabling the fisherman in the boat to keep the mouth of the bag always open and against the tide. Vast quantities are taken in this way, to be used as manure, and to supply London. The Firth of Forth produces sprats—in Scotland called *garvies*—in great abundance. But there are many parts of the British coast where the sprat is rare, some of these being parts

where the herring is plentiful. Notwithstanding its cheapness the sprat is a very fine fish, of flavour quite equal to the herring, although decidedly different. Dried sprats are a very common article of provision, and sprats are also sometimes salted. The *kilbies* brought from Riga and other ports on the Baltic are sprats cured with spices, as also are the 'Norwegian Anchovies' sent in small wooden barrels from Norway to England. The value of the sprat does not seem to be as yet fully appreciated in Britain. Very closely allied to the sprat is another fish (*Clupea latula*), the *Blanquette* of the French, which is caught in great abundance on some parts of the west coast of France. Other allied species are found in other seas. One of them (*C. humeralis*), which abounds in the West Indies, and southwards as far as Rio de Janeiro, is much esteemed, but becomes poisonous at certain seasons, from some unknown cause. The question of species is very difficult, but there is no doubt that many a sprat is sold as a Sardine (q.v.).

Spree, a river of Prussia, rises in the east of Saxony, on the borders of Bohemia, and after a winding course of 227 miles, but bearing generally north and north-west, falls into the Havel (q.v.) at Spandau. Area of drainage basin, 3655 sq. m. The principal towns on its banks are Bautzen, Kottbus, and Berlin. In the Spreewald, a district near Kottbus much cut up by the interlacing arms of the river, there still exists a colony of Wends.

Sprengel, CHRISTIAN CONRAD (1750-1816), botanist, for some time rector at Spandau. His enthusiasm for botany led to neglect of clerical duties, and he was removed from his post. Though 'an observer of genius' and a generaliser ahead of his time, he won no recognition from his contemporaries, and lived in straitened circumstances in Berlin, giving lessons in languages and botany and leading excursions on Sundays. He discerned, as Sachs says, that 'all the peculiar characters of a flower can only be understood from their relations to the insects that visit them and effect their pollination'; he detected 'dichogamy' or the fact that the stamens and pistil of flowers are often mature at different times; he saw that 'nature appears not to have intended that any flower should be fertilised by its own pollen.' Though he did not discover the object of the crossing which he recognised to be a fact, he laid some of the foundations on which Darwin built. His book—one of the botanical classics—which did not make him famous until Darwin recognised its merits, was entitled *Das neu-entdeckte Geheimniss der Natur in Bau und Befruchtung der Blumen*, and was published in 1793. See Sachs, *History of Botany* (1890, from the German, 1875).

Sprengel, KURT, physician and botanist, was born at Boldekow in Pomerania on 3d August 1766, and died at Halle on 15th March 1833. All his life was spent in quiet labour at Halle, from 1789 as professor of Medicine and from 1797 as professor of Botany. He won a reputation as a writer on the history of medicine and as a student of the anatomical structure and functions of plants. His principal books are *Pragmatische Geschichte der Arzneikunde* (5 vols. 1792-1803), *Geschichte der Botanik* (2 vols. 1817-18), and *Neue Entdeckungen im ganzen Umfang der Pflanzenkunde* (3 vols. 1819-22). Rosenbaum edited in 1844 Sprengel's *Opuscula Academica*, with a biography.

Sprenger, ALOYS, orientalist, was born 3d September 1813 at Nassereit in the Tyrol, studied medicine, the natural sciences, and the oriental languages at Vienna, next at London assisted Count Münster, and in 1843 sailed to Calcutta. He was teacher, interpreter, librarian, and translator in turn, until in 1857 he became professor

of Oriental Languages at Bern. In 1881 he settled at Heidelberg, and he died 19th December 1893. His rich collection of Arabic, Persian, Hindustani, and other MSS. and books are now in the Royal Library at Berlin. The most important of Sprenger's numerous works are *Leben und Lehre des Mohammed* (3 vols. 1861-65), *Die Alte Geographie Arabiens* (1875), and *Babylonien* (1886); besides editions of Arabic and Persian works, as Sadi's *Gulistan*, &c.

Sprenger, JACOB, of the Order of Preachers, and professor of Theology in Cologne, and HENRICUS INSTITOR (Latinised form of Krämer), two names of enduring infamy as the authors of the famous *Malleus Maleficarum* or *Hexenhammer* (1489), which first formulated in detail the doctrine of witchcraft, and formed a text-book of procedure for witch-trials. They were appointed inquisitors under the bull 'Summis desiderantes affectibus' of Innocent VIII. in 1484, and their work is arranged in three parts—Things that pertain to Witchcraft; The Effects of Witchcraft; and The Remedies for Witchcraft. It discusses the question of the nature of demons; the causes why they seduce men, and particularly women; transformations into beasts, as wolves and cats; and the various charms and exorcisms to be employed against witches. The writers detail the extraordinary dangers to which they were exposed in their task, and how all the artillery of hell had been employed against themselves in vain, and they tell with complete composure of mind how in one place forty, in another fifty, persons were burned by their means. They admit bodily transmission of sorcerers through the air, and relate numerous cases of the devilish malice of witches upon horses and cattle as well as mankind; and in the latter part, consisting of thirty-five questions, give minute directions for the manner in which prisoners are to be treated, the means to be used to force them to a confession, and the degree of evidence required for a conviction of those who would not confess. The book contains no distinct allusion to the proceedings at the Witches' Sabbath any more than did the *Formicarum* (c. 1440) of John Nider, whose fifth book is devoted to the subject of sorcery.

Spring. See SEASONS.

Spring, a stream of water issuing from the earth. The source of springs is the rain and snow that falls from the clouds. Very little of the water precipitated in any district finds its way immediately by rivers to the sea; the great proportion either sinks into the earth or is evaporated from the surface of the earth, and, reabsorbed by the atmosphere, is employed by plants and animals. All loose soils and gravels greedily absorb water, which descends until it meets with a stratum through which it cannot penetrate. A pit dug into the water-charged soil would speedily fill itself by draining the water from the soil. All rocks contain water; some retain it by capillary attraction, like a sponge, others hold it merely mechanically, and easily part with it. Chalk will absorb and retain one-third of its bulk of water; and sand, on the other hand, while it will absorb as much, will part with nearly the whole amount to a well dug in it. Argillaceous deposits and compact rocks are barriers to the passage of water, and cause the superincumbent pervious strata to become water-logged when there is no outlet. Sometimes the edges of the strata are exposed on the sides of a valley, and permit the free escape of the contained water, which pours from them over the neighbouring land. But rents and fissures, as well as inequalities on the surface of the impervious beds, give the water a circumscribed course, and cause it to issue in springs.

The water as it percolates through the earth, always becomes more or less charged with foreign matter, owing to its solvent property. Carbonate, sulphate, and chloride of lime, chloride of soda, and iron are the most common impurities in spring-waters; magnesia and silica also frequently occur. These substances, from the evaporation of part of the water, or the escape of the carbonic acid gas, by which so large a quantity is often held in solution, are frequently deposited on the margins of the springs, or in the courses of the streams flowing from them. Such deposits are found in all so-called petrifying springs; and the hot wells of Iceland, the Yellowstone Park, and the Azores are surrounded with basins formed of siliceous sinter which has been derived from the water. When the foreign ingredients have medicinal qualities the springs are known as Mineral Waters (q.v.).

Springs are either associated with the superficial strata or rise from a considerable depth. Surface-springs occur where the absorbent surface-deposits rest on an impervious bed, which prevents the

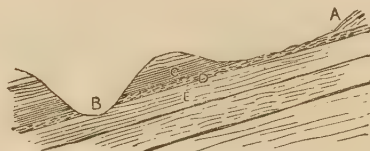


Fig. 1.

further downward progress of the water, or where the beds through which the water flows are near the surface, as shown in fig. 1, where C and E are impervious clay-beds, and D is a bed of sand or gravel, which in the upper portion is exposed on the surface, or is only overlaid by loose soil, and after being covered for some distance by the clay-bed, C, makes its appearance again at B, where the valley cuts it through: here the water collected over the area, A, is discharged. Surface-springs, depending as they do so directly on the rain for supplies, are very variable in the amount of water they deliver. They frequently fail entirely in the summer, and always after great droughts. Their temperature varies with that of the district where they exist, being warm in summer and cold in winter, as they do not penetrate below that plane in the earth's crust which is affected by the seasonal changes in temperature.

When the bed which forms the reservoir for the spring is at such a distance from the surface as to be beyond the zone of season changes, and yet within that which is influenced by the climate, the water has a temperature equal to the mean temperature of the locality where it springs. Such springs have generally a large area for the collection of the superficial water, and are consequently regular in the quantity of water they give out. They are brought to the surface by means of master-joints and dislocations. The celebrated Well of St Winifred at Holywell, in Flintshire, rises through a fault in the coal-measures. It formerly discharged about 4400 gallons per minute, and the water, in its short course of little more than a mile to the sea, was used to propel eleven mills; but the discharge has been much diminished by drainage works.

Most deep wells have a lower origin than the zone of climate temperature, which in Britain is between 200 and 300 feet. It is well known that a regular increase in the temperature is observed after this zone is passed, equal to 1° of F. for every 54 feet. As wells have a temperature corresponding to that of the strata from which they spring, it follows that the deeper the spring the higher will

be its temperature. Local conditions may affect the thermal state of springs, as in the case of the geysers in the active volcanic district in Iceland, and the warm springs near Naples; but where no such local influences exist the depth of the bed from which the water comes may be to some extent estimated by its temperature. Thermal springs occur in Britain at Matlock (66° F.) and Buxton (82°) in Derbyshire, at Bath (117°) in Somerset, and at Clifton (76°) in Gloucestershire. When water is brought to the surface from deep-lying strata, the temperature is found to increase in proportion to the depth of the bore (see ARTESIAN WELLS). The Wiesbaden springs have a temperature of 156°; others are actually at boiling-point. Remarkable thermal springs are those of New Zealand, and the geysers of Iceland and the Yellowstone (q.v.) Park. The presence of radium has been certified in the water of many springs.

Intermittent springs are sometimes produced by the ebb and flow of the tide, as at Richmond, where the rise at high-water is seen in the wells which flow from the arenaceous strata on the banks of the Thames; and sometimes they depend on the supply of rain-water. But there is a kind of spring the intermittences of which are believed to be owing to the structure of the internal cavities from which the supply is obtained. This will be more easily understood by a reference to the accompanying diagram (fig. 2). The large reservoir, A, is fed by the rain percolating through the rock. It communicates with the surface by a siphon-shaped tube, BCD. As long as the water in the reservoir

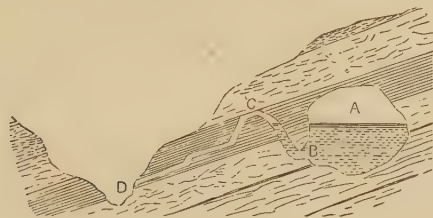


Fig. 2.

is at a lower level than the arch of the siphon at C no water can escape; but as soon as it reaches its level the whole of the water in the cavity will be drawn off, the spring will then cease, and will only make its appearance when sufficient water has accumulated to permit the siphon again to act.

Spring-balance. See BALANCE.

Springbok (*Antidorcas euchores*), an antelope, which like many others is getting scarcer; it is still,



Springbok (*Antidorcas euchores*).

however, abundant a little south of the Zambezi. It is an extremely beautiful creature, of graceful

form, and fine colours. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The general colour is fulvous brown on the upper parts, pure white beneath, the colours separated on the flanks by a broad band of deep vinous red. The whole head is white, except a broad brown band on each side from the eye to the mouth, and a brown spot in the centre of the face. There is a peculiar erectile white fan of long hairs on the middle of the back, exposed when the animal runs. The springbok derives its name from the prodigious leaps which it takes either when alarmed or in play, often to the height of 7 feet, and sometimes more. Its ordinary haunts are in the *karroos* or arid sandy plains; but when all pasture there is burned up great herds congregate, and migrate to more fertile regions, often devastating the fields of the colonist. When taken young the springbok is easily tamed, and becomes very familiar, troublesome, and tricky.

Springer. See SPANIEL.

Springfield, (1) the capital of Illinois, stands in a fertile prairie country rich in bituminous coal, 185 miles by rail SW. of Chicago, at the meeting-point of seven railway lines. It is regularly laid out with broad streets and gardens, possesses a handsome federal building, a state arsenal, colleges, and one of the largest state capitols in the Union (of marble, 385 feet long by 296 wide). Its coal-mines have made it an active industrial centre: here are large factories for stoves, boilers, watches, shoes, and flour, and much else. Springfield, which became the capital in 1837, was the home of Abraham Lincoln, who is buried in the beautiful Oak Ridge cemetery, in the crypt of the great national monument—a granite obelisk (1874) Pop. (1880) 19,746; (1920) 59,183.—(2) A thriving city of Massachusetts, capital of Hampden county, on the left bank of the Connecticut River, by rail 99 miles W. by S. of Boston and 25 N. of Hartford. The river is crossed by five bridges to West Springfield (pop. 13,000), and four railways meet here. The city is stretching out over an elevated plain to the east; the older streets are broad, shaded avenues, and there is a large and beautiful park. The public buildings include a cathedral and numerous other churches, a brown-stone post-office, city hall, granite court-house, and a notable railway station. Springfield is remarkable for the great variety of its manufactures. Among its larger factories is the United States Armoury (since 1794), employing about 1000 men; the others embrace foundries, railway and motor car-works, and manufactories of cottons and woollens, paper, machinery, pistols, and many varieties of metal goods. The town was settled in 1635. Pop. (1880) 33,340; (1920) 129,614.—(3) Capital of Greene county, Missouri, 232 miles by rail WSW. of St Louis, with machine-shops, car-works, and many other factories. Here is Drury College (Congregational; 1873). Near Springfield was fought the battle of Wilson's Creek, 10th August 1861. Pop. (1880) 6522; (1920) 39,631.—(4) Capital of Clark county, Ohio, on Lagonda Creek and Mad River, 80 miles by rail N.E. of Cincinnati. Six railways meet here. The city contains the Wittenberg College (Lutheran; 1845), and handsome county and municipal buildings. Its principal products are various kinds of machinery (steam-engines, motor-cars, farm implements, &c.). Pop. (1880) 20,730; (1920) 60,840.

Spring-gun, a gun having wires connected with its trigger, and so fixed and planted that when wild animals, trespassers, &c., stumble against the wire the gun shall be discharged at them so as to wound them. Since 1827 it is illegal in Britain to set Man-traps (q.v.) or spring-guns save indoors as a defence against burglars.

Spring-tails (*Collembola*), an order of primitive wingless insects which, along with the somewhat similar Thysanura, are included in the small group Apterygota. The popular name refers to a peculiar springing fork which is usually present on the abdomen. It seems to result from a pair of abdominal appendages which are united at the base and bent forward when the animal is at rest. 'By a process analogous to that by which the common toy frogs are made to jump,' the spring-tails leap to a considerable height. The *Collembola* are all small, usually under a quarter of an inch in length; there are six or fewer abdominal segments; there are no compound eyes, nor hints of wings, nor metamorphosis. They usually live in damp and sheltered places—e.g. under bark or stones. Among the representative forms may be noted *Podura aquatica*, common on stagnant water in England; *Orchesella cincta*, among dead leaves and moss; *Desoria glacialis*, on the glaciers; *Sminthurus*; *Isotoma*; *Macrotona*. See Sir John Lubbock, *Monograph of the Collembola and Thysanura* (Ray Society, 1873).

Spruce. See FIR.

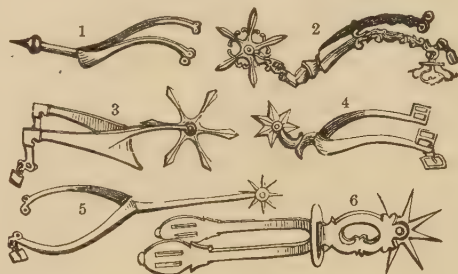
Spruce-beer. The essence of spruce is obtained by boiling the green tops of the Black Spruce (*Picea nigra*) in water, and then concentrating the decoction by another boiling without the spruce tops. The young shoots of this fir, like most others of its family, are coated with a resinous exudation, which is dissolved in the water. Spruce-beer was made by adding the essence of spruce to water in which sugar or treacle has been dissolved, in the proportion of about four ounces of essence of spruce to ten pounds of sugar, or three quarts of treacle, and ten or eleven gallons of water, with about half a pint of yeast. Various spices are used for flavouring. A similar beverage was made largely in the north of Europe, from the buds of the Norway Spruce (*Picea excelsa*), and was known as Black Beer, that of Danzig being the most famous.

Spruce, RICHARD, botanist, was born the son of a schoolmaster on 10th September 1817 at Ganthorpe, in the North Riding of Yorkshire, and educated by his father. In his boyhood he showed a strong inclination towards plant collection, and, except for some five years spent in teaching mathematics at the collegiate school in York, his whole life was subsequently devoted to botanical research and collecting. He concerned himself especially with the study of mosses and liverworts, publishing, among other things, papers on their distribution in Eskdale, Teesdale, and Yorkshire. Ill-health sent him in 1845 to the Pyrenees, where he spent a year collecting the specimens described in the *Musci and Hepaticæ of the Pyrenees* (Trans. Bot. Soc. Edinburgh, 1850). In 1849 he left on an expedition to South America, and for fifteen years he botanised in the Amazon basin, sending his specimens home periodically to George Bentham (q.v.), who acted as his agent in England. The species collected by Spruce during these years amounted to over 7000 in number. Of his numerous writings describing his work in South America the most important are *Palmæ Amazonicæ* (Linn. Soc. Journ. Bot., 1870) and *Hepaticæ Amazonicæ et Andinæ* (Trans. Bot. Soc. Edinburgh, 1885), while his discoveries of South American mosses are included in the work on that subject published by William Mitten in 1867. After his return in 1864 Spruce retired to a small house in Coneythorpe, Yorkshire. He soon became a close invalid, and could only work under great difficulties. Completely bedridden in the end, he died 28th December 1893. Russel Wallace condensed and edited his *Notes of a*

Botanist on the Amazon and Andes, with a biographical introduction (2 vols. 1908.).

Spruner von Mertz, KARL, author of some useful historical atlases, was born at Stuttgart on 15th November 1803, joined the army of Bavaria, and taught geography in the Bavarian cadet college from 1855. His name is associated with a well-executed, and painstaking and accurate, *Historisch-geographischer Handatlas*, in three parts (1853-64), embracing in all 139 maps; besides this he published historical atlases of Bavaria (1838), Austria (1860), and Germany (1866), and a few historical works dealing with Bavaria. He received the rank of General-lieutenant in 1869, and retired in 1886. He died at Munich, 24th August 1892.

Spur, an apparatus fastened to the heel of a horseman, for goading the horse. It is much less



Various Kinds of Spurs

(From Antiquarian Museum, Edinburgh):

1, bronze prick spur found at Lintthgow Palace; 2, iron spur found near Bannockburn; 3, bronze spur found at Colchester; 4, brass spur found at Culloiden; 5, spur found at Halidon Hill; 6, spur found in making a drain in High Street, Edinburgh.

used than formerly, and the modern apparatus, having only minute serrations on its rim, does not possess the cruel effect of the formidable spiked spurs of old times here illustrated. All cavalry soldiers wear spurs, but their use, except in the heat of an actual charge, is discouraged as much as possible. In the age of chivalry spurs were an essential ensign of knighthood, the spurs of knights (*equites aurati*) being golden or gilt, while those of squires were of silver. In the degradation of a knight—a ceremony now rarely performed—one part of the proceedings consisted in hacking the spurs from his heels. Till into the 19th century knights of the shire might enter the House of Commons wearing spurs.

Spurge (*Euphorbia*), a genus of plants of the family Euphorbiaceæ, having a very peculiar inflorescence described at CYATHIUM. The fruit has three valves and three cells, the cells one-seeded, and bursting elastically. The species are very numerous, natives of warm and temperate climates, mostly herbaceous, but some of them woody. About twelve species are natives of Britain. All contain a resinous milky juice, which in most is very acrid. Several tropical species are cultivated for their great beauty in hothouses. No other genus in the whole vegetable kingdom shows such extreme diversity of form. Some, like *E. humifusa* and *E. maculata*, insignificant tiny weeds, may be seen between the paving-stones of Lugano, Como, and cities further south, accidentally introduced there from America. *E. nutans*, about 2 span high, from America too, covers the St Gotthard Line. *E. dendroideis* is plentiful on the coast from Nice to Naples, and forms there bushes from 3 to 10 feet high. *E. abyssinica* presents itself in the shape of huge leafless columns, like a cactus; and so do *E. Dinteri* and

E. resinifera in South and North Africa respectively. *E. meloformis* is like a melon; *E. candelabrum*, a mighty candelabrum; *E. Caput-Medusæ*, a turnip just peeping out of the ground, from which run long branches of the thickness of a rope, twisting themselves on the ground like snakes; and this resemblance explains the name of a somewhat smaller plant growing in South Africa too, which is called *E. viperina*.

Spurge Laurel. See DAPHNE.

Spurgeon, CHARLES HADDON, preacher, the son of an Independent minister, was born at Kelvedon, Essex, 19th June 1834. He was educated at Colchester and Maidstone, and in 1849 became usher in a school at Newmarket, where he studied French and Greek, spent his leisure time in religious work, and began to give addresses in the hall of the Independent chapel. In 1850 he removed to Cambridge, connected himself with the Baptist church there, and was received as a member of the Lay Preachers' Association. In his eighteenth year he had a call to be pastor of the Baptist chapel, Waterbeach, and soon the small congregation was doubled. In 1853 he was invited to preach in New Park Street Chapel, London, and in 1854 he was unanimously called to become its pastor. Growing popularity made enlargement of the chapel a necessity in 1855 and 1856, services being conducted first in Exeter Hall, and then in the Surrey Music Hall in the interim. A panic occurred (19th October 1856) while Spurgeon was preaching in the latter place, and when 7000 persons were assembled; seven persons lost their lives, and many were injured. At a service in the Crystal Palace, on a day of national humiliation in connection with the Indian Mutiny, Spurgeon preached to an audience of about 24,000. The vast Metropolitan Tabernacle was erected in 1859-61; it was burnt down in 1898. Strangers flocked thither from all parts of the world to hear the popular preacher. In 1879 he received a pastor's silver-wedding testimonial of over £6000; a further sum of about £5000 was presented to him on his attaining his fiftieth year, all of which he devoted to benevolent schemes. In 1887 he withdrew from the Baptist Union, because no action was taken by its leaders against persons charged with fundamental errors, whom he thought on the 'down-grade' theologically and spiritually. In his later years repeated illnesses led to his wintering in the south of France; he died at Mentone 31st January 1892. A musical voice, clearness, directness, independence, and simplicity of style, combined with humour, common sense, a rich store of anecdote and continuous hard work, contributed to his power. Around the Metropolitan Tabernacle grew up Almshouses, the Pastor's College (1856), and the Stockwell Orphanage (1867).

Besides his weekly sermons and a monthly magazine, *Sword and Trowel* (1865), Spurgeon gave to the world upwards of a hundred volumes, mainly based on his sermons. He always preached extemporaneously, had his notes written on a half-sheet of note-paper, and the sermons, taken down in shorthand, were afterwards carefully revised by himself. The average weekly circulation of his sermons was 30,000; one reached 200,000. Some 3500 sermons have been published. Other books were the very popular *John Ploughman's Talk* (1868) and the *Treasury of David*, a commentary on the Psalms in 7 vols. (1865-80). The authorised life, largely autobiographical, was published by his wife and Mr Harrald (1897-99). There is also a *Life* (1920) by Fullerton; and his letters were collected (1924) by his son.—Of his twin sons one, Thomas, born 1856, studied at the Pastor's College, and, after some years' service in New Zealand, accepted the pastorate of the Metropolitan Tabernacle in 1893. His health failing, he resigned this post in 1908 to become president of the Pastor's College and of the orphanage, and died 21st October 1917.

Spurn Head, a promontory stretching 2½ miles into the mouth of the Humber (q.v.), and forming the south-eastern extremity of Yorkshire. It is connected with the mainland by a causeway of pebbles and sand 300 yards wide, and, unlike so many headlands, rises only a few feet above sea-level. The spit seems largely to be composed of shingle and drift washed by the sea currents from the coast of Holderness to the northward, and seems to have come into existence only in the early part of the 16th century. Outside the Spurn is deep water; to the west the desolate Trinity Sands, and beyond them Sunk Island, an embanked tract of 6000 acres of rich farming land. Close by what is now the Spurn stood the old port of Ravenspur, which, like Hedon (close to Hull), was a notable place before Hull grew great. There Bolingbroke landed in 1399; but the sea was even then making ravages on the coast, and by the early part of the 16th century Ravenspur had almost completely disappeared. Since 1895 one lighthouse with a flashlight has superseded the two lighthouses (one of them by Smeaton) which used to mark the headland. See books on the lost towns by Boyle (1889) and Sheppard (1912).

Spurrey (*Spergula*), a genus of Caryophyllaceæ. The species are annuals, dichasiously branched; their leaves linear-filiform, with membranaceous stipules, in tufts owing to the growth of internodes being checked; the flowers in terminal cymes. The flowers have a calyx of five sepals, five white petals, five or ten stamens, and five styles; the capsule is five-valved, with numerous round seeds, surrounded by a membranous border. Common Spurrey, or Yarr (*S. arvensis*), is plentiful in cornfields, especially on light stony or sandy soils in Britain and most parts of Europe. In some parts of Europe a larger variety is frequently sown for fodder, and is much relished by cattle.—Sand Spurrey is a kindred genus, *Spergularia*, mostly fleshy-leaved halophytes.—Knotted Spurrey is *Sagina nodosa*.

Spurs, BATTLE OF. See COURTRAI, GUINEGATE.

Spurzheim, JOHANN GASPAR, one of the founders of the so-called science of Phrenology (q.v.), was born near Trier on 31st December 1776. Whilst studying medicine at Vienna he became acquainted with Franz Joseph Gall (q.v.), and became a proselyte to his doctrines. The two in 1805 started on a lecturing tour through the principal countries of central Europe, and in 1807 they settled in Paris. In 1813 the two friends, their teachings disagreeing in some particulars, separated; Spurzheim proceeded (1814) to England, and lectured and wrote and laboured in the principal cities of the United Kingdom for four years, gaining a powerful adherent in George Combe (q.v.). After remaining at Paris from 1817 to 1825, Spurzheim again went back to England and renewed his propaganda, this time with much greater success. In 1832 he sailed to the United States, but died suddenly at Boston on 10th November that same year. Spurzheim advocated his doctrines with great eloquence and enthusiasm, and greatly popularised phrenology. He wrote on that subject and education. See Carmichael's *Memoir* of him (1833).

Spy, a place in the province of Namur in Belgium, where in 1886 were found in a cave, along with Mousterian flints, two skeletons which, in respect of brain-case, jaws, dentition, and other features, represented a very low type of humanity, the Neanderthal race. See ANTHROPOLOGY.

Spy, in WAR, is a useful but not highly honoured auxiliary employed to collect information and ascertain the enemy's intended operations. Spies are always used in war, and their employ-

ment is quite recognised by the law of nations as interpreted by Grotius, Vattel, and Martens; nor is it held to be any dishonour to a general to avail himself of their services. On the other hand, the spy himself is looked upon as an outlaw, and when taken is put to death ignominiously and without mercy. A spy is well paid, lest he betray his employer. In the British army spies are employed by the Intelligence branch under the quartermaster-general. In minor expeditions they are generally friendly natives. Military law, though distinct enough in ordering his death, is not clear in defining what constitutes a spy. A man, not belonging to the army, found within the lines, either in uniform or civil dress, if unable to give a good account of himself would certainly be arrested as a spy, and if anything suspicious could be proved against him would probably be hanged or shot; but if found in one camp in the uniform of the opposite side, he may not be treated otherwise than as a prisoner of war, or else as a deserter from the enemy.

Squadron. See CAVALRY, REGIMENT, TROOP.

Squarcione, FRANCESCO (1394-1474), originally a tailor, but founder of the Paduan school of painters, best known as teacher of Mantegna (q.v.)

Square Root. See INVOLUTION.

Squares, METHOD OF LEAST, an arithmetical process of great importance for combining observations, or sets of observations, so as to obtain the most probable value of a quantity which depends on these observations. It is in fact the scientific method of taking certain averages, and it finds its most constant use in astronomy and other physical sciences. The necessity for applying the method arises from the fact that, when the greatest precision of measurement is sought, repeated measurements of the same quantity do not agree. Thus, the altitude of a star at culmination, if carefully measured night after night by the same observer through the same instrument, will in general come out a little different in the different observations. All the measurements will, however, lie within a certain range of variation; and if all are equally trustworthy, the arithmetical mean will give the most probable value of the real altitude. The differences between this mean and the individual measurements on which it is founded are called the residuals. The important mathematical property of these residuals is that the sum of their squares is less than the sum of the squares of the differences between the individual measurements and any other single quantity that might be taken. Now, this principle of 'Least Squares' holds not only for the simple case just described, but also for more complicated cases in which one observed quantity (y) is to be expressed as an algebraic function of another or of several independently observed quantities (x). Here the object is to find the most probable values of the assumed constants or parameters which enter into the formula. When these values are calculated we can calculate in terms of them and the observed x 's a value of y corresponding to each set of observations. Comparing the calculated y 's with the observed y 's, we get a set of residuals, the sum of whose squares is a minimum if the parameters have been calculated according to a particular process. It is this process which is described as the method of least squares. Its basis is found in the mathematical principles of Probability (q.v.). See Professor Merriman's *Textbook on the Method of Least Squares* (8th ed. 1901), or Chauvenet's smaller treatise (1879), Comstock's (1890), and for elementary discussion any good treatise on practical astronomy and geodesy.

Squaring the Circle. See QUADRATURE.

Squash, a term loosely used, especially in the United States, for two or three kinds of Gourd (q.v.), including the pumpkin.

Squid. See CALAMARY.

Squier, EPHRAIM GEORGE, American author and archæologist, was born at Bethlehem, New York, 17th June 1821. From 1841 to 1848 he was a newspaper editor, latterly in Ohio; and his attention being attracted to the antiquities of the Scioto Valley, he made an exploration of similar monuments through the Mississippi Valley, an account of which was published in vol. i. of the *Smithsonian Contributions to Knowledge* (1843). He made similar explorations in New York in 1848; and next year being appointed *chargé d'affaires* to the states of Central America, he used his official position as a means of making extensive geographical and archæological explorations in those regions. For his researches he received the gold medal of the French Geographical Society. In 1853 he surveyed a railway route through Honduras, and extended his archæological inquiries. In 1863 he was appointed U.S. commissioner to Peru; and afterwards he edited Frank Leslie's publications. He died in Brooklyn, 17th April 1888. Among his works are *Nicaragua: its People, Scenery, and Ancient Monuments* (1852); *Serpent Symbols* (1852); *Notes on Central America* (1854); *Waikua, or Adventures on the Mosquito Shore* (1855); *Central America* (1857); and *Peru: Explorations in the Land of the Incas* (1877).

Squill (*Scilla*), a genus of bulbous-rooted plants of the family Liliaceæ, with radical leaves, and flowers in terminal racemes or loose corymbs. The species, which are numerous, are natives chiefly of the Mediterranean and Caucasian regions. Three



A, *Scilla verna*; B, Officinal Squill (*Urginea Scilla*): a, plant with flowering scape in blossom; b, plant with full-grown leaves. (From Bentley and Trimen.)

are natives of Britain, *S. verna*, which is abundant on the east coast of Ireland, the west and north coasts of Scotland, more sparingly on the east coast of Scotland, and very locally in north-eastern England; *S. autumnalis*, which is confined to some of the southern counties of England; and *S. festalis* (better known as *S. nutans*), otherwise *Endymion*

non-scriptum, the wood-hyacinth or blue-bell of England, which is very abundant in most parts of Great Britain and Ireland. These and many exotic species are frequently cultivated for the sake of their beauty in British gardens.

Very different in habit from these, and now separated from the genus, is the Official Squill (*Urginea Scilla*; formerly called *Scilla maritima*), a native of the sandy and rocky shores of the Mediterranean, which has a scape from two to four feet high, with a raceme of many whitish flowers and large leaves. The bulb is of the size of a man's fist, or sometimes as large as a child's head, and contains a viscid juice so acrid as to blister the fingers if much handled, whilst the vapour arising from it irritates the nose and eyes. Squill was used in medicine by the ancients, and is still largely employed. The bulb is dug up in autumn, divided into four parts, the centre being cut out as being inert, and the remainder being cut into thin slices, which are quickly dried by a gentle heat. The dried slices are white or yellowish white, slightly translucent, odourless, disagreeably bitter, brittle, and easily pulverisable if very dry. The bulb contains a number of active principles, the chief of which is a glucoside, *scillain*, having much the same action as digitalis; other active ingredients have been described under the names *scillitoxin*, *scillon*, and *scillipicrin*. This medicine is prescribed as a diuretic and expectorant, and occasionally as an emetic; but it must be recollected that in moderately large doses it acts as a narcotico-irritant poison, twenty-four grains having proved fatal. When given as a diuretic it is usually prescribed in combination with digitalis and calomel, when it seldom fails to produce an increased secretion of urine, and thus promotes the absorption of the dropsical effusion which is generally present when diuretics are ordered. Its dose as a diuretic is from one to three grains of the powdered bulb, or about twenty minims of the tincture. As an expectorant it is much employed in the subacute stages and chronic forms of pulmonary affections, and is very serviceable in bronchitis and pneumonia of children. From its property of promoting the secretion of mucus, it gives relief by facilitating the expectoration in cases of asthma, &c., in which the sputa are viscid. In these cases it is usually prescribed with some of the more stimulating expectorants, as carbonate of ammonium. As an expectorant the dose of the powdered squill should not exceed one grain, repeated several times daily. For children the syrup, in doses of from ten to thirty minims, may be given. As its action as an emetic is uncertain and dangerous, it should not be prescribed with the view of inducing vomiting.

Squilla, a genus of Crustaceans, representative of the order Stomatopoda. The members are sometimes called *Mantis Crabs* or *Mantis Shrimps*, from the slight resemblance to the insects of the genus *Mantis* (q.v.). The body is slightly flattened; the carapace does not completely cover the thorax; the pincers of the large anterior forceps are formed by the last joint closing on the second last; the gills are borne by the first five pairs of abdominal appendages; the last pair of abdominal appendages form a broad tail fin. The species are numerous, especially in tropical seas. They are active, voracious crustaceans, fond of burrowing in the mud; they are often very brightly coloured; the young forms undergo a marked metamorphosis, which has not been completely followed.

Squint, or HAGIOSCOPE, a narrow aperture cut in the wall of a church (generally about two feet wide), to enable persons standing in the side-chapels, &c., to see the elevation of the Host at the high altar.

Squinting (technically, *Strabismus*) is a well-known and common deformity, which may be defined as a want of parallelism in the visual axes, when the patient endeavours to direct both eyes to an object at the same time. It may be due to loss of power (paralysis or paresis) of one or more of the eye muscles; and this may depend on a merely local affection, or may be a symptom of serious brain disease. But in the majority of instances, and in all ordinary cases of squint (to which this article will be confined), no such condition is present. The squint is said to be *convergent* when the squinting eye is directed towards the nose, and *divergent* when it is directed towards the temple; the convergent is much the more common. Misdirection of one eye upwards or downwards is of rare occurrence. If sometimes one eye and sometimes the other is misdirected, the squint is said to be *alternating*; if always the same eye, *monocular*.

Convergent squint usually comes on during childhood, most often from the second to the seventh year. If present at birth it is caused by some serious defect in the muscles. It is sometimes due to defective sight in the squinting eye, from congenital abnormality, severe inflammation, or injury; but very often no such condition is present. In a large proportion of cases it is accompanied by *hypermetropia* (see EYE), and is due to the increased effort of accommodation required to see near objects, being associated with an increased and disproportionate effort of convergence. In such cases, if suitable glasses can be worn as soon as the squint begins to show itself, it may be prevented from becoming permanent. It is but seldom, however, that the surgeon is consulted at a sufficiently early stage for this treatment to have a fair chance to succeed, and even at an early stage it is by no means certain to prevent the development of a squint. In other cases the presence of a squint may be traced to the presence of worms, the irritation of teething, &c.; and it disappears when the cause is removed. In early childhood, when one eye is less useful than the other, the child may gradually acquire the habit of using only the better eye. The power of vision in the less efficient eye then gradually deteriorates through disuse, unless the squint, refractive error, &c., are corrected at an early stage by suitable glasses, so that the child is forced to use both eyes.

Divergent squint is very rarely present without considerable defect in the sight of the squinting eye, except where it is the result of over-correction of a convergent squint by operation. It is often associated with myopia, as the other form is with hypermetropia. When the vision of one eye is damaged by disease or injury in the adult, and takes a faulty position in consequence, divergence is much more common than convergence; in children, as has been said, the latter is the usual result.

The surgical operation for the correction of a squint consists in the division of the muscle whose excessive activity leads to the faulty position—in convergent strabismus the internal rectus, in divergent the external. It is often necessary to operate on both eyes in the same manner, even where the squint is monocular. In some cases it is requisite in addition to shorten the opposing muscle (i.e. in divergent strabismus, where this procedure is most often resorted to, the internal rectus).

Squire, JOHN COLLINGS, English poet and critic, was born 2nd April 1884 at Plymouth, and educated at Blundell's School, Tiverton, and St John's College, Cambridge, where he graduated B.A. in 1906. He worked for a time in the press gallery of the House of Commons, and, over the name of 'Solomon Eagle,' wrote reviews for the *New Statesman*, with which periodical he was

editorially connected from 1913 to 1918. In 1919 he founded the *London Mercury*, and became its editor. Of his writings, which include poems, parodies, essays, reviews, and some short stories, the chief are: *Poems and Baudelaire Flowers* (1909), *Steps to Parnassus* (1913), *Tricks of the Trade* (1917), volumes of *Poems* (1918, 1922, 1926), *Books in General* (1918, 1920, 1921), *Collected Parodies* (1921), *Grub Street Nights* (1924), *The Comic Muse* (1925). He edited a collection of J. E. Flecker's poems in 1916.

Squirrel, the vernacular name of the *Sciurus vulgaris*, and in a wider sense of all members of the sub-family Sciurinae. These are characterised by their slender body, cylindrical hairy tail, and large prominent eyes; the ears are of variable size—often tufted; anterior limbs shorter than posterior, the former have four fingers and a rudimentary thumb, the latter five complete toes. Their habits are for the most part arboreal; some few excavate subterranean retreats. Their distribution is cosmopolitan, excluding the Australian region. There are seven recent genera and several fossil ones. (1) *Sciurus*, in addition to the characters of the family above mentioned, has the tail long and bushy, ears pointed—often tufted, the digits with long, curved, sharp claws, skull delicate, with long post-orbital processes, penultimate upper premolar, when present, minute. *S. vulgaris*, the common squirrel, measures 18 inches long (including the tail, which is 8 inches), and weighs about half a pound; its colour in summer is brownish red above, mixed with gray on the side of the head, white below from the chin; in winter



Common Squirrel (*Sciurus vulgaris*).

the brownish red above becomes mixed with grayish hairs, whilst in Siberia and northern Europe the whole animal becomes whitish gray without a trace of red; black varieties occasionally appear. It occurs at the present day all over the Palaearctic region, from Ireland to Japan and from North Italy to Lapland, whilst its remains occur as far back in the geological history as the Cromer Forest Bed. In Scotland it bade fair to become extinct towards the end of the 18th century, but a rapid recovery was made between 1800 and 1850. Its favourite dwellings are dry and shady woods, especially of beech and oak, whose nuts furnish it with a winter food-supply. It is always in motion, and in fine weather may be seen skipping from tree to tree as if in pure enjoyment; on the ground its pace is so rapid that a dog can scarcely catch it, but it is still more at home among the branches, where its sharp claws enable it to cling safely to the smoothest bark. When undisturbed it seems to be constantly on the lookout for food, which, if abundant, is stored up for future use. It eats berries, nuts, bark, and buds, and is a greedy and

successful plunderer of birds' nests. Thus it helps to check the multiplication of wood-pigeons, but it does great harm in forests by eating off the tips of the main shoots and by gnawing the bark. The squirrel will use a bird's nest for a temporary lodging, but the home is always constructed afresh, though the materials collected by others may be utilised. The nest is usually situated in the fork of a branch near the stem, and has a roof to keep out rain, a main entrance opening downwards, and a smaller accessory opening near the stem. The squirrel lies curled up when asleep. It is very sensitive to the weather. It swims freely on occasion. Pairing takes place in spring, when there are often savage fights between the males; four weeks later three or four, occasionally more, young ones are born, which remain blind for about nine days; for five days or so after the young leave the nest the whole family sports together among the trees, and then breaks up. The squirrel is not a hibernator, though it may doze in very hard weather. It has very few enemies. Young ones are easily tamed and make interesting pets. The long hairs are used for 'camel's hair' paint-brushes. The fur of the squirrel has some commercial value, and large numbers are trapped in Russia and Siberia. In the early years of the 20th century the American Grey Squirrel (*S. carolinensis*) was inconsiderately allowed to establish itself in various parts of England and Scotland—an introduction to be watched with foreboding. The genus includes between seventy and eighty other species, some of those from the Oriental region being very highly coloured; in one of them (*S. caniceps*) the back becomes of a bright orange colour during the breeding season, a rare phenomenon among mammals. (2) *Pteromys* includes the Taguan or Flying Squirrel (*P. petaurista*), the largest of the sub-family, being nearly as large as a cat; see FLYING ANIMALS. (3) *Rhithrosciurus* is a large squirrel from Borneo, with black and white striped sides and grooved incisor teeth. (4) *Tamias* is an American genus, though one species extends into Asia and even to eastern Europe. All the four species have cheek-pouches, and the back is ornamented with darker and lighter stripes; see CHIPMUNK. (5) *Xerus* includes the so-called 'Spiny Squirrels,' of which there are four species, all African; the fur is coarse, the claws straight, and the external ear small or absent. They inhabit the dry steppes, and dig holes in the roots of trees or among rocks. The Prairie Dog (q.v.) was sometimes called the 'Barking Squirrel.' See J. A. Harvie-Brown's *History of the Squirrel in Great Britain* (Edin. 1881).

Squitch. See COUCH-GRASS.

Srinagar, or KASHMIR, the capital of the native state of Kashmir in Northern India, stands in a lovely valley of the Himalayas (besung by Moore in his *Lalla Rookh*), on both sides of the Jehlam (Jhelum) at an elevation of 5276 feet. Its appearance and situation are described under KASHMIR. Pop. (1921) 141,735.

Srirangam. See SERINGHAM.

St. For places named after saints (St Albans, &c.), see at SAINT.

Staal. MARGUERITE JEANNE, BARONESS DE, usually distinguished from the greater Mme. de Staël-Holstein as Madame de Staël-Delaunay, was born at Paris, 30th May 1684, the daughter of a poor painter named Cordier, whose name she dropped for that of her mother, Delaunay. She had a sound education at the convent of Saint Louis at Rouen, and at twenty-seven was attached to the person of the imperious and intriguing Duchesse de Maine at the little court of Sceaux. Here she saw before her eyes all that comedy of life which she was later

to describe with such penetrating insight. Her position was at first a servile one, and she must often have been sorely tried by the temper of her mistress, but in herself remained not one whit of what she calls the 'caractère indélébile de femme de chambre,' and all her life was ruled in harmony with her own words, that it is only our own actions which can degrade us. Her devotion to the interests of the Duchesse brought her two years in the Bastille, where she had a love affair with the Chevalier de Menil. In 1735 she married the Baron de Staal, an officer of the Guard. She died at Paris, 16th June 1750. Her *Mémoires* (1755; ed. Lescure, 1878; trans. by Bathurst and by Bell) show intellect and observation, as well as remarkable mastery of subtle irony, and are written in a style clear, firm, and individual. 'Je ne me suis peinte qu'en buste,' she says, by which must not be understood that this lofty soul and admirable writer was ever consciously or unconsciously untrue. For indeed sincerity is her first characteristic, and throughout she reflects things like a mirror, without addition, omission, or distortion. 'Le vrai est comme il peut, et n'a de mérite que d'être ce qu'il est.' Her *Œuvres Complètes* appeared at Paris in 2 vols. in 1821. See the study by Frary (1863), and Sainte-Beuve, *Portraits Littéraires*, vol. iii.

Staaten Island. See STATEN ISLAND.

Stabat Mater, a celebrated Latin hymn on the seven dolours of the Blessed Virgin, whose authorship has been assigned to Jacopone da Todi, a Minorite who flourished in the 13th century. It has been set to music by many composers of eminence—e.g. 'Palestrina, Pergolese, Astorga, Haydn, and Rossini.

Stability, the name given to the property possessed by all material systems whose configuration remains permanent or never departs far from a permanent average type. There are two kinds—static and kinetic. Of static stability, or stable equilibrium, we have numerous examples of a simple character. A pendulum or any body hanging under the influence of gravity by a point which is not its centre of mass; a ball resting inside a basin; any object resting on supports in such a way that a vertical line through its centre of mass falls well within the polygon formed by joining the points of support—all these are familiar instances. If any displacement (within certain limits) is given to the body, it will, when released, tend to recover its original condition. In dynamic language the forces brought into play by the displacement resist it. If, however, the ball is placed on the top of a convex surface, or if a chair, for example, is tilted until the vertical line through its centre of mass falls outside the original area of its base, then the configuration is no longer stable. Both bodies will fall away from these positions until a new configuration of stable equilibrium is reached. In general, stability is proved by a system recovering its configuration after a slight displacement. Instability is demonstrated when any slight displacement is followed by a complete change of configuration, forces being brought into existence which assist the displacement. When a displacement brings into play no forces, so that the system tends neither to recover nor to fall away from its original configuration, the equilibrium is said to be neutral or labile. A uniform sphere resting on a plane is a simple example of this kind of equilibrium.

In kinetic stability, or stability of steady motion, a new factor comes into play. Neither a spinning-top nor a bicycle can rest upright unless it is in more or less rapid motion. The moon would fall into the earth, and the earth into the sun, if it were not for the orbital velocity sustaining each in

its path. The perturbations produced by the planets cause the earth to be constantly deviating from its mean orbit; yet in virtue of kinetic stability this deviation is never large, and takes place now in one direction, now in another. If no frictional effects existed in the solar system, all the planetary orbits would never vary beyond certain assignable limits.

Stachys, a genus of plants of the family Labiatae, containing a great number of species found in all parts of the world except Australia and New Zealand, having a ten-ribbed calyx, with five nearly equal teeth, the upper lip of the corolla entire, and the lower lip three-lobed. Several species are natives of Britain. *S. sylvatica* is very common in shady places, a coarse herbaceous plant, sometimes called *Hedge Nettle*, with stem two to three feet high, ovate heart-shaped leaves on long stalks, whorls of purple flowers, and unpleasant smell. *S. palustris* is another very common British species, growing in moist places, and sometimes proving a very troublesome weed in meadows. The plant was formerly used as a vulnerary, and has therefore the English name *Woundwort*. Several species are not unfrequently to be seen in flower-gardens. Common Betony or Wood Betony (*S. Betonica*, or *Betonica officinalis*), plentiful in woods and thickets in the southern parts of Britain, is a plant one or two feet high, with hairy stem, oblong heart-shaped leaves, whorls of purple or white flowers, and a fetid smell. It was formerly much used in medicine. The roots, in small doses, are emetic and aperient.

Stade, an ancient town of Hanover, near the mouth of the Schwinge, a tributary of the Elbe, 22 miles W. by N. of Hamburg. There are large brickworks. Pop. 11,000. The *Stade Dues* were a toll charged by the Hanoverian government on all merchandise carried up the Elbe to Hamburg. First formally recognised in 1691, they gradually increased till they brought a revenue of £40,000 a year. They were abolished in 1861, Hanover receiving £428,600 as compensation, of which Britain and Hamburg contributed each £155,555.

Stadhouder (Dutch; 'stead-holder,' literally *lieutenant* or *Statthalter*), is not connected with the German word *Stadt*, 'city,' as the barbarous English form Stadtholder suggests. The title of Stadhouder (i.e. royal lieutenant or viceroy) of the provinces Holland, Zealand, and Utrecht was in defiance of the rights of these provinces conferred in 1540 on a foreigner, René, Prince of Orange, at whose death (1544) it passed to his cousin, William the Silent. In 1559 there were in the Low Countries eight other Stadhouders of provinces, or groups of provinces, besides the Prince of Orange; all were commanders-in-chief of their provinces, and all except Count Egmont were also supreme civil and criminal judges. In Brabant there was no Stadhouder other than the Regent. After the United Provinces had thrown off the yoke of Spain (see the section *History* in the article HOLLAND) this title, now grown dear, was retained (though a misnomer) for the head of the republic, and became hereditary in the House of Orange until superseded by the title of king.

Stadium, the course on and over which the foot-races were run in Greece. That of Olympia was oblong in shape, and 631 feet long. Seats were provided overlooking the course for more than 40,000 spectators. Besides foot-races, leaping, discus-throwing, wrestling, and other sports were celebrated on the same racecourse. The stadium at Athens, levelled and laid out by the orator Lycurgus in the first half of the 4th century B.C., was 600 feet long by 130 wide, and its seats could accommodate as many onlookers as those at Olympia.

The length of the Olympian stadium was adopted as the Greek standard measure of length or distance. Seven and a half stadia, or 4732 English feet, were reckoned as equivalent to a Roman mile, at least in the time of the empire.

Stadtholder. See STADTHOUDER.

Staël, MADAME DE, one of the most illustrious of Frenchwomen, was born at Paris, 22d April 1766. Her full name was Anne-Louise-Germaine Necker, and she was the only child of Necker and his irreproachable but colourless wife, who as Suzanne Curchod had loved the young historian Gibbon at Lausanne. Germaine was an extraordinarily precocious child, figured at receptions at eleven, and grew up in an atmosphere of admiration. She ever loved and respected her mother, but her father throughout life she loved on this side idolatry. Rousseau, Clarissa, and Werther were her first idols, she was steeped in the sensibility of the age, and already in her girlhood she wrote romantic comedies, tragedies, novels, essays, and one book which has lived, *Lettres sur Rousseau* (1789). She was fifteen when her father was dismissed from office for publishing his famous *Compte Rendu*, and withdrew into retirement, carrying with him the admiration of the whole of France. A great marriage was desired for the young heiress, and it seems certain that William Pitt on his visit to the Continent in 1783 was a suitor for her hand, and one favoured especially by her mother, although displeasing to herself. At length after long negotiations she married on January 14, 1786, the Baron de Staël-Holstein, whom Gustavus III. of Sweden pledged himself to retain as his ambassador at Paris. He was drowned in debt, and seventeen years her senior, but proved an inoffensive and easy husband. She bore him two sons (1790 and 1792) and a daughter (1797), but to protect her fortune separated formally from him in 1798, although she hastened dutifully to his bedside when he died four years later. The deepest feeling of her heart was a woman's craving for love, and those who can read between the lines of *Delphine* (1802)—the real romance of her life—will understand how little she had realised her youthful dream in marriage. But hardly less deep within her heart was the desire to shine and to please, and this she gratified to the full as a society-queen in the brilliant world of the Paris of her day. She lacked the special charm of beauty, she was careless of dress, impulsive and abrupt in manners, but her vast capacity for enthusiasm and the passionate intensity of her affections gave force and colour to her rich and versatile character, and combined to form a personality whose influence was irresistible. Society and conversation were a necessity of her nature, and called forth from the depths of her heart that flowing impromptu eloquence that subdued all hearers into admiration. The simplicity and directness of her thought was no less remarkable than its impetuosity and force, and words and ideas flowed from her lips in a kind of glorified improvisation that suggested at once the exalted inspiration of the prophet, the refined sensibility of the woman, and the clear understanding of the thinker. 'Were I queen,' said Madame de Tessé, 'I would order Madame de Staël to talk to me for ever.'

She shone brilliant and solitary in Paris, but many envious enemies—her father's before her own—embittered her triumph. Meanwhile the dawn of revolution promised to open up new horizons for France, but events moved quickly to their inevitable end, and Necker's elevation and unregretted fall but hastened on the dénouement of the tragedy. She mistrusted Mirabeau, and saw with sinking heart the ruin of the monarchy, but only quitted Paris for Coppet at the last moment, in September 1792. Indeed she

risked her own life with characteristic unselfishness to save some of her friends, and only fled when it was impossible longer to remain. From Coppet she went to England, where at Mickleham in Surrey she was surrounded by Narbonne, Talleyrand, Montmorency, Lally, and Malouet, and cast her unflinching spell over that warm-hearted little prude Fanny Burney. Even here, victim of the Revolution as she was, Necker's daughter was shunned by the royalist exiles; still with all her mortifications she acknowledged that she owed to England 'four months of happiness saved from the shipwreck of life.' She joined her husband at Coppet in May 1793, and launched into the world her *Réflexions sur le Procès de la Reine* in the vain hope to save the head of Marie Antoinette. The Terror literally crushed her sympathetic heart, and all work became for a time impossible. Her mother died in May 1794; in September of the same year she found some consolation in a new friendship with Benjamin Constant, which formed an epoch in the lives of both. In May 1795 she returned to Paris, where her husband had re-established himself as ambassador. She prepared for a political rôle by her *Réflexions sur la Paix intérieure* (1795), and published some of the novels of her youth, with an *Essai sur les Fictions*, but the Directory found her inconvenient as a citizen of Paris, and she was advised to return to Coppet in December. Her book *De l'Influence des Passions* appeared in the autumn of 1796; the chapters on ambition and suicide are forced and feeble; those on woman's love, unsatisfied, misunderstood, betray the living heart. She was allowed to return to Paris in April 1797. The young conqueror, Bonaparte, overawed her with a vague presentiment of fear. He disliked clever women, and received her friendly advances with such studied coldness that their mutual feelings soon turned to hatred. In April 1800 she published her famous book *De la Littérature considérée dans ses Rapports avec les Institutions sociales*—a thesis of 600 pages on that perfectibility of the human mind which finds its consecration in the liberty guaranteed by republican institutions.

She returned again to Paris in March 1802, when her salon was more brilliant than ever. Here the vulgarity and charlatanism of the Napoleonic régime were heartily laughed at, but at length the epigrams of Constant, her own friendship with disaffected men like Moreau and Bernadotte, and last of all the appearance of Necker's *Dernières Vues de Politique et de Finances* exhausted the patience of Napoleon. And now commenced that ten years' duel between Cæsar and a single woman of genius, which drew towards her the pity and admiration of the world. If she does pose somewhat too complacently throughout as the victim of a tragedy, and if there is still something of theatrical exaltation in her exile's despair, it cannot be denied that Napoleon belittled himself by his malignant and spiteful persecution. Already in 1802 her friends fell off from her under Napoleon's displeasure, and in the autumn of 1803 she received orders to keep forty leagues from Paris. Her husband had died in May 1802, and she was now free to marry Constant, but she determined not to convert a slave into a master, and in December 1803 set out with her children for Weimar. Schiller received her with warmth, but Goethe paid a more unwilling homage. She dazzled the whole court with the extraordinary volubility and force of her ideas, yet even the generous Schiller breathed a sigh of relief when she departed for Berlin. Here she made acquaintance with the erudite August Schlegel, afterwards to be added to the circle of intimates at Coppet to the displeasure of Sismondi, Bonstetten,

and the rest. She next turned her steps towards Vienna, but on the way learned of her father's death, and at once returned to Coppet, her heart weighed down under the deepest grief of her life. She found relief during the spring in writing the sincere and touching eulogy, *Du Caractère de M. Necker et de sa Vie privée*. Then she set out for Italy accompanied by Schlegel, Wilhelm von Humboldt, and Bonstetten, and returned to Coppet in June 1805 to write *Corinne*, a romance unfolded in a journal of travel mingled with meditations on history, the heroine again herself, exalted indeed, but recognisable down to close personal traits. It at once brought her a European fame, and it revealed to Frenchmen all the mystery and charm of Italy.

She visited Germany again in the end of 1807, thought for a moment of travelling in America, and about this time began to turn for consolation to religion, or at least to what the Duc Victor de Broglie terms with a happy and pious vagueness, 'un latitudinariste piétisme.' Her famous book *De l'Allemagne* was finished in 1810, submitted to the established censorship, and then entrusted to the same publisher who had printed *Corinne*. To see it through the press she established herself at Chaumont, and ten thousand copies had already been struck off when the whole was seized by Savary and destroyed, and herself ordered instantly to Coppet. It was the crowning act of Napoleon's malignity, but fortunately her son had preserved the manuscript, and at length the work was safely published by John Murray at London in 1813. But her exile had now become a bitter reality, and she found herself encompassed with spies, the post-masters between Coppet and Geneva forbidden to supply her with horses, and her faithful friends, Montmorency, Schlegel, Madame Récamier, and others exiled or imprisoned for visiting her. Overwhelmed with despair, she escaped secretly to Berne, and thence made her way through Innsbruck, Vienna, and Galicia to Russia, then to St Petersburg and Stockholm, and finally in June 1813 to London. The progress of the enemy of Napoleon through the northern capitals was a continuous triumph, and in England she found herself the object of an unbounded admiration that reached its climax in the enthusiasm which followed the publication of *De l'Allemagne*, the most finished of all her works. She made acquaintance with Lord Grey, Lord Lansdowne, Sir James Mackintosh, Lord Holland, Canning, Wilberforce, and Byron. The last, while acknowledging his admiration for the writer, has not spared some characteristic sneers against the woman. The autumn of 1814 found her again at Paris. She was received with the utmost cordiality by Louis XVIII., but it sickened her patriotic heart to see that French freedom was the work of strangers whose foreign uniforms darkened the streets of Paris. Her old friends flocked to her salon; Madame Récamier, Madame de Krüdener, and Benjamin Constant, already twice married, disillusioned, and forty-eight years old, but still in love with her, although her own feeling had long subsided into quiet affection; even the time-serving Talleyrand, who had so long forgotten his early friendship, was generously forgiven. She returned for the summer to Coppet, but spent the winter of 1814-15 again at Paris, where the two millions which Necker had left in the Treasury was honourably paid back to her. The escape of Napoleon from Elba drove her hurriedly from Paris, and after Waterloo she did not return to witness the humiliation of the second occupation. She spent the winter in Italy for the sake of the health of Albert de Rocca, whom she had met about the end of 1810 at Geneva, and married secretly, though

twenty-one years his senior, in the beginning of 1811. Her daughter Albertine married the Duc Victor de Broglie in February 1816. Her own health now began to give way, but she forgot her sufferings in the devoted affection of her husband, himself in enfeebled health and destined for an early grave. She died without pain on the morning of 14th July 1817, and was buried at her father's feet at Coppet. Her surviving son and daughter made public the marriage with Rocca, and received as a brother the son she had borne him. They published with pious care in 1818 her unfinished *Considérations sur la Révolution Française*, which Saint-Beuve thought her finest work, and in 1821 the *Dix Années d'Exil*.

A complete edition of her works was issued by her son, the Baron Auguste de Staël (17 vols. 1820-21), with a Notice by her cousin, Madame Necker de Saussure.

Madame de Staël has not maintained the place unanimously given her by her contemporaries and her immediate posterity, but she still remains as a woman and a writer a unique phenomenon in the history of letters. She had little creative power, was careless of style, and was steeped in a sensibility long since happily forgotten; but her remarkable personality can never lose its attraction, and her work remains entire in its influence on the one side on Royer-Collard, Guizot, and the Doctrinaires, and on the other on Lamartine and the whole Romantic movement in France. She has given an endless subject to the ablest critics of France. Sainte-Beuve says 'she has been one of the idols of my youth, and that idolatry I have not abjured.'

See the elaborate Lives by Stevens (2 vols. Lond. 1880), Lady Blennerhassett (3 vols. Berl. 1887-89; Eng. trans. 3 vols. 1889), and the shorter studies by Bella Duffy (1887) and Albert Sorel (1890; Eng. trans. 1892). See also Gérando, *Lettres inédites et souvenirs biographiques de Mad. Récamier et de Mad. de Staël* (1868), and the Comte d'Haussonville's book, *Le Salon de Madame Necker* (1882; trans. 1882). Criticisms will be found in Sainte-Beuve's *Portraits de Femmes*, and in the collected studies of Caro, Scherer, and Brunetière. See also D. G. Larg, *Mme. de Staël: Her Life as revealed in her Work* (trans. from French, 1926).

Staff, in a Military sense, consists of a body of skilled officers, whose duty it is under orders from the commanding officers of various grades to arrange the movements and supply of the various bodies which go to make up an army, and to issue the orders of the commander of each body. Regimental officers deal personally with the men under their command. Staff officers deal only with the commanders of the larger units into which the troops are grouped for tactical or administrative purposes. Thus in arranging the march of an army, the officers of the *Army Staff* would, amongst other things, allot the available roads to the divisions of the army, and to the extra-divisional or 'Army' troops. The officers of each *Divisional Staff* would direct the order in which their brigades, &c., would move along those roads. The *Brigade Staffs* would give more detailed orders, arranging what battalions were to form advanced guards, &c., while the *Regimental Staffs* of these battalions would order the actual formation to be assumed by them under the command of their *Regimental Officers* (captains and lieutenants). On the staff of each army corps and division there are representatives of the Artillery, Engineers, Army Service Corps, Medical Staff, Ordnance Store Corps, Veterinary and Pay Departments, Chaplains, Post-office, and Military Police. A good staff is all-important to the success of a military enterprise.

The *General Staff* of an army comprises the general in actual command, with the subordinate generals commanding the several divisions and brigades; the assistants to these—viz. the officers of the adjutant-general's department—i.e. the adjutant-general, his deputy, assistants, and deputy-assistants; the officers of the quartermaster-general's

department; the brigade-majors; the provost-marshal; and the judge-advocate—the functions of all of whom are described under their respective heads. An officer before he can be appointed to the general staff must have passed the Staff College or become qualified for the staff by having been employed as a staff officer with a force on active service. The *Personal Staff* consists of the aides-de-camp and military secretaries to general officers. These officers are appointed, within certain limits, by the generals whom they serve. The *Regimental Staff* of a battalion of infantry or regiment of cavalry consists of the lieutenant-colonel commanding, the adjutant, quartermaster, surgeon, veterinary surgeon, and transport officer.

In 1906 an army order was issued for the formation of a *General Staff* for the British army. See *ARMY* (*Army Administration*).

Staff Corps.—During the wars of Wellington the generals and staff officers were aided by a staff corps composed of intelligent officers and men who performed engineering and siege duties, made reconnaissances, and executed other necessary labours for which regimental officers or soldiers were unsuited. This corps died out after the peace. The whole body of officers (British) of the Indian army was until 1902 designated the Indian Staff Corps, but the term thus used was a misnomer, and has been dropped; but the Indian army has a staff on the lines of the British.

In the Navy the staff of a fleet consists of the captain of the fleet (who is chief of staff), Flag-officers (q.v.), the Flag-lieutenants (q.v.), and secretaries; also of the inspector-general of hospitals (see *ARMY, NAVY*), and an inspector of machinery. In 1912 a War Staff for the Navy was formed, corresponding to the General Staff of the Army. It is a development of the Naval Intelligence Department, branches of which dealt with foreign intelligence, mobilisation, trade, war schemes respectively.

Staff, LEOPOLD (b. 1878), Polish poet, started his poetical career with his *Dreams of Might and Power*, and has written an epic *Master Twardowski*, and a number of lyrics.

Staffa (Scand., 'pillar-island'), a celebrated islet on the west of Scotland, lies 4 miles SW. of Ulva, 6 N. by E. of Iona, and 54 W. of Oban. It

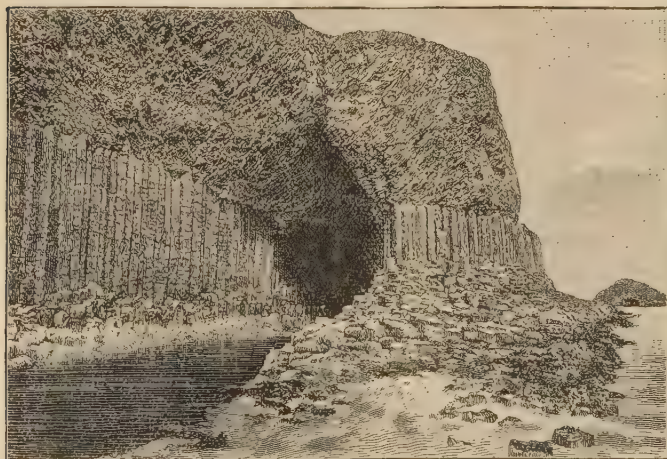
in the lee of the prevailing winds, is a tract of low shore, stretching out in beaches, and forming a landing-place; but elsewhere the coast is girt with cliffs from 84 to 112 feet high. Regarded in section, the rocks show themselves to be of three kinds—conglomerated tufa, forming the basement; columnar basalt, arranged in colonnades, which form the façades and the walls of the chief caves; and amorphous basalt, overlying the columnar basalt, but pierced here and there by the ends of columns and by angular blocks. The most remarkable feature of the island is Fingal's or the Great Cave, the entrance to which is formed by columnar ranges on each side, supporting a lofty arch. The entrance is 42 feet wide, and 66 feet high, and the length of the cave is 227 feet. The floor of this marvellous chamber is the sea, which throws up flashing and many-coloured lights against the pendent columns, whitened with calcareous stalagmite, that form the roof, and against the pillared walls of the cave. First described (in *Pennant's Tour*) by Sir Joseph Banks, after a visit in 1772, Staffa has since been frequently visited—among others by Faujas de St Fond, Wordsworth, Keats, Scott, Mendelssohn, Tennyson. Traces of a chapel have been found.

Staff College. See *MILITARY SCHOOLS*.

Stafford, the county town of Staffordshire, on the left bank of the Sow, 3 miles above its junction with the Trent, and 25 miles SSE. of Crewe, 29 NNW. of Birmingham, and 133 NW. of London. St Mary's Church, formerly collegiate, is a good cruciform structure, with an octangular tower. Transition Norman to Decorated in style, it was restored by Scott in 1844–47, and in 1878 received a bust of Stafford's chief worthy, Izaak Walton, who was baptised in its font. St Chad's, Norman, was very thoroughly restored during 1855–85; and there are also King Edward's grammar-school (1550; rebuilt 1862), the town-hall (1798), a free library (1882), the William Salt Library (1874), the Clement Wragge Museum, the infirmary (1766), the county lunatic asylum (1818), &c. Stafford Castle, finely situated on an eminence outside the town, which commands a magnificent view, is an unfinished castellated pile. It was built by Sir G. Jerningham in 1810–15, successor to a Saxon fortress of the Princess Ethelfleda, and to a later Norman stronghold, which was finally taken by the parliamentarians in 1643, and demolished. Boot and shoe making is the staple industry, and Stafford is an important railway centre. Chartered by King John, it returned two members from Edward I.'s reign till 1885, one till 1918. Pop. (1851) 11,829; (1871) 14,437; (1901) 20,894; (1921) 28,632.

Stafford, WILLIAM HOWARD, VISCOUNT (1614–80), a Roman Catholic nobleman, beheaded on Tower Hill as a victim of the perjuries of Titus Oates (q.v.).

Staffordshire, a west midland county of England, bounded by Cheshire, Derbyshire, Leicestershire, Warwickshire, Worcestershire, and Salop. Measuring 54 by 35 miles, it has an area of 1158 sq. m. or 741,318 acres. The only hilly district is in the north, where the wild 'Moorlands,' the southern extremity of the Pennine range, extend from north-west to south-east in long ridges, separated by deeply-cut valleys, and subside as they



Fingal's Cave, Staffa.

forms an oval uneven tableland, rising at its highest to 144 feet above the water, $1\frac{1}{2}$ mile in circumference, and 71 acres in area. In the north-east,

extremity of the Pennine range, extend from north-west to south-east in long ridges, separated by deeply-cut valleys, and subside as they

near the valley of the Trent. Several points exceed 1500 feet above sea-level, but Axe Edge Hill (1756) falls just within Derbyshire. The rest of the county is gently undulating, with the low upland of Cannock Chase in the centre. The Trent, flowing first south-eastward through the interior, and then north-eastward along the Derbyshire border, is the chief river, and receives the Sow, Tame, Blythe, and Dove. New Red Sandstone occupies nearly three-fourths of the total area; and in the north and south are the Pottery and Dudley coalfields, which, besides containing nearly 600 collieries, yield also (especially the northern one) vast quantities of ironstone (see IRON). The climate is cold and humid, with a rainfall of 36 inches; and, though more than four-fifths of the area is arable, much of the soil is cold and clayey, and agriculture is in rather a backward condition. In the 'Potteries' of North Staffordshire, embracing Stoke-on-Trent, Newcastle-under-Lyme, &c., most extensive manufactures of china and earthenware are carried on (see POTTERY); and in the 'Black country' in the south, with Wolverhampton and Walsall, iron is very largely manufactured in all its branches. The Burton breweries are world-famous. There is a perfect network of railways and canals. For parliamentary purposes the county has been divided since 1918 into seven divisions, each returning one member—Leek, Burton, Lichfield, Kingswinford, Cannock, Stafford, and Stone. The county boroughs are Burton-on-Trent, Snethwick, Stoke-on-Trent, Walsall, West Bromwich, and Wolverhampton. Stoke-upon-Trent, Hanley, Burslem, Longton, &c., were united in 1910 as the county borough of Stoke-on-Trent. The other municipal boroughs are Lichfield, Newcastle-under-Lyme, Stafford, Tamworth, and Wednesbury. Pop. of county (1801) 242,693; (1841) 509,472; (1881) 931,009; (1921) 1,349,225. Staffordshire has no great wealth of antiquities, and has been the scene of no battles more important than Blore Heath (1459) and Hopton Heath (1643). Among its natives have been Lord Anson, Ashmole, Dr Johnson, Thomas Newton, Cardinal Pole, Earl St Vincent, Izaak Walton, Josiah Wedgwood, Arnold Bennett.

See county histories by Plot (1686), Erdeswick (1717), Shaw (1798–1801), R. Garner (1844–60), and the Victoria History (1908–12); the *Proceedings of the William Salt Archaeological Society* (1880 *et seq.*); *Collections for a History of Staffordshire* (vol. xiii. 1893); and works cited in Simm's *Bibliotheca Staffordiensis* (Lichfield, 1894).

Stag is the male of the Red Deer (q.v.). In Scotland the pursuit of the stag is mainly by deer-stalking, a long and laborious approach on foot allowing at best a chance of a rifle shot at the deer from a place of concealment. In England wild red deer are still hunted on horseback on Exmoor. The hounds are like foxhounds (see BUCKHOUNDS), and a good run may extend to 20 or 30 miles. The hunting season is 12th August–8th October, and 25th March–10th May. See DEER FORESTS, EXMOOR FOREST.

Stag-beetle (*Lucanus*), a genus of Lamellicorn beetles, nearly allied to the Scarabees. The males are remarkable for the large size of their mandibles, the branching of which in *L. cervus* and *L. elaphus* has suggested stags' antlers. The common European Stag-beetle (*L. cervus*) is a large formidable-looking insect, the males being fully 2 inches long, and able to give a sharp bite with their strong mandibles. It flies about in the evening in the middle of summer, chiefly frequenting oak-woods. The larva feeds on the wood of the oak and willow, and is injurious to the trunks of trees, into which it eats its way very rapidly. It is supposed by some to be the *Cossus* of the ancient

Romans, much esteemed by them as a delicacy. It lives for several years before undergoing its transformations (see BEETLE). Most species of



Stag-beetle (*Lucanus cervus*).

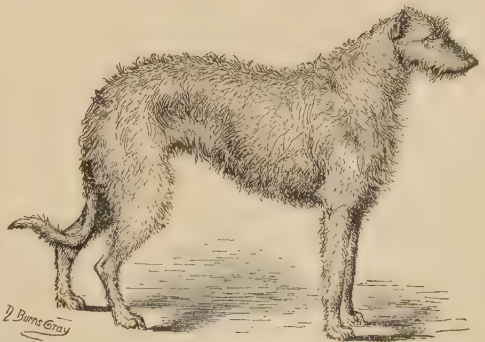
Lucanus, and of the nearly related genus Passalus, are some shade of brown, but the tropical forms are often brilliant.

Stage. See DRAMA, THEATRE.

Stage-coach. See COACHING.

Staggers is a popular term applied to several diseases of horses. Mad or Sleepy Staggers is inflammation of the brain, a rare but fatal complaint, marked by high fever, a staggering gait, violent convulsive struggling, usually terminating in stupor; it is treated by bleeding, full doses of physic, and cold applied to the head. Grass or Stomach Staggers is usually occasioned by overloading the stomach and bowels with tough hard grass, vetches, or clover, a full meal of wheat, or other indigestible food. It is most common in summer and autumn, is indicated by impaired appetite, dull aspect, unsteady gait, and is remedied by full doses of purgative medicine, such as six drachms of aloes and a drachm of calomel rubbed down together, and given in a quart of thin, well-boiled gruel. Frequent clysters, with hand-rubbing and hot water to the belly, are likewise useful. Where the dullness increases, non-alcoholic stimulants should be given. See also HYDATID.

Staghound, a name applied both to the Buckhound (q.v.) and to the Scottish deerhound. The latter breed has been established in Scotland from time immemorial, and has probably sprung from the same source as the Irish wolfhound and the



Deerhound, 'Rossie Ralph.'

smooth greyhound. A contest between two deerhounds is vividly described in Ossian's poems. The breed seems to have been in danger of extinction about the beginning of the 19th century, when crosses of fresh blood were tried, and the

breed successfully revived. Owing to the altered conditions of sport the staghound can only be looked on now as an ornamental dog, as he is rarely used for pulling down the wounded deer, the purpose for which he was originally kept. The deerhound is an immense shaggy dog, standing nearly 30 inches high in some cases, and has a peculiar swing in his action suggestive of great speed, with a keen, determined expression. In conformation the deerhound is similar to the greyhound, but with more bone and power; the head is long, with powerful jaws. The body is covered with wiry hair about 3 inches long. The colour varies from dark gray to white. As an ornamental and graceful dog the deerhound is without an equal, and as a rule combines good temper with his other companionable qualities.

Stagira. See ARISTOTLE.

Stahl, FRIEDRICH JULIUS, writer on law and jurisprudence, was born of Jewish parents at Munich on 16th January 1802. He became a Protestant when seventeen, studied law at the universities of central Germany, and in 1830-37 published his greatest book, *Die Philosophie des Rechts*. In this work, improved in 1854-56, Stahl proclaimed the doctrine that belief in the revealed truths of the Christian religion is the only satisfactory basis of jurisprudence and politics. From 1832 to 1840 he taught alternately at Erlangen and Würzburg, and in 1840 was called to the chair of Philosophy of Law at Berlin. There he acquired an influential position as a leader of the 'Junkers' in the Chamber of Magnates (of which he was a life-member) and as an uncompromising opponent of all political change, and the mouthpiece of a stern Lutheranism in the church assemblies. He died at Brückenau (Bavaria) on the 10th August 1861, a determined opponent to the last of the various liberal parties in both civil and ecclesiastical politics. *Der Christliche Staat* (1847) advocated a doctrine very similar to the 'divine right of kings.' He wrote several other books.

Stahl, GEORG ERNST, author of the Phlogiston (q.v.) theory in chemistry and of the theory of Animism (q.v.; and see ANIMA MUNDI) in medicine, was born at Ansbach on 21st October 1660, and held successively the appointments of court-physician (from 1687) to the Duke of Saxe-Weimar, professor of Medicine (from 1694) in Halle, and body-physician (from 1714) to the king of Prussia. He died at Berlin on 14th May 1734. His chemical theory was expounded in *Experimenta et Observationes Chemicæ* (Berl. 1731), and his medical in *Theoria Medica Vera* (Halle, 1707).

Ståhlberg, KAARLO JUHO, first president of the Finnish republic, born in 1865, was professor of Law at Helsingfors, minister of commerce (1905), prime-minister, president of the diet (1914), and president of the Supreme Court. A progressive, with the support of social democrats and agrarians, he defeated General Mannerheim, the White leader, in the presidential election, July 1919, and held office till 1925.

Stained Glass. See GLASS (PAINTED).

Stainer, JAKOB, violin-maker, was born at Absam near Hall in Tyrol on 14th July 1621, and was apprenticed to a maker of stringed musical instruments at Innsbruck. There is a legend, devoid of foundation, however, that he worked under some of the Amati at Cremona. He did somehow learn the secret of the Italian method of constructing violins, and so won a reputation that passed beyond Germany, into Italy and England, and lasted for more than a century. At the present day his violins are valued as curiosities, but are not esteemed of use by practical musicians. Stainer died in 1683, insane, and, in spite of grand-

ducal favour, in a state of poverty. There is a *Life by Ruf* (Innsbruck, 1872).

Stainer, SIR JOHN, organist and composer, was born in London, 4th June 1840, and became a chorister in St Paul's Cathedral. He was made organist of Magdalen College at Oxford in 1859, took degrees in arts and music, in 1872 became organist of St Paul's, and in 1889-99 was professor of Music at Oxford. In 1888 he was knighted. Among his works are the cantatas *The Daughter of Jairus* (1878) and *The Crucifixion* (1887), a *Treatise on Harmony*, and a *Dictionary of Musical Terms* (with Barrett). He died at Verona, 31st March 1901.

Staines, a picturesque town of Middlesex, on the left bank of the Thames, 6 miles SE. of Windsor and 19 WSW. of London (35½ by river). It took its name from the 'London Stone' (1280), marking the county boundary; it has a granite bridge by Rennie (1832); and in the neighbourhood are Runnymede, Egham, and Cooper's Hill, all noticed separately. The reservoir (begun 1898) to store the flood-waters of the Thames valley for the supply of London (in use since 1904) has an area of 424 acres with a total capacity of 3,338,000,000 gallons. Pop. 7000.

Stair, a village in central Ayrshire, gives the title of Earl to the ancient Scottish family of Dalrymple. A Dalrymple of Stair was among the Lollards of Kyle summoned before James IV.; his great-grandson was one of the earliest to make public profession of the Reformed doctrines.—James Dalrymple of Stair (1619-95) studied at Glasgow University, served in the army, and acted six years as Regent in Philosophy at Glasgow, next joined the bar (1648), and scarcely ten years after was recommended by Monk to Cromwell for the office of a lord of session, as 'a very honest man and a good lawyer.' He was confirmed in office, and created a Nova Scotia baronet in 1664. It was the death of his daughter Janet in 1669, within a month of her marriage to Dunbar of Baldoon, that gave Scott the tragic plot of *The Bride of Lammermoor*. His wife, who survived till 1692, was credited in Galloway with being a witch. About the close of 1670 Dalrymple was made president of the Court of Session and member of the Privy-council, and during the next ten years, if he distinguished himself by reforms in legal process, he must have winked hard at much wickedness and illegality in high places. The Duke of York took up the work of government at Edinburgh in 1679, and Dalrymple, who honestly hated Popery at least, soon found himself obliged to retire to the country. In his leisure he prepared his famous work, the *Institutes of the Law of Scotland*. His wife and his tenants were devoted to the Covenant, and accordingly he soon became involved in a fierce dispute with Claverhouse, who was ravaging Galloway with a military commission. In October 1682 he found it necessary to flee to Holland, returned with the Prince of Orange, and soon after was restored to the presidency in Lockhart's room. He was created Viscount of Stair, Lord Glenluce and Stranraer in 1690, was much molested by factious attacks during his last years, and died at Edinburgh, 25th November 1695. See J. G. Mackay's *Memoir* (Edin. 1873), and *The Stair Annals*, edited by J. Murray Graham (Edin. 1875).—His second son was Sir James Dalrymple (q.v.). Collaterally connected was the learned Lord Hailes (q.v.), whose own younger brother was the hydrographer Alexander Dalrymple (q.v.).

The eldest son, Sir John Dalrymple, first Earl of Stair, was born in 1648, and followed the hereditary profession of his family. He came into violent collision with Claverhouse in Galloway, and was flung into prison in Edinburgh and heavily fined,

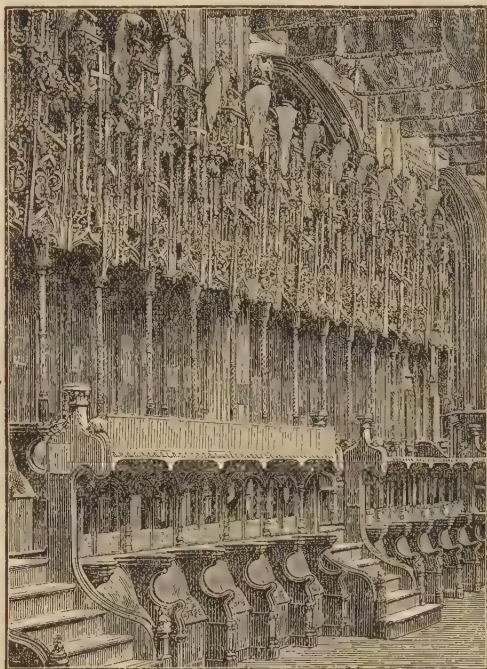
but early in 1687, by a remarkable turn in the royal policy, 'the springs' of which Wodrow prudently leaves 'to the civil historian of the period,' he had all his charges remitted, and became king's advocate, Lord Justice-clerk the next year. He acquiesced easily in the accession of William, became Lord Advocate, and for some years as Secretary of State had the chief management of Scottish affairs. On his shoulders, therefore, with Breadalbane and the king, mainly rests the infamy of the massacre of Glencoe (q.v.). He was created Earl of Stair in April 1703. He took an active part in the debates and intrigues that preceded the carrying of the Treaty of Union, and indeed fell a victim to his zeal in its cause, dying suddenly the morning after a long and vehement debate, 8th January 1707. 'He was,' says Defoe, 'justly reputed the greatest man of counsel in the kingdom of Scotland.' See Omond's *Lord Advocates of Scotland* (vol. i.), and J. Murray Graham's *Stair Annals* (2 vols. 1875).—John Dalrymple, second Earl of Stair, was the second son of the second viscount and first earl, and was born at Edinburgh, 20th July 1673. At eight he shot his elder brother dead by accident at the family seat of Carscreugh Castle in Wigtownshire. He was brought up in Holland, studied at Leyden, and early attracted the notice of the Prince of Orange. He volunteered for service, was present at Steenkerk, and by 1701 was lieutenant-colonel in the Scots foot-guards, in 1706 colonel of the Cameronians. He was aide-de-camp to Marlborough in 1703, and showed conspicuous courage at Venlo. He commanded a brigade of infantry at Ramillies, and was rewarded with the colonelcy of the Scots Greys in August 1706. He distinguished himself greatly at Oudenarde (1708), was promoted major-general, and commanded his brigade at the siege of Lille and at Malplaquet. His rank of general he received in 1712, after which he retired to Edinburgh to intrigue for the Hanoverian succession. In 1714 he married the beautiful and strong-willed widow, Eleanor, Viscountess Primrose, forcing her consent for the sake of her reputation by the artifice of concealing himself in her house and showing himself at her bedroom window. This audacious ruse afforded a foundation for Scott's story, *My Aunt Margaret's Mirror*. On the accession of George I. Stair returned to favour, and soon after was appointed ambassador to Paris. He lived with splendid magnificence, yet checkmated at every turn the Pretender and the vast schemes of Alberoni. Recalled in 1720 with fortunes sadly impaired, he mainly devoted himself thereafter to agricultural improvements, introducing turnips and cabbages, while his clever wife became a leader of society in Scotland, and helped to make Moffat the fashion. On Walpole's fall he was made field-marshal (1742), and governor of Minorca, without residence. He took the command of the army which was to support Maria Theresa in conjunction with a Dutch and Austrian force, but had already lost ground strategically in presence of Noailles, when George II. came to take command in person. Stair showed his usual courage at Dettingen, but after the victory was allowed to resign. He died at Queensberry House, Edinburgh, 9th May 1747. See the *Annals* by Graham.

Stalactites, Stalagmites. See CAVE, LIME-STONE.

Stalin (or DZHUGASHVILI), JOSEPH, Russian politician, the son of a peasant, was born in 1879 in the Tiflis region of Georgia. From his youth he harboured revolutionary tenets, for which he was expelled from college and repeatedly imprisoned and exiled. He edited the Bolshevik organ *Pravda* in 1917, and served with Lenin in stout support of the Communist party, attaining chief power in 1926.

Stalingrad, formerly TSARITSYN, a great port and industrial town of Russia, above the last great bend of the Volga; pop. 100,000.

Stall, the technical English name for the seats in churches reserved for the clergy and choir, and usually lining the choir or chancel on both sides, sometimes in two or more rows. In cathedrals and other large churches they are generally enclosed at the back with a high screen, and are often surmounted with pinnacles of tabernacle work, the backs and arms being usually carved in a more or less ornate manner. At the west end are often 'return' stalls, facing east, for the dean, warden, chancellor, or other dignitaries.



Stalls, Westminster Abbey.

In Henry VII.'s Chapel (1502-20), Westminster Abbey, the dark oak choir stalls, with their finely-carved misericords (q.v.), are appropriated to the Knights of the Bath, and the lower seats to their squires; and each stall bears its occupant's armorial bearings in brass, with a sword and banner above. At Winchester, Chester, Windsor, and King's College, Cambridge, are also fine examples of stalls.

Stallbaum, GOTTFRIED (1793-1861), born near Delitzsch in Saxony, was rector of the Thomaschule, and professor at Leipzig. He edited Herodotus, Plato (12 vols. 1821-25), and other classics.

Stalybridge, a cotton-town of Cheshire, with machine-shops, &c., 7½ miles E. by N. of Manchester. Made a municipal borough in 1857, it was a parliamentary borough (partly in Lancashire) from 1867 to 1918. Pop. 25,000.

Stambolov, STEPHAN NIKOLOV, Bulgarian statesman, was born, the son of an innkeeper, in 1854, at Trnova, studied there and at Odessa, and bore a part in the rising of 1875-76. He held office during the Russian occupation after the war of 1878, and, now an advocate in Trnova, became conspicuous as a radical leader in the new National Assembly. He was the chief member of the regency

after Prince Alexander's abdication (1886), and strenuously opposed all Russian partisans. After the election of Ferdinand he was premier 1887-94, and ruled with as little regard for the prince as for the Assembly. Forced then to retire, on 15th July 1895 he was attacked by assassins and savagely mutilated, and died on the 18th. See Life by A. Hulme Beaman (1895).

Stamboul. See CONSTANTINOPLE.

Stamens constitute the male portion of the Flower (q.v.). Each stamen consists of a stalk or filament and a pollen chamber or anther. The *andracium*, as the group of stamens in a flower is termed, is situated between the parts of the floral axis occupied by carpels and petals. But their position on the axis, whether below the carpels, as is most commonly the case, or on a level with them, or above them, varies, and is used as an aid to classification. When they are inserted on the thalamus (flower receptacle) below the carpels the flower is said to be *hypogynous*; when, carried upwards by the continued growth of the outer part of the flower receptacle, they are inserted on the same level as the carpels, then the flower is *perigynous*; when, carried up still farther, they are inserted above the carpels, the flower is *epigynous*. If the stamens are adherent to the petals they are *epipetalous*; if adherent to the pistil (united carpels) they are *gynandrous*. If the filaments only are more or less coherent (mallow) the stamens are *monadelphous*; if united into two bundles (pea) they are *diadelphous*; if only the anthers cohere, then the stamens are *syntantherous*. The stamens vary in number from a single one in a flower to as many as several hundreds. These variations also are used in classification. When the stamens are *definite*—i.e. ten or less in number—the individuals are inserted alternately with each of the petals, or each of the sepals, or alternately with both whorls. If they are less in number than the petals or sepals of the flower, then their position varies. When there is more than one whorl of stamens, then the individuals of each whorl alternate with the individuals of the next whorl below it. Often the full number of stamens, that comparison with other flowers of the same order would lead us to expect, is not present; but usually aborted traces of them may be seen. Thus most of the Scrophulariæ are peculiar in having only four stamens, but the fifth is represented by a minute scale. Remnants of this description are called *staminodes*.

The stamens are commonly said to be metamorphosed leaves. A leaf is often defined as an appendage of the axis or stem; this, however, is only an assertion of the general homology, or similarity of origin, of the two kinds of appendages. Often, too, stamens are said to be altered flower-leaves—i.e. petals. But this is a case of putting the cart before the horse. Stamens very commonly become petaloid, as, for instance, when a flower becomes 'double' under cultivation, and in a few cases in the natural state—the white water-lily, for instance. In all such cases there may be seen in the same blossom a complete series of transition forms between stamens and petals. This indicates the homology of the two kinds of appendages, but of itself gives no evidence as to which form is the precursor of the other. But the fact that the Gymnosperms (q.v.), conifers for example, which are older forms and are less highly developed than the true flowering plants, have stamens but not petals, indicates that the petals of the Phanerogams are a more recent evolutionary introduction than stamens. The further facts that the characteristic colour of stamens is yellow, and that the simplest, lowest flowering plants have yellow flowers, are

again examples of evolution leading to the same conclusion.

The anther which contains the fertilising pollen is the essential part of a stamen. The pollen is set free by the splitting—*dehiscence*—of the anthers. The mode of dehiscence is sometimes characteristic of the plant. Thus the anthers of the Rhododendron open and shed their pollen through a small circular pore at the upper end of each lobe; and in a few cases the dehiscence is transverse, or across the anther. But the most usual mode of dehiscence is by a longitudinal slit in each lobe, either on the inner or outer face of the anther.

The time at which the stamens dehisce relatively to the ripening of the stigma is important. For if the anther dehiscence when the stigma is ready to receive pollen, then the flower may be self-fertilised; but if it does not open at that time, then self-fertilisation will be impossible, or nearly so, and that flower must be cross-fertilised. Stamens present numerous modifications of form that are apparently adaptations to the process of fertilisation.

The particular functions of a stamen are the production and liberation of pollen-grains. In comparison with the higher Cryptogams, such as Horse-tails and Lycopods, the pollen is essentially a microspore whose microscopic structure and ultimate development are adapted to terrestrial instead of aquatic or semi-aquatic conditions. In short, whereas the microspore of the Cryptogam produces a prothallus which liberates a free active spermatozoid into the outer world to find its way to the egg by wriggling through water, the pollen-grain is conveyed by wind, insect, or other agent to the stigma of a flower, where it develops a tube that bores its way through the tissues of the style, ovary, and ovule to the egg; then the non-motile sperm passes from the tip of the pollen-tube to the egg, with which it fuses, as in Cryptogams, and thus effects fertilisation. The recognition of this homology has introduced a change of nomenclature, bringing the parts of the stamen into harmony with structures of the same equality in the Cryptogams. The filament is a microsporophyll, the anther is a microsporangium, the pollen-grain is a microspore, the pollen-tube is a male prothallus, and the generative nucleus or sperm is the equivalent of the spermatozoid; in Gymnosperms the antheridial cell of the pollen-grain represents the antheridium of the male prothallus of Cryptogams, but this is suppressed in Phanerogams.

See FLOWER, SPORE; Avebury's *Flowers in their Relation to Insects*; Kerner and Oliver's *Natural History of Plants*; and the better class of botanical text-books.

Stamford, a municipal borough chiefly in Lincolnshire, but partly also in Northamptonshire, on the Welland, and on the Great North Road, 12 miles WNW. of Peterborough. Hengist is said to have here defeated the Picts and Scots in 449, and Stamford thereafter is notable as one of the Danish 'five boroughs,' for the persecution of its Jews (1190), as having between 1266 and 1334 only missed becoming a rival to Oxford, for its colony of Flemish Protestants (1572), as the birthplace of the earliest provincial newspaper, the *Stamford Mercury* (1695), and for its famous bull-running on 13th November from King John's time until 1839. It has lost ten of its sixteen churches, an Eleanor Cross, two castles, six religious houses, and two hospitals. Existing edifices are St Mary's, with a fine spire; All Saints, with a fine tower and steeple; St Martin's, with Lord Burghley's grave, and, in the churchyard, Daniel Lambert's; a town-hall (1777), corn exchange (1859), literary institute (1842), bridge (1849), Browne's Hospital (5th century), and boys' and girls' high schools (1874-76), 'Burghley House, by Stamford town,' is a magnificent Renaissance pile, dating from 1575, with

a noble park, carvings by Grinling Gibbons, and a great collection of pictures. The trade and industries are mainly agricultural. Chartered by Edgar in 972, and afterwards by Edward IV., Stamford was a parliamentary borough, but lost one of its two members in 1867, and the other in 1885. For good services rendered by the inhabitants at the battle of Loose-coat-field (in 1469) the town seal bears the royal arms. Pop. 10,000.

Stamford, a city of Connecticut, on Long Island Sound, 33 miles by rail N.E. of New York. It has a handsome town-hall, and the hills around are embellished with the summer residences of well-to-do New Yorkers. There are iron and bronze foundries, and manufactories of hats, drugs, sashes and blinds, and Yale locks (see LOCK). Stamford was settled in 1641. Pop. (1880) 11,297; (1890) 15,700; (1900) 15,997; (1910) 25,138; (1920) 35,096. Pop. of the 'town,' including the 'city,' 40,067.

Stamford Bridge, a small town in the East Riding of Yorkshire, on the river Derwent, 9½ miles N.E. of York by rail. It was the scene of the great victory of King Harold (q.v.) over the invading Norwegians under Harold Haardraada.

Stammering, or STUTTERING, is an infirmity of speech, the result of failure in co-ordinate action of certain muscles and their appropriate nerves. It is analogous to some kinds of lameness; to cramp or spasm, or partial paralysis of the arms, wrists, hands, and fingers, occasionally suffered by violinists, pianists, and swordsmen; to the scrivener's palsy, or writer's cramp, of men who write much. For speech—like writing, fencing, fingering a musical instrument, and walking—is a muscular act involving the co-ordinate action of many nerves and muscles.

The words stammering and stuttering practically denote the same infirmity. Any distinction that may have come to be established in the usage of them respectively would seem to be that stuttering—an onomatopoeic word—is now limited more or less to the futile repetition of sounds, while stammering covers the whole defect, the hesitation, glide, stop, holding on to the sound as well as repeating it. With defective articulation due to malformation—cleft palate, high-roofed mouth, disproportionate tongue and tonsils; or due to affectation and bad habit—interjection of meaningless sounds, lisping, burring, and other such imperfections of speech—we have nothing further to do in this article beyond remarking that a fault of habit may be entirely cured, a faulty formation can only be mended, its irksomeness alleviated.

Since speech at a high degree of excellence is a fruit of advanced civilisation, it is not startling to be told that stammering does not prevail among Negroes in Africa and North American Indians. But when it is proved to be pretty widespread in Prussia, Great Britain and its colonies, and the United States of America, and uncommon in Italy and Spain, the question suggests itself whether languages of Teutonic origin are not more apt to generate stammering than languages of Latin origin. A much larger proportion of males stammer than of females.

Stammering, the chief of the imperfections of speech, may be hereditary, and it may be acquired by imitation. Like yawning, it is infectious. It may be the abiding result of mental strain or shock. Fever may bring it on, epilepsy, hysteria, any nervous affection, temporary failure of health, any excitement, soreness of the mouth. It rarely shows itself earlier than at four or five years of age. It usually begins in youth, but may be produced at any later age. It used to be ascribed exclusively to the organ of articulation, the mouth; to faulty setting of the teeth or the jaws; to the largeness

and thickness of the tongue, its weakness of movement, its excessive vigour. Formerly various operations were performed on the tongue with the idea of freeing it or altering its shape. The tongue was thought to lie too flat on the bottom of the mouth; a plug was inserted to raise it, Demosthenes and the pebbles being referred to. It was one of the secret cures to tell the stammerer to keep the tip of his tongue on the roof of his mouth. An improvement on this was to keep the whole breadth of the tongue lying on the palate. When, by and by, the breathing began to be taken into account, stammering was explained exclusively by reference to the organ of respiration, and the cure was breathing exercises which were kept secret. A later step in the research for the cause and cure of stammering was to take full account of the vocal cords or cushions and the vocal chink.

Stammering occurs in the mouth, the organ of articulation. Its proximate cause is always in the larynx, the organ of voice. Sometimes the lungs, the organ of breathing, complicate the uncertainty and unsteadiness of the vocal cords and the vocal chink in the larynx. A current of air, variously shaped by the mouth as a whole, is what we call a vowel. A stammer on a vowel can only take place in the vocal chink, *rima glottidis*. The sounds called consonants are produced by closures, more or less firm, of contents of the mouth. Thus, *b, p, m, w*, by the closure of the two lips; *f, v*, of the lower lip and upper teeth; *j, zh*, and *sh*, of the teeth; *l* and *th*, tongue and upper teeth; *t, d, n, s, z, y*, tip of the tongue and fore gum; *g* (hard) and *k*, back edges of the tongue and back gum. Stammering may occur at any of these six closures. It is, perhaps, most apt to occur at the labials *b, p*, the dentals *d, t*, the gutturals *g, k*, because for these the closure is firmest. The stammerer has no difficulty in setting lips, teeth, tongue, and gums against each other as required. His difficulty is to relieve the closure, to get at the vowel which is to follow the consonant. The tongue, for example, will not part from the teeth, seems to cling spasmodically to them. Why? Because the current of air, the vowel, does not come at the proper instant through the vocal chink to relieve it. In this way the three observable modes of stammering are explained. If the vocal chink does not open soon enough, there is a stop stammer; if it flutters, there is a stutter; if it opens too soon, there is a glide stammer. But, further, the chest expands and contracts by nervous and muscular energy; and the muscular and nervous machinery of the breastbone, ribs, midriff, and upper abdomen are all concerned in that expansion and contraction. These complicated and delicate bellows which supply air under pressure to the organ of voice may be defective, out of order, misused. Their working is to be closely observed in the case of each stammerer. Stammerers, as a rule, breathe badly. They constantly try to speak when their lungs are empty.

Stammering can be cured. It often disappears gradually without effort at cure. Improvement generally takes place as age advances. In some cases resolute endeavour is demanded. A waving motion of the arms, time kept to a baton, were favoured as cures at one time. They were on the lines of the musical methods of cure—intoning, chanting, singing—which were based on the fact that most stammerers can sing. The doctrine of this article suggests as instructions for cure: Regulate the breath. Work for an habitual use of the chest voice—i.e. for deeper, steadier vibration of the vocal cords—because people generally stammer in a head voice. Take exercise, in a chest voice, on the sounds (seldom vowels) at which a stumble is apt to be made.

Stampa, GASPARA (1523-54), Italian poetess and classical scholar, born at Padua, was a member of the Venetian Academy. She wrote love-poems to Collatino di Collalto, Count of Treviso, who deserted her.

Stamp Act, a measure which required all legal documents in the colonies to bear stamps, proposed by Grenville, then premier, and passed by parliament in 1765. The Americans denied the right of the English parliament, in which they were not represented, to impose taxes upon them, and offered violent opposition. Riots took place in many of the towns, the offices were seized, and the stamped paper destroyed; while a congress of delegates of nine of the states met at New York in October, and passed resolutions claiming for the provincial assemblies the exclusive right of taxation. In the January of 1766 the subject was brought before parliament. In the great debate that followed Burke made his maiden speech, and Pitt, who had been absent for a year, in one of his greatest speeches denied the absolute right of parliament to tax the colonies, as taxation and representation went hand-in-hand. After examining witnesses, chief among them Franklin, the ministry proposed the repeal of the Stamp Act, and carried it on February 21. Thus Pitt's wisdom staved off for a time the breach between England and her colonies.

Stamps, impressed and adhesive, are extensively used for making and verifying payments of money. Stamp-duties were first imposed in England in 1694. For the protection of the public revenue penalties are imposed; thus any person receiving a premium of insurance without issuing a properly stamped policy is liable to a fine. Where the law requires a stamp, an unstamped document cannot be given in evidence in civil proceedings unless the party producing it is willing to pay the duty and an additional penalty. Stamp-duties are a form of indirect taxation, and ought to be moderate in amount; excessive duties on legal documents discourage business. Forgery (q.v.) of stamps is severely punished. See Highmore, *Stamp Laws* (4th ed. 1921).

Stamps for postal purposes were used, or were proposed to be used, in Paris as far back as 1653. Stamped paper or covers, both with impressed and embossed stamps, were used for official correspondence in the kingdom of Sardinia in 1819-21, several values being provided for. Mr Charles Knight suggested stamped covers for the prepayment of newspaper postage in 1833-34. Stamps, or labels, to be gummed or pasted on articles liable to duty, have been in use by the British Revenue authorities ever since 1802, though prior to 1840 they were not issued ready gummed. The use, for postal purposes, of a piece of paper just large enough to bear the stamp, with a glutinous wash on the back rendered adhesive by moisture, was recommended by Sir Rowland Hill (q.v.) as part of his scheme of uniform rates of postage, combined with prepayment, in his pamphlet on post-office reform in February 1837. From the death of Sir Rowland Hill in 1879 till 1891 a pamphlet controversy was carried on by his son and the son of James Chalmers, a Dundee bookseller, by whom, it was asserted, the idea had been fully developed as early as 1834. Chalmers, however, whose scheme was not very workable, had himself recognised Hill's priority.

With the postal reform of 1840 the Franking (q.v.) of letters was abolished in the United Kingdom, and postage-stamps introduced.

The first English postage-stamp (issued on 6th May 1840) was black. The famous 'Mulready envelope,' issued at the same time, and intended to be both cover and stamp, was not a practical success, and was withdrawn the same year.

Stamp-collecting, philately, or timbrology, began to be a common and fashionable hobby about 1861, which spread from Britain to the Continent. Many societies and periodicals devote themselves to it. Some countries have made the stamp-collector a source of revenue by frequent issues of new stamps. Centenaries and events of national importance have been seized as excuses for an elaborate series of artistic designs. Times of war and revolution have added to the number, when ephemeral states and provisional governments have produced a succession of new stamps, often by overprinting those of their predecessors. Rare stamps bring high prices.

See the handbooks issued by the Royal Philatelic Society, London (1879-1920), by Fred. J. Melville, and by D. B. Armstrong; and for forgeries, *Album Weeds*, by the Rev. R. B. Earée. See also POST OFFICE.

Standard. See FLAG, CURRENCY, MONEY, BIMETALLISM, WEIGHTS AND MEASURES, HALL-MARKS, PAPILIONACEÆ; for the Battle of the Standard, NORTHALLERTON.

Ständchen. See SERENADE.

Standing Orders is the name given to permanent regulations made by either House of Parliament for the conduct of its proceedings, and enduring from parliament to parliament unless rescinded. A standing order of the House of Lords when rescinded is said to be *vacated*; in the Commons the corresponding term is *repealed*. In the Lords a motion for making or dispensing with a standing order cannot be granted on the same day that the motion is made, or till the House has been summoned to consider it; and every standing order as soon as agreed to is added to the 'Roll of Standing Orders,' which is carefully preserved and published from time to time. In the House of Commons there was until 1854 no authorised collection of standing orders, except such as related to private bills. In that year a manual of rules, orders, and forms of proceeding relative to public business was drawn up and printed by order of the House. Standing orders are occasionally suspended when it is desirable that a bill should be passed with unusual expedition. See May, *Parliamentary Practice*.

Standing Stones, or monoliths of unhewn stone, erected singly or in groups, are met with



Standing Stones, Lundin Links, Fifeshire.

almost everywhere. They are not in all cases necessarily of ancient origin, but the motive of

their erection may be presumed to have been in general honorary or commemorative either of events or individuals. In certain cases, however, they marked the boundaries of sanctuary or proprietary rights. Single stones, sometimes of great size, are often found standing in sites where no memory or tradition of their purpose exists. Occasionally accident or investigation discloses the fact that they mark the sites of prehistoric burials. They are sometimes arranged in groups of two or four, placed at short distances apart, as at Lundin Links, near Largo, in Fife, three of which are still standing (about 18 feet in height), as shown in the engraving. Such groups, if composed of a large number of stones, may be arranged in the form of circles, or avenues, or alignments, or groups of irregular lines converging slightly at one end. When arranged in the form of circles they are usually considered as belonging to a special class of prehistoric monuments or burial-places known as Stone Circles (q.v.). Other groups of standing stones arranged in lines like those of Carnac (q.v.) in Brittany, however, are as yet undetermined as to their purpose, though they are unhesitatingly assigned to the prehistoric period. Smaller groups than the famous ones of Brittany are found in the north of Scotland, and are sometimes associated with burial-cairns, presumably of the age of Bronze. Several of these have been described in Caithness, the largest consisting of about 450 stones disposed in twenty-two rows of about 150 feet in length. In Norway groups of standing stones arranged in triangular and rectangular forms occur, and are known by investigation to be burial-places of the Iron Age. Commemorative monuments of the early Christian time frequently consist of unhewn blocks of stone having short inscriptions cut on their smoother faces, or incised with crosses or symbols. See Ferguson's *Rude Stone Monuments* (1872); T. E. Peet, *Rough Stone Monuments and their Builders* (1912); and other works cited at ARCHAEOLOGY and SCULPTURED STONES. See also CALLERNISH, CROMLECH, DOLMEN, STONEHENGE.

Standish, MYLES, was born at Duxbury, Lancashire, about 1584, served in the Netherlands, and, though not a member of the Leyden congregation, sailed with the *Mayflower* colony to Massachusetts in 1620, and became the champion of the Pilgrims against the Indians. During the first winter his wife died, and the traditional account of his first effort to secure another partner has been made familiar by Longfellow. In 1622, warned of a plot to exterminate the English, he enticed three of the Indian leaders into a room at Weymouth, where his party, after a desperate fight, killed them, and a battle that followed ended in the flight of the natives. In 1632 he settled at Duxbury, Massachusetts, where he died, 3d October 1656. Standish was the military head of the colony, and for long its treasurer. A monument, 100 feet high and surmounted by a statue, has been erected to him on Captain's Hill, at Duxbury. See De Costa's *Footprints of Miles Standish* (1864); Henry Johnson's *Exploits of Miles Standish* (1897).

Stanfield, CLARKSON, marine painter, was born of Irish Roman Catholic parents at Sunderland in 1794, his father being an actor and author. He became a sailor in 1808, was pressed into the navy in 1812, and served for a time in the ship in which Douglas Jerrold was a midshipman. He showed talent both in painting and drawing, and was taken note of by Captain Marryat. Stanfield left the navy in 1818, and thereafter took to scene-painting as a means of earning his bread—at first in the Old Royalty Theatre, and afterwards in Edinburgh and at Drury Lane. While painting for the theatres he by no means neglected

easel-painting. The first picture by him that attracted any considerable notice was 'Market-boats on the Scheldt,' exhibited at the British Institution in 1826. In 1830 he exhibited at the Academy his 'Mount St Michael, Cornwall,' which placed him at once in the foremost rank as a marine painter. In 1823 Stanfield, in conjunction with David Roberts and others, founded the Society of British Artists. Elected A.R.A. in 1832 and R.A. in 1835, he continued to send pictures to the Academy till his death at Hampstead, 18th May 1867. Among his best-known pictures, marked by truth, finish, and poetic feeling, were 'The Abandoned' and 'The Wreck of a Dutch East Indianman.'

Stanford, SIR CHARLES VILLIERS (knighted 1902), was born at Dublin on 30th September 1852. He entered at Queen's College, Cambridge, and in 1873 was appointed organist at Trinity College there. Except his operas, most of his works have been produced at one or other of the musical festivals in the provincial capitals of England—Gloucester, Birmingham, Leeds, Norwich, &c. His best and most successful productions have been the choral settings of Tennyson's *Revenge* (1886) and the *Voyage of Maeldune* (1889); the oratorios *The Three Holy Children* (1885) and *Eden* (1891); the operas *The Veiled Prophet of Khorassan* (1881), *Savonarola* (1884), *The Canterbury Pilgrims* (1884), *Shamus O'Brien* (1896), *Much Ado About Nothing* (1901), *The Critic* (1916); an orchestral serenade; half-a-dozen symphonies, particularly the *Elegiac* symphony (1882); much chamber music; church music; and pieces for the violin and pianoforte. In 1882 he was appointed professor of Composition and Orchestral Playing in the Royal College of Music, and in 1887 succeeded Sir G. A. Macfarren as professor of Music at Cambridge. He wrote *Studies and Memories* (1908), *Musical Composition* (1911), and *Pages from an Unwritten Diary* (1914). He died 29th March 1924.

Stanford, LELAND, railway constructor, millionaire, and senator, was born at Watervliet, New York, 9th March 1824, and in 1856 settled in business in San Francisco. A strong supporter of the Pacific Railway scheme, he was made president of the Central Pacific Company, and superintended the construction of the line. Already governor of California, he was in 1885 elected a United States senator, and died in 1893. He and his widow founded and endowed the Leland Stanford Junior University at Palo Alto (q.v.), California, in memory of their son. This magnificent building was opened for students in 1891, but was partly ruined by the great earthquake of April 18, 1906.

Stangeria, a south-east African cycad, formerly mistaken for a fern, and hence named *S. paradoxa*. The stem is subterranean. There are usually one or two leaves, sometimes three or four, very fern-like. Baboons eagerly devour the seeds.

Stanhope, a town in the county of Durham, on the Wear, 26 miles W. of Durham by rail. Its rectory, once known in the north country as the 'golden rectory,' was held by Bishop Butler (1725-40). The famous lead-mines are now much less profitable than of old. Pop. 2000.

Stanhope, an earldom created in 1718 for JAMES STANHOPE (1675-1721), a grandson of the first Earl of Chesterfield, an eminent military commander, who effected the reduction of Mahón in Minorca, and was the favourite minister of George I.—His grandson, CHARLES, third earl (1753-1816), was an advanced Liberal, distinguished for his scientific researches, and the inventor of a printing press (see PRINTING, p. 388) which bears his name. See Life by Ghita Stanhope and G. P. Gooch (1914).—PHILIP HENRY, fifth Earl Stanhope, historian and

biographer, only son of the fourth earl, was born at Walmer, 31st January 1805. He took his B.A. at Oxford in 1827, and seven years later was created D.C.L., having entered the House of Commons in 1830. He was greatly instrumental in 1842 in securing the passing of the Copyright (q.v.) Act, was Under-secretary for Foreign Affairs during the brief Peel administration (1834-35), and Secretary to the Indian Board of Control under the same minister (1845-46). He was a moderate Conservative in politics, and was warmly attached to Sir Robert Peel, who named him one of his literary executors, and whose Memoirs he edited in conjunction with (Viscount) Cardwell. His contributions to history are numerous and valuable. Macaulay, in a review of his *War of the Succession in Spain* (1832), credits him with some of the most valuable qualities of a historian—viz. perspicuousness, conciseness, 'great diligence in examining authorities, great judgment in weighing testimony, and great impartiality in estimating characters.' His most considerable work is *A History of England from the Peace of Utrecht to the Peace of Versailles, 1713-83* (7 vols. 1836-54); and his other works include *Lives of Belisarius, Condé* (originally in French), and *Pitt*; a *History of Spain under Charles II.*; an edition of *Lord Chesterfield's Letters*; *Historical and Critical Essays*; and *Miscellanies*. He was elected President of the Society of Antiquaries (1846), and Lord Rector of the university of Aberdeen (1858). He was known by the courtesy title of Viscount Mahon till 1855, when he succeeded his father in the earldom. He helped to secure the appointment of the Historical Manuscripts Commission and the foundation of the National Portrait Gallery. In 1872 he was elected one of the six foreign members of the Academy of Moral and Political Sciences at Paris, and he died at Bournemouth, 22d December 1875.

Stanhope. See CHESTERFIELD.

Stanhope, LADY HESTER LUCY, the eldest daughter of Charles, third Earl Stanhope, and his wife Hester, daughter of the great Lord Chatham, was born at Chevening, Kent, on 12th March 1776. She grew up to be a woman of great personal charm and of unusual force and originality of character. In 1803 she went to reside with her uncle, William Pitt, and as mistress of his establishment and his most trusted confidant during his season of power and till his death she had full scope for the exercise of her imperious and queenly instincts. On Pitt's death in 1806 a pension of £1200 a year was assigned her by the king. Fox proposed to provide for her much more munificently, but she proudly declined his offers, as unwilling to accept benefit at the hands of the political enemy of her dead uncle. The change from the excitements of a public career, as it might almost be called, to the life of an ordinary woman of her rank with means somewhat insufficient was naturally irksome to her, and in 1809 she was tried still further by the death at Coruña of her favourite brother Major Stanhope, and of Sir John Moore, for whom she is known to have cherished an affection. Conceiving a disgust for society, she retired for a time into Wales, and in 1810 left England, never to return. In mere restlessness of spirit she wandered on the eastern shores of the Mediterranean, and finally in 1814 settled herself among the half-savage tribes of Mount Lebanon. Here she led the strangest life, adopting in everything the Eastern manners, and by the force and fearlessness of her character obtaining a wonderful ascendancy over the rude races around her. She was regarded by them with superstitious reverence as a sort of prophetess, and gradually came so to consider herself. She indulged in political

intrigues, to the annoyance of British consuls. With the garb of a Mohammedan chieftain, she adopted something of the faith of one, and her religion, which seems to have been sincere and profound, was compounded in about equal proportions out of the Koran and the Bible. Her recklessly profuse liberalities involved her in constant straits for money; and her health also giving way, her last years were passed in wretchedness of various kinds, under which her untamable spirit supported her bravely to the end. She died on 23d June 1839, with no European near her.

Sources of information about her are the notes of Lamartine, Kinglake, and other travellers who visited her; the *Memoirs and Travels* derived from her own lips, and (1845-46) published by Dr Meryon, the physician who went abroad with her (boiled down by Mrs Roundell, 1909); a biography by 'Frank Hamel' (1913); and the *Life and Letters*, at first privately printed by her niece, the Duchess of Cleveland, and published in 1913.

Stanhopea, a genus of tropical American epiphytic orchids. The flowers are often large and scented, in hanging inflorescences, with elaborate floral mechanism, the labellum and column forming a sort of cage. The Mexican *S. tigrina* has flowers eight inches in diameter. It is believed that pollination is effected by insects entering the cage, finding their way on to a slippery surface, and sliding out at the mouth.

Stanhurst. See STANYHURST.

Stanislaus. See LESZCZYŃSKI, POLAND, PONIATOWSKI.

Stanisławów, or STANISLAU, a town in Eastern Galicia, stands on the Bistritza, 87 miles by rail SE. of Lemberg, has important railway workshops, brick-works, &c., and is the seat of a Greek-Catholic (Ruthenian) bishop. Pop. (1921) 51,391, including many Jews. It was several times taken and retaken in the Great War.

Stanko. See COS.

Stanley, capital of the Falklands Islands, on Stanley Harbour, on the east coast of East Falkland, was founded as a port of refuge; pop. 1000

Stanley, (1) a coal-mining town of Durham, 8 miles W. of Durham; pop. 25,000.—(2) A town of the West Riding of Yorkshire, 2 miles NNE. of Wakefield; pop. 15,000.—(3) A village 7 miles NW. of Perth.

Stanley. See DERBY (EARL OF).

Stanley, ARTHUR PENRHYN, born at Alderley rectory, Cheshire, 13th December 1815, was the second son of Edward Stanley (1779-1849), from 1837 Bishop of Norwich. Educated at Rugby under Arnold, and at Balliol, he won the Ireland and the Newdigate, and graduated with a first-class in 1837. In 1839 he was elected a fellow of University College and took orders. In 1840 he travelled in the East, during 1841-51 was a college tutor, and in 1851 became a canon of Canterbury, in 1856 professor of Ecclesiastical History and canon of Christ Church, and in 1863 Dean of Westminster. A voluminous writer in the periodical press, he was author of the *Life of Arnold* (1844), *Sermons on the Apostolic Age* (1847), *Memoir of Bishop Stanley* (1851), *Commentary on Corinthians* (1855), *Memorials of Canterbury* (1855), *Sinai and Palestine* (1856), *Memorials of Cambridge* (1857), *Lectures on the Eastern Church* (1861), *Lectures on the Jewish Church* (1863-65), *Memorials of Westminster Abbey* (1866), *Essays on Church and State* (1870), *Lectures on the Scottish Church* (1872), *Addresses and Sermons delivered at St Andrews* (1877); he was elected Lord Rector, 1874), *Memorials of Edward and Catherine Stanley* (1879), and *Christian Institutions* (1881). Outstanding events in his life were his travels in Egypt and

Palestine (1852-53), and in Russia (1857); his accompanying the Prince of Wales on his Eastern tour (1862); his marriage (1863) to Lady Augusta Bruce (1822-76), of the Elgin family; a second visit to Russia (1874), when he celebrated the English marriage of the Duke and Duchess of Edinburgh; and his visit to America (1878). For all his large tolerance, charity, and sympathy, High Church Anglicans could never forgive him for championing Colenso and for preaching in Scottish Presbyterian pulpits. He was pre-eminently representative of the broadest theology of the Church of England. Christianity to him was sacred because of its moral and spiritual elements, and the divinely perfect life embodying these; but for systematic theology he had little reverence, and none at all for the pretensions of the priesthood; whilst he regarded as 'infinitely little' the controversies about postures, lights, vestments, and the like. The Evangelicals also deplored his lack of 'the root of the matter.' As a preacher he wielded a wide influence. His ancient lineage, his independent and exalted ecclesiastical office, his personal popularity, his alliance with a lady of mental ability and social charm, all combined to invest the Deanery with singular prestige and influence as a centre of society. He died 18th July 1881, and was buried by the Queen's commands beside his wife in Henry VII.'s Chapel. See *Life* by R. E. Prothero (Lord Ernle) and Dean Bradley (1894); *Letters and Verses*, edited by Prothero (1895); and *Recollections of A. P. Stanley*, by Dean Bradley (1883).

Stanley, SIR HENRY MORTON, G.C.B. (created 1899), the African explorer, was born at Denbigh, in Wales, in 1841. His parents were not married; his father died soon after, and his unloving mother left the child to her father's care. When old Moses Parry died in 1847, John Rowlands, as Stanley was then called, was sent to St Asaph workhouse. After a hard, unhappy boyhood, he shipped in 1859 for New Orleans, where he was fortunate enough to win the sympathy of a broker named Stanley. He assumed the name of his benefactor; but on the death of Mr Stanley intestate in 1861, he was again thrown on his own resources. He served in the Confederate army, and was taken prisoner at the battle of Shiloh (1862). After further adventures Stanley joined the U.S. navy, serving as ship's writer till 1865, when he drifted into journalism. In 1867 he was acting as correspondent for the *New York Tribune* and the *Missouri Democrat* on a military expedition against the Indians, and towards the close of that year began his connection with the *New York Herald*. It was as its special correspondent that Stanley first entered Africa. He accompanied Lord Napier's Abyssinian expedition, and so ably did he make his dispositions that the first news of the fall of Magdala was conveyed to the British public—and also to the British government—by the *New York Herald*. Stanley next went to Spain for his paper, and while in Madrid received the famous telegram from Mr Gordon Bennett summoning him to Paris; he went at once, and received the laconic instruction 'Find Livingstone.' This was in October 1869, but Stanley did not at once proceed on his new mission; he visited Egypt for the opening of the Suez Canal, and travelled through Palestine, Turkey, southern Russia, and Persia, arriving in India in August 1870. In the following January he reached Zanzibar, and towards the end of March he set out on his first expedition into the heart of the dark continent. One white companion died; the other proved 'a mere burden'; there was the usual trouble with porters; but Stanley displayed qualities of courage, perseverance, and command over the native African which won for him

a high position in the long roll of African explorers. The road to Tanganyika was not then what it is now; but all difficulties were overcome, and on November 10th Stanley had the satisfaction of greeting Livingstone. For four months they remained together, and there can be little doubt that the influence and example of Livingstone during these four months had a lasting effect on Stanley's character and career. Stanley met Livingstone a special correspondent; he parted from Livingstone with the fever of African exploration burning in his veins. The two men had together explored the north end of Lake Tanganyika, and conclusively settled that the lake had no connection with the Nile basin. On March 14, 1872, Stanley left Livingstone and set out on his return to the coast, having left large quantities of goods with the veteran, and given promises of further assistance. In less than two months he arrived at Zanzibar, and in August in England, where he was awarded the medal of the Royal Geographical Society, and fêted as the lion of the hour. His book, *How I Found Livingstone*, had an enormous sale. During the Ashanti campaign he followed the fortunes of Wolseley's troops, for the *New York Herald*, and he returned to London only just in time to assist at the funeral of Livingstone in Westminster Abbey. The news of Livingstone's death kindled in Stanley a great resolution to complete the work in which his master had lost his life.

An expedition fitted out at the joint charge of the *New York Herald* and the *Daily Telegraph* was projected, with Stanley in supreme command. In August 1874 he left England to attempt the solution of some of the great problems of Central African geography. In November, with some 350 men of all descriptions, he quitted Bagamoyo, following the ordinary route to Ugo, when, turning suddenly northwards, he made for the southern shore of the Victoria Nyanza. From Kagehi, on Speke Gulf, he circumnavigated the lake, and approximately fixed its general outline. In Uganda he formed a close friendship with King Mtesa, and on his return home his reports of the readiness of the king to receive instruction in the Christian religion led to a great outburst of missionary enthusiasm, and the establishment of mission stations in Uganda. At Bambireh, an island off the south-west shore of the lake, he came into serious conflict with the natives, and the severe measures he adopted on this and other occasions aroused much hostile criticism in England. Passing through Karagwé, he reached Tanganyika, and set himself to determine its exact configuration. This accomplished, he made his way to Nyangwé on the Lualaba, where he first met Tippu Tib, the Arab chief; and from Tippu he learned that Cameron had not attempted the solution of the problem suggested by this great mass of water flowing northwards. It is of course impossible to give even in the barest outline the story of Stanley's ten months' journey from Nyangwé to the sea, by which he traced the course of the Congo and filled up an enormous blank in the map of Africa. When he arrived at Boma (9th August 1877) all his white companions were dead, hardly a third of his native followers had survived, and Stanley's black hair had turned white. It would be difficult to exaggerate the effect produced by this great journey. Politically it led directly to the founding of the Congo Free State (now Belgian Congo), and indirectly to that scramble for Africa among the European powers which left but an insignificant portion of the continent unpartitioned. Stanley returned to London in January 1878, published *Through the Dark Continent*, and in 1879 again went out to Africa to found, under the auspices of Leopold II. of Belgium,

the Congo Free State. Until 1884 this work engaged all his energies. He then returned to Europe, and in 1885 published *The Congo and the Founding of its Free State*. He took part in the Congo Congress at Berlin in 1884-85, and lectured widely, in Britain and in America, on his African work.

Towards the end of 1886 Stanley was summoned from America to take command of the expedition for the relief of Emin Pasha (see SCHNITZER). On 22d February 1887 he arrived at Zanzibar; on the 25th he, his officers, and the Zanzibari porters, Somalis, and Sudanese soldiers sailed for the mouth of the Congo, where they landed on 18th March. On 15th June the expedition had reached the village of Yambuya, 1400 miles from the sea, on the left bank of the Aruwimi, 96 miles above its confluence with the Congo. Here Stanley divided his forces. He left at Yambuya camp a large number of loads, which were to be brought on as soon as porters were provided by Tippu Tib. The entire force which left Zanzibar numbered, all told, 706 men. Between Zanzibar and Yambuya it was reduced to 649. Of this number 389, including Stanley and four Europeans, made up the advance force. Major Barttelot was left in command of the rear column, and on 28th June Stanley set out on his forced march through the forest. It is impossible to follow in detail the story of Stanley's indomitable struggle with almost insurmountable difficulties. Not till the end of April 1888 did Emin and Stanley join hands on the shores of the Albert Nyanza. Retracing his steps, Stanley found that disaster had overtaken his followers left behind at Yambuya. With amazing fortitude he reorganised his party and again joined Emin on Albert Nyanza. The return journey was made by an overland route to the east coast, and Bagamoyo was reached on 4th December 1889. Apart from the main object of this expedition, Stanley discovered Albert Edward Nyanza and the lofty snow-capped mountains of the Moon (Ruvenzori range), and established the existence of a vast pigmy-inhabited tropical forest to the west of the lake country, and occupying the northern portion of the Congo basin. This journey also led to the foundation of the British East African Protectorate. In 1890 Stanley, after recruiting his health in Egypt, returned to London, and met with a royal reception. He married Miss Dorothy Tennant (1890), abandoned American for British citizenship, settled in England, stood unsuccessfully as Unionist candidate for North Lambeth in 1892, was elected in 1895, sat—without attaining parliamentary distinction—till 1900. His health undermined by his African travels, he died 9th May 1904. His tombstone records the significant name given him by the Congo natives—*Bula Mutari*, Breaker of Rocks—i.e. Maker of Roads.

His works include, besides those named above, *Coomassie and Magdala* (1874); *In Darkest Africa: or the Quest, Rescue, and Retreat of Emin* (1890); a tale, *My Kalulu* (1873); *My Dark Companions and their Strange Stories* (1893); *My Early Travels in America and Asia* (1895); and *Through South Africa* (1898). See his *Autobiography* (1909), edited and completed by his wife, an accomplished artist, who afterwards married Dr H. Curtis, and died in 1926; and the articles SCHNITZER, CONGO.

Stanley, THOMAS, son of Sir Thomas Stanley, was born at his house of Cumberlow, in Hertfordshire in 1625. He had Fairfax, translator of Tasso, for private tutor, and studied at Cambridge, passing M.A. in 1641. He also had the Oxford master's degree, though he does not seem to have studied there. He became a member of the Middle Temple, and practised law throughout life, though his best energies were given to literature. He published translations from the Greek, Latin, French, Spanish, and Italian poets;

but his great works were the *History of Philosophy* (4 vols. 1655-62) and an edition of Æschylus, with Latin translation and commentary (1663-64). The former deals only with Greek philosophy, and is based on Diogenes Laertius; but it was long a standard work, having been translated into Latin by Leclerc and others. The Æschylus was generally considered to surpass its predecessors (though Stanley was blamed for 'plagiarism' from Casaubon, Scaliger, and others); the best edition is Butler's (1809-16). Stanley died in London, 12th April 1678. See Brydges' edition of his *Poems* (1814-15), Saintsbury's (in *Caroline Minor Poets*, vol. iii. 1922), and Miss Guiney's of his *Original Lyrics* (1907).

Stanley, VENETIA. See DIGBY (KENELEM).

Stanley Falls, Stanleyville. See CONGO.

Stanley Pool, a lake-like expansion of the river Congo about 350 miles from its mouth, discovered by Stanley in 1877. It measures 25 miles by 16, and lies 1142 feet above sea-level. It is connected by railway with Matadi (see CONGO).

Stannaries (Lat. *stannum*, 'tin'), the mines from which tin is dug. The term is most generally used with reference to the peculiar laws and usages of the tin-mines in the counties of Cornwall and Devon. By an early usage peculiar to these counties, the prerogative of the crown, elsewhere reaching only to gold and silver mines, is extended to mines of tin, which are the property of the sovereign, whoever be the owner of the soil. A charter of King John to his tinners in Cornwall and Devonshire, of date 1201, authorised them to dig tin, and turf to melt the tin, anywhere in the moors, and in the fees of bishops, abbots, and earls, as they had been used and accustomed—a privilege afterwards confirmed by successive monarchs. When Edward III. created his son, the Black Prince, Duke of Cornwall, he at the same time conferred on him the Stannaries of Devon and Cornwall, which were incorporated in perpetuity with the duchy. Their administration is committed to an officer called the Lord Warden of the Stannaries, who has two substitutes or vice-wardens, one for Cornwall and one for Devon. In former times representative assemblies of the tinners (called parliaments) were summoned by the warden, under a writ from the Duke of Cornwall, for the regulation of the stannaries and redress of grievances: the last of them was held in 1752. The Stannary Courts are courts of record held by the warden and vice-warden, of the same limited and exclusive character as the Courts-palatine, in which the tinners have the privilege of suing and being sued. They were remodelled and regulated by a series of acts of parliament. Appeals from these courts are now taken to the Court of Appeal, and there is a final appeal to the House of Lords. In Cornwall the right to dig tin in unenclosed or 'wastrel' lands within specified bounds may be acquired by one who is not the owner of the lands, on going through certain formalities, the party acquiring this right being bound to pay one-fifteenth to the owner of the lands. An ancient privilege, by which the Duke of Cornwall had the right of pre-emption of tin throughout that county, has long fallen into abeyance.

Stannic Acid. See TIN.

Stannotypes. See PHOTOGRAPHY.

Stanovoi Mountains. See SIBERIA.

Stanton Drew, a small village of Somersetshire, 7 miles S. of Bristol, with great megalithic remains, especially stone circles.

Stanyhurst, RICHARD (1547-1618), born at Dublin, studied at Oxford, and died a Catholic priest at Brussels. He wrote on Irish history,

commented on Porphyry, and translated part of Virgil and some Psalms into hexameters of the Gabriel Harvey kind. See HOLINSHED.

Stapelia. See CARRION FLOWERS.

Stapes, a stirrup-shaped bone of the Ear (q.v.).

Staphylea. See BLADDER-NUT.

Staphyleaceæ, a family of archichlamydeous dicotyledons, trees and shrubs, akin to Celastraceæ, mainly inhabitants of the Northern Hemisphere. The flowers are regular, with five sepals, five petals, five stamens, and a superior trilocular ovary of three carpels. The fruit is a capsule (see BLADDER-NUT). The axis is concave, and forms a disc within the ring of stamens. The leaves are imparipinnate (rarely simple), stipulate. In *Staphylea*, *Turpinea*, and *Euscaphia* they are opposite, in *Tapiscia* and *Huetea* alternate.

Staple, a word representing both Old English *stapol* and Old French *estaple*, which, borrowed through mediæval Latin *stapola*, from Low German, is ultimately of the same origin as the Old English word. The history of the many meanings is obscure. Probably the Old Teutonic word meant a support; hence it came to mean a post, platform, heap, &c. Perhaps from the last-mentioned it came to mean a place where goods are stored up for sale. Or possibly the 'king's staple' was originally a raised platform from which judgment was administered. In the middle ages, when the term was in common use, a staple meant both the trading-town for particular commodities and the commodities that were wont to be exposed for sale there. The kings of England from the beginning of the 14th century issued various regulations affecting the staple towns for the sale of England's principal commodity in those ages—wool. In 1313 Edward II. enjoined that all English merchants trading abroad, in Flanders, Brabant, and the adjacent countries, should carry all their wool to one staple town in Flanders; from 1343 Bruges was the town that enjoyed this privilege. But the men of Bruges greatly hampered the trade, and put vexatious hindrances in the way of the English merchants trading with the towns that lay farther inland; so that in 1353 Edward III. transferred the staple to England, and shared its privileges amongst half a score of coast towns from Newcastle to Bristol. At the same time all questions in dispute affecting mercantile transactions at these towns were put under the jurisdiction of an officer (one in each town) called the mayor of the staple, who decided all such differences by 'merchant law', with the assistance of foreign merchants as assessors. The change to England, however, which it was hoped would relieve the English merchant from the vexatious interference of foreign governments and advantage the island country by attracting foreign merchants, proved anything but satisfactory, and from about the year 1362 the staple for English wool was almost constantly fixed at Calais, and remained there down to the year 1558. The Scottish merchants had their staple at Campvere (q.v.) in Holland. But as commerce grew with the lapse of time, it gradually broke down the barriers imposed by the system of staples. This concentration of trade in particular commodities or of particular countries at certain cities and towns was owing to both economic and political reasons. It was a sort of established policy of the Plantagenet kings to regulate trade in the interests of the royal power. Important privileges were accorded to foreign merchants on condition of their agreeing to frequent certain towns for purposes of traffic. This, too, enabled the royal officers of the customs the more readily and easily to collect the revenues of the crown accruing from those sources. And this line of state policy was so far congruent with

the requirements of international commerce that it was the means of bringing buyers and sellers together at the same time and in the same place, and that it enabled the merchants trading from or to one town, or country, or association of trading-towns, to combine together for their mutual advantage and protection.

Staples. See FARNE.

Stapleton-Cotton. See COMBERMERE.

Star. See STARS, ORDERS OF KNIGHTHOOD.

Star-Anise. See ANISE.

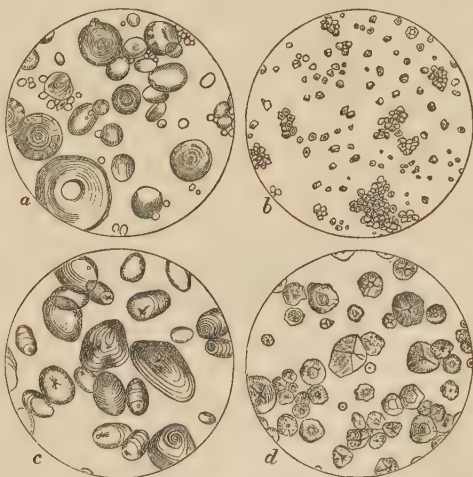
Star Apple (*Chrysophyllum*), a genus of trees and shrubs of the family Sapotaceæ. They are natives of tropical and subtropical countries. The Star Apple of the West Indies (*C. Cainito*) is a tree about 30 or 40 feet high. The fruit is large, purple or green, and has a soft sweet pulp of an agreeable flavour. Other species also produce edible fruit.

Staraya-Russa, a town of Russia, 62 miles S. of Novgorod by rail round Lake Ilmen, is remarkable for its salt springs.

Stara-Zagora (Turkish *Eske-Zagra*), a town of Bulgaria at the southern base of the Balkans, 70 miles NNW. of Adrianople, was almost destroyed during the Russo-Turkish war of 1877-78; pop. 25,000.

Starboard. See STEERING.

Starch, $C_6H_{10}O_5$. It is one of the essential functions of the leaves of plants to decompose carbon dioxide, by the help of sunlight which shines through the chlorophyll, with evolution of oxygen and the formation of starch. The starch becomes converted by a diastatic ferment into sugar, which passes from the leaves to various parts of the plants, and being reconverted into starch, is stored. See CHLOROPHYLL, LEAF, and SEED. It is in this way that fruits and seeds, stems—e.g. that of the sago palm, tubers like the potato—tap-roots, bulbs, &c. become stored with starch. The granules of starch are usually of a rounded form, consisting of a nucleus surrounded by a number of envelopes or layers. Each species of plant has its own peculiar



Starch Granules :

a, wheat; b, rice; c, potato; d, maize; all magnified 250 diameters. (From Dr Bell's *Chemistry of Foods*.)

shape of granule which can be recognised under the microscope, but in the same plant these granules differ in size. The smallest size of a granule of oat-starch is $\cdot 0001$, while the largest-sized granule of Tons-les-mois starch is about $\cdot 0015$ of an inch.

Starch has the same elementary composition as sugar, gum, and cellulose. These all belong to a class of substances called carbohydrates, because they could be represented as compounds of carbon and water, as shown by the formula given above, which corresponds to six atoms of carbon and five molecules of water, H_2O . Starch contains no nitrogen, and is thus distinguished from characteristic animal compounds. The peculiar structure of starch granules and the way in which they occur in the vegetable cell permit of their being readily separated from other matters occurring along with them in plants. As usually prepared, starch is either a white glistening powder or it is obtained in irregular prisms which arise from the cracking up of a cake of the dried material. When pressed between the fingers a slight but peculiar sound is produced. Its specific gravity varies from 1.55 to 1.60. Starch is soluble only to a very slight extent in cold water, but when heated in water to above $150^{\circ}F$, the granules burst, and a clear ropy solution is formed which, on cooling, becomes a translucent jelly called starch-paste. This paste gives a deep-blue colour with iodine and an orange-yellow with bromine, the former being a highly characteristic and delicate test for starch. If a salt of iodine, such as iodide of potassium, is used, the iodine must be liberated either by a drop of strong nitric acid or preferably by a little chlorine water. By the gentle action of nitric acid on starch an explosive compound called *xyloidine* is obtained. At a temperature of about $320^{\circ}F$. ($160^{\circ}C$.) starch is converted into *dextrine* or *British gum*, and the same change is produced on starch by the action of dilute mineral acids. Dextrine is usually made on an industrial scale from potato-starch. It is this Dextrine (q.v.) which is the adhesive matter on postage-stamps, but it is otherwise largely used in the arts. By the further action of acids on starch *dextrose* or grape-sugar, and also the crystallisable sugar, *maltose*, are obtained. Maltose sugar is likewise produced during the operation of malting by the action of diastase on the starch of grain.

Starch is heard of in England as early as 1511, or even sixty or seventy years earlier, but was not much used till 1564, when, according to Planché, 'Missess Binghein Vandh Plasse, a Fleming, came to London, and publicly taught the art of starching. . . . Stubbes falls foul of this "liquid matter which they call starch, wherein the devil hath learned them to wash and dive their ruffs, which being dry will then stand stiff and inflexible about their necks."' Not only ruffs but beards were starched. Later yellow starch, introduced by Anne Turner, had a great vogue, which suddenly ended when Mrs Turner was hanged in yellow-starched ruff for complicity in the murder of Sir Thomas Overbury (q.v.).

Manufacture.—Starch is manufactured on a large scale in Europe from maize, wheat, rice, potatoes, and from sago-flour.

Maize-starch.—Maize contains 65 per cent. of starch and about 14 of gluten and other nitrogenous matters. The grain is first steeped for forty-eight hours in water at a temperature not exceeding $120^{\circ}F$. It is then ground with water by millstones into a milky state, after which it is sieved to keep back the husks. From the sieve the starchy liquid passes into 'runs' or channels made of wood, from $2\frac{1}{2}$ to 4 feet broad and 9 inches deep, in which the starch deposits. It is then removed from the runs and put along with water into vats or tuns (10 feet in diameter and 4 feet 6 inches deep) provided with stirrers, some very weak soda-lye being added. After it is sufficiently stirred the liquid is allowed to settle, when the starch falls to the bottom. At this stage the vats contain a layer of starch, over it a layer

of gluten, and above that again a stratum of yellowish water thick with gluten. The starch is again washed with water in the final settling vats, from which, after drawing off the water, it is removed and spread on clean cotton sheeting to be dried in stoves at a temperature between 120° and $130^{\circ}F$. A little bleaching powder is used to bleach maize and other kinds of starch.

Potato-starch.—In manufacturing starch from potatoes, the latter are first washed in machines of various kinds, of which one of the simplest is a revolving cage-like cylinder with wooden bars. Then follows the grating of the washed potatoes by forcing them against the saw-like teeth of rasps, which, as sufficient water is fed to the machine, reduces them to a paste. In order to separate fibrous and albuminous matters and other impurities, the starch-paste with an addition of water is passed through fine sieves, and at the same time agitated by various arrangements. From the sieves it is received into settling tanks in which the deposit of starch is again washed in clean water. It then descends in a milky stream over an inclined plane, on which the starch is deposited, and afterwards once more washed. A little alum or sulphuric acid is used to assist in the removal of albuminous matters. The starch is dried either on porous bricks or on slabs of gypsum, and for some purposes it undergoes another drying in a hot chamber.

Wheat-starch.—Owing to the large amount of albuminous and other nitrogenous bodies (gluten or its equivalents) which wheat contains, amounting sometimes to more than 15 per cent., the methods of making starch from this grain are a little more complicated than the processes employed to obtain it from other cereals or potatoes. Wheat-starch is made by the old plan of removing the gluten by fermentation, and also by Martin's method of kneading the flour into a stiff dough and washing out the starch with water on a sieve. Good English wheat contains about 69 per cent. of starch, but in this grain the proportion of both starch and gluten varies much.

Rice-starch is prepared by removing the gluten, which amounts to from 7 to 8 per cent. of the seed, by the action of soda in weak solution. The proportion of starch in rice is higher than it is in other cereals, varying from a little under to a little over 80 per cent. The *corn-flours* of commerce are prepared either from the purified starch of maize or from that of rice. These flours, being nearly pure starches, with the flesh and bone forming constituents extracted, are not flours of their respective seeds in the sense that wheat-flour is.

Sago-starch is obtained from the pith of the stems of sago palms (see PALM and SAGO). Most of the sago imported into England is in the form of sago-flour, which is used in the manufacture of household starch and glucose sugar. Besides its use in the laundry, starch is extensively employed in dressing textile fabrics and as a thickener for the colours used in printing calico; also for mounting photographic prints and dusting founders' moulds.

The principal starches prepared for food besides the 'corn-flours' are *Arrowroot* (q.v.), *Tapioca* (q.v.); and *Tous-les-mois*, from the rhizomes of a species of *Canna* cultivated in St Kitts, West Indies. *Curcuma Starch* is made to some extent in southern India from the tuberous root of *Curcuma angustifolia*, and is sometimes called by Europeans East India arrowroot. In France starch is manufactured from horse-chestnuts. Paisley is the principal seat of the starch-manufacture in Great Britain, where it is chiefly made from maize. Rice-starch is made on a large scale at Norwich, and wheat-starch at Belfast.

In the United States, where maize-starch was

first produced in 1842, the principal manufactories are at Oswego, New York, and at Glen Cove, on Long Island. Maize-starch is manufactured from a large porous-grained Indian corn.

It was discovered in 1912 that synthetic rubber could be prepared from starch. By a process of fermentation butyl alcohol is got from the starch. It is then converted into the hydrocarbon isoprene, which polymerises to rubber in contact with sodium.

Star-chamber, a tribunal which met in the old Council-chamber of the palace of Westminster, and is said to have got its name from the roof of that apartment being decorated with gilt stars. That 'starres' or Jewish bonds had been kept in it is not now believed. It is supposed to have originated in early times out of the exercise of jurisdiction by the king's council, whose powers in this respect had greatly declined when in 1487 Henry VII., anxious to repress the indolence and illegal exactions of powerful landowners, revived and remodelled them, or, according to some investigators, instituted what was practically an entirely new tribunal. The statute conferred on the Chancellor, the Treasurer, and the Keeper of the Privy Seal, with the assistance of a bishop and a temporal Lord of the Council, and Chief-justices, or two other justices in their absence, a jurisdiction to punish, without a jury, the misdemeanours of sheriffs and juries, as well as riots and unlawful assemblies. Henry VIII. added to the other members of the court the President of the Council, and ultimately all the privy-councillors were members of it. The resulting tribunal was, during the Tudor age, of undoubted utility as a means of bringing to justice great and powerful offenders who would otherwise have had it in their power to set the law at defiance. It was independent of a jury, and at that time juries were too easily terrorised by the nobles. The civil jurisdiction of the Star-chamber comprised controversies between English and foreign merchants, testamentary causes, disputes between the heads and commonalty of corporations, lay and ecclesiastical, and claims to deadlands. As a criminal court it could inflict any punishment short of death, and had cognisance of forgery, perjury, riots, maintenance, fraud, libels, conspiracy, misconduct of judges and others connected with the administration of the law, and all offences against the state, in so far as they could be brought under the denomination of contempt of the king's authority. Even treason, murder, and felony could be brought under the jurisdiction of the Star-chamber, where the king chose to remit the capital sentence. The form of proceeding was by written information and interrogatories, except when the accused person confessed, in which case the information and proceedings were oral; and out of this exception grew one of the most flagrant abuses of this tribunal in the later period of its history. Regardless of the existing rule that the confession must be free and unconstrained, pressure of every kind, including torture, was used to procure acknowledgments of guilt; admissions of the most immaterial facts were construed into confessions; and fine, imprisonment, and mutilation inflicted on a mere oral proceeding, without hearing the accused, by a court consisting of the immediate representatives of prerogative. The proceedings of the Star-chamber had always been viewed with distrust by the commons; but during the reign of Charles I. its excesses reached a pitch that made it odious to the country, especially the punishments inflicted on Leighton, Prynne, Burton, and Bastwick; and in 1641 a bill carried in both Houses decreed the abolition of the Star-chamber and the equally unpopular court of High Commission (q.v.). See CHARLES I., LAUD.

See Leadam's *Select Cases before the King's Council of the Star Chamber* (Selden Society, 1904).

Starch-hyacinth. See GRAPE-HYACINTH.

Starfishes (Asteroidea), a class of Echinoderms, nearly allied to the Brittle-stars (Ophiuroidea) and to the Sea-urchins (Echinoidea). The Common Five-rayed Starfish (*Asterias* or *Asteracanthion rubens*) is sometimes seen in shore-pools about the low-water level, but its haunts are on the floor of the sea at depths of a few fathoms. It moves sluggishly by means of suctorial tube-feet on the under surface of each arm. It often feeds on young oysters and other bivalves, but it may live on much smaller booty. Although without any



Fig. 1.—Starfishes and Brittle-stars:

- 1, Common Starfish (*Asterias rubens*); 2, Gibbous Starlet (*Asterina gibbosa*); 3, Common Starfish, reproducing rays; 4, Eyed Cribella (*Cribella oculata*); 5, Lesser Sand-star (*Ophiura albida*). (From Forbes's *British Starfishes*.)

concentration of nerve-cells into ganglia, the starfish often exhibits genuine behaviour. Thus it will attack a small sea-urchin and gradually wrench off the snapping spines or pedicellariæ which fasten on to its suctorial tube-feet, continuing to do so until the sea-urchin has no weapons left. Jennings has shown that a starfish is able to form habits and to profit by its experience. When it is in process of righting itself after being turned upside-down 'given parts sacrifice their own more direct turning, or even reverse it, in the interest of

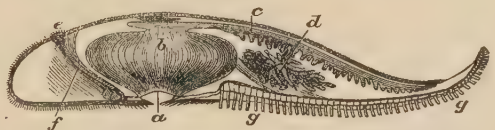


Fig. 2.—Longitudinal Section of an Arm:

Section through arm and disk of *Solaster*, showing (a) mouth, (b) stomach, (c) digestive caeca, (d) reproductive organs, (e), madrepore plate, (f) stone-canal, (g) tube-feet.

the general result.' There is a harmonious working together of the different parts under the action of the righting impulse, and experiment shows that one factor in this correlation is previous experience. For some time the starfish rights itself in awkward ways, certain rays playing a part that hinders rather than helps the process. But gradually it learns to right itself more effectively.

Although a typical starfish appears very different from a sea-urchin, there is a close homology of

parts. As regards shape, the dorsal surface of a starfish corresponds with the anal area or 'periproct' in the centre of the apical disc of a sea-urchin, the ventral surface with the ambulacral grooves to the ambulacral areas, and the sides of the arms to the inter-ambulacral areas. The tips of the arms of the starfish each with an eye-spot—a modified tentacle—correspond to the 'ocular plates' around the periproct of the sea-urchin. Through these plates in the common sea-urchin (*Echinus esculentus*) five sensitive tube-feet emerge. The five genital plates of the sea-urchin's apical disc correspond to the corners between the arms of the starfish.

Like most Echinoderms, the starfish is very calcareous. Forming the ventral groove of each arm there are important rafter-like plates called ambulacral ossicles; from the more external mesoderm are developed smaller ossicles, superficial spines, and snapping scissor-like pedicellariæ. The starfish is not very muscular, but the arms can be bent in various ways, part of the stomach can be protruded, and there are contractile elements in connection with the water-vascular system. Besides the five radial nerves and the circum-oral pentagon, there is a diffuse nervous network beneath the ciliated ectoderm covering the body. Thus the skin is diffusely sensitive, and the little red 'eye' at the tip of each arm is certainly sensitive to light. The mouth is in the centre of the ventral surface; from the median stomach a pair of digestive cæca grow out into each arm; from the short tubular intestine between the stomach and the central dorsal anus, two little outgrowths arise, comparable, it is said, to the respiratory trees of Holothurians. There is a distinct, though not spacious, body-cavity, lined by ciliated epithelium, and containing a fluid with some amœboid cells, the brownish pigment of which perhaps aids in respiration.

When we watch a starfish crawling up the side of a rock we see that scores of soft tube-feet are protruded from the ventral groove of each arm, that these become long and tense, and that their sucker-like terminal discs are pressed against the hard surface. There they are fixed, and towards the attachment the starfish gently lifts itself. The protrusion is effected by the internal injection of fluid into the tube-feet; the fixing is due to the fact that the contained fluid, flowing back again from the tube-feet to the internal reservoirs, produces a vacuum between the ends of the tube-feet and the surface of the rock.

On the dorsal surface, between the bases of two of the arms, there is a complex calcareous sieve, somewhat suggestive of the rose of a watering-pan. Its pores converge into a 'stone-canal,' which, like a complex calcareous filter, extends vertically through the body, and leads into a ring around the mouth. This circum-oral ring gives off nine transparent vesicles and five radial tubes, one for each arm. Each radial vessel lies in the ventral groove of an arm, roofed by the rafter-like ossicles, and gives off internally reservoir-like bladders or ampullæ, and externally the tube-feet. The fluid in the system seems to pass from the radial vessels into the tube-feet, and from the tube-feet back into the ampullæ. It is evident

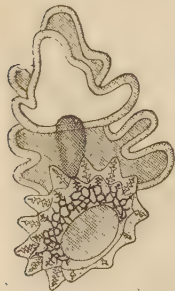


Fig. 3.—Bipinnaria with young Starfish developing within it.

that the water-vascular system is modified for locomotion, but it is likely that it also helps in respiration and perhaps also in excretion. At the

end of each arm there is a long unpaired tube-foot which acts like a tactile tentacle. There are various channels and sinuses which have been called blood-vessels, but a true vascular system seems to be absent. Respiration is in great part discharged by numerous 'skin-gills,' contractile hollow outgrowths from the skin of the dorsal and lateral surfaces. Of excretion in the starfish we know almost nothing. The sexes are separate, but quite like one another; the reproductive organs—branched like elongated bunches of grapes—lie in pairs in each arm; the genital ducts open dorsally between the bases of the arms.

The ova are fertilised in the water. It is said that they occasionally begin to develop without fertilisation. The segmentation is complete; a blastosphere is formed and a typical gastrula. The free-swimming larva, as in other Echinoderms, is remarkably specialised, with two ciliated bands and peculiar arm-like outgrowths. It is known as a Bipinnaria or as a Brachiolaria. The adult is a new formation within the larva, retaining the water-vascular system, and midgut, but absorbing or rejecting the provisional larval structures. There is also in this indirect development a remarkable change from bilateral to radial symmetry. Parental care occasionally occurs among Asteroids; thus a large *Asterias* has been seen sheltering its young within its arms, while in *Pteraster* and some others there is a dorsal brood-pouch. Many Asteroids break very readily, throwing off their arms when seized. The lost parts are slowly regenerated, and strange shapes, especially the 'comet-form,' often result in the course of regrowth. This 'autotomy' of members may sometimes be a means of multiplication, as in *Linckia guildingii*.

The commonest European starfishes are species of *Asterias* or *Asteracanthion*, *Astropecten*, *Cribrella*, *Solaster*, *Goniaster*. In *Astropecten* and several related forms the food-canal ends blindly; in *Brisinga* the arms are very long and arise abruptly from a small central disc, as in *Ophiroids*; in *Luiddia* the pedicellariæ are three-bladed instead of two-bladed; and there are many minor differences like the above. There are also considerable differences in external form; witness the many-rayed *Solaster*, the pincushion-like *Goniaster*, the flat pentagonal



Fig. 4.—Process of budding from one of the arms of *Linckia multi-fora*. (After P. and F. Sarasin.)

such as *Asterias gigantea*, from the Pacific coast of North America, which measures two feet in diameter, and *Pycnopodia helianthoides*, which measures about a yard in diameter, and has over twenty arms. The majority live in comparatively shallow water, but the *Ophiuroid*-like *Brisinga*, the widely distributed *Hymenaster*, the blue *Porcellanaster ceruleus*, and many others are deep-sea forms. The earliest occurrence of Asteroids is in Silurian strata.

The *Brittle-stars* (*Ophiuroidea*) differ from Asteroids in the more centralised body, more sharply defined arms, and more active habit. Compared more fully with starfishes, the brittle-stars are more muscular and less limy; the arms do not contain digestive cæca from the gut nor reproductive organs, and are supported by an axis of limy 'vertebral ossicles'; the tube-feet are smaller, apparently tactile and respiratory, and locomotion is effected by the muscular wriggling of the arms;

the groove so well seen on the ventral surface of the starfish arm is here closed in by limy plates; the alimentary canal ends blindly; the entrance to the water-vascular system (madreporic plate) is ventral; the larval form is known as a Pluteus. The popular name 'brittle-star' refers to the extreme ease with which the arms break; another common name, 'sand-stars,' refers less happily to their occasional occurrence on the shore; the technical title Ophiuroid describes the snake-like coils of their arms.

The brittle-stars creep about by wriggling their muscular arms. Some are found creeping on the shores at low-tide, but the majority keep to the floor of more or less deep water. On blocks of



Fig. 5.—The Shetland Argus (*Astrophyton scutatum*).
(From Forbes.)

coral and the like they swarm in enormous numbers, twisting themselves most fantastically about the crevices. They are carnivorous animals feeding on small molluscs, crustaceans, worms, and much simpler organisms like Foraminifera.

With few exceptions (e.g. *Amphiura squamata*), the brittle-stars are unisexual. In most the eggs are liberated as such, are fertilised externally, and develop in the water; but some species—e.g. *Ophiopholis bellis*, *Ophiocoma vivipara*—produce their young alive (viviparously), and in these cases the genital clefts are enlarged to form distinct brood-chambers. The openings of the clefts admit water, and thus aid in respiration. When the young are born viviparously they are more or less like the parent Ophiuroid, and have no free-swimming larval stage, but where the eggs develop freely in the water, the result is a strange swimming larval form utterly unlike a brittle-star. This so-called 'Pluteus' is fancifully compared to a many-legged painter's easel, the legs being rods of lime which project from the body of the

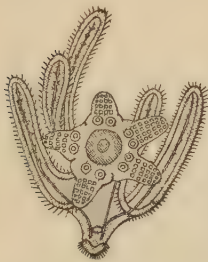


Fig. 6.—Pluteus larva with young Ophiuroid developing within it.

larva. Similar forms are characteristic of sea-urchins (Echinoids). As in other Echinoderms, the development is indirect. It is well known that in the panic of capture the brittle-stars justify their name by giving off their arms with singular facility. This pathological process is doubtless advantageous, for, like other Echinoderms, the brittle-stars have great powers of regeneration. They can grow new arms or new points, and thus recuperate their injuries; and in some species of Linckia and Ophiaster an isolated arm may produce other arms.

The brittle-stars are world-wide in their distribution, or occur at least in all seas yet dredged. The depth of their habitat varies greatly. 'More than two hundred species are restricted in their range to a zone of thirty fathoms,' but 'sixty-nine species descend below one thousand fathoms, and about eighteen below two thousand.' About fifty fossil species are known. Some are said to appear in the Silurian and Devonian, but about these very ancient forms not much is certainly known. In the higher Mesozoic strata, however, they become frequent, and are especially numerous in Jurassic beds.

The Ophiuroids form the most numerous class of Echinodermata, and may be divided into two distinct orders—(a) the Ophiurida, with unforked arms, which cannot be rolled up towards the mouth, and usually have distinct limy shields; (b) Euryalida, often with forked arms, which can be rolled up towards the mouth, and have not distinct limy shields.

Important Forms.—(1) *Ophiurida*.—Among the commonest British species are the Common Sand-star (*Ophiura texturata*), the Lesser Sand-star (*O. albida*), and the Common Brittle-star (*Ophiocoma rosula*). In North-European seas *Ophioglypha lacertosa* is very common. *Ophiopholis bellis* is viviparous. *Ophiactis virens* divides spontaneously. The very widely distributed *Amphiura squamata* is hermaphrodite, viviparous, and phosphorescent. *Ophiopsila aranea* is another luminous form. *Ophiothrix fragilis* is one of the most abundant species, and *Ophiothrix echinata* is common on Mediterranean shores. *Ophiomyxa* leads on to the Euryalida, which in its soft skin and general appearance it markedly resembles. (2) *Euryalida*.—The very curious Gorgonocephalus or medusa-headed brittle-star is one of the best-known genera in this division. The arms are repeatedly forked, and as they curl in towards the mouth become intertwined in a living knot of the most fantastic appearance. Euryale is another important genus. One form has been occasionally caught on herring-nets off British coasts. They are sometimes called Basket-fish, Medusa-headed Starfish, or Argus Starfish.

See Forbes, *British Starfishes* (Lond. 1841); Hamann, *Beiträge zur Histologie der Echinodermen* (Jena, 1885); Ludwig, in Bronn's *Thierreich, und Morphologische Studien* (1877–82); Lyman, *Challenger Report on Ophiuroidea* (1882); Romanes, *Jellyfish, Starfish, and Sea-urchins* (1885); Bell's *Catalogue of British Echinodermata* (1892); MacBride in the *Cambridge Natural History*, vol. i. (1906); Bather in Lankester's *Treatise on Zoology* (1900).

Stargard, the chief town of Further Pomerania, Prussia, on the Ihna, 22 miles by rail E. by S. of Stettin, has foundries, machinery and bridge-building works, and various mills and factories; pop. (1925) 32,575.

Starigrad (Ital. *Cittavecchia*), a small seaport of Yugoslavia, in the north-west of the Dalmatian island of Lesina or Hvar; pop. 4000.

Star Jelly. See NOSTOC.

Starkenburger Land, a province of Hesse (q.v.), east of the Rhine.

Starling, a genus *Sturnus*, and family *Sturnidae* of Passerine birds. The family is a highly characteristic Old-World one, extending to every part of the Eastern continent and its islands, and even to Samoa and New Zealand, but wholly absent from the Australian mainland. The Common Starling (*S. vulgaris*) is a beautiful bird, rather smaller than the song-thrush or mavis, brown, finely glossed with black, with rich metallic purple and green reflections, with a buff-coloured tip to each feather, giving the bird a fine speckled appearance, particularly on the breast and shoulders; in

advanced age it is more uniform in colour. The female is less brilliant than the male, and has the terminal spots larger. Both sexes are more speckled in winter than in summer. The starling is abundant in most parts of Britain, and nowhere more so than in the Hebrides and Orkneys. It is very abundant in nearly every district of England, but is less common in Cornwall and in Wales. It is found in all parts of Europe. It extends even to Iceland and Greenland. To the Mediterranean basin it is a cold weather visitor in enormous numbers; and it is also common in the north of Asia. Starlings make artless nests of slender twigs, roots, and dry grass (often in company with other birds), in hollow trees, in holes of cliffs, under eaves, in chimneys, or, readily, in boxes, which are often placed for them in trees or elsewhere near houses. Year after year they return and build in the same spot if the nest has been removed. They lay from four to seven pale-blue eggs, and breed twice, sometimes thrice, in a season. In autumn the young birds join to form flocks, which become augmented by the other birds, until there is a whole crowd of starlings executing aerial evolutions night after night before roosting-time. In winter they disperse in search of food. Their food consists of worms, slugs, beetles, wireworms, and larvæ, also berries; and since about 1896 they have greatly increased in numbers and become very destructive in cherry-gardens. Many ornithologists hold that three types of starling occur in Europe and north Asia, one with a green gloss, another (a Siberian) purple, and a third mixed; and that the influx of the stronger Siberian birds is driving the weaker green ones farther and farther west, even to Ireland, where starlings never nested till 1905. Introduced into Victoria and New Zealand as a farmer's friend, our starlings rapidly grew into a plague; the insect food supply ceased to suffice, and they took to grain and fruit. In Australia especially they became a serious economic problem; shooting and poisoning have failed to reduce their numbers. They breed not once or twice a season, but three and even five times, and are driving native



Starling (*Sturnus vulgaris*).

parrots, cockatoos, and laughing jackasses from their breeding-places. The starling becomes very pert and familiar in confinement, displays great imitative powers, and learns to whistle tunes, and even to articulate words with great distinctness. Its natural song is soft and sweet. In Spain, southern Italy, and Sicily the unspotted starling (*S. unicolor*) is found, and from Asia Minor to north-western India *S. purpurascens* and several other allied species. The Rose-coloured Starling (*Pastor roseus*), a crested bird with rose-pink back, shoulders, breast, and under parts, is an annual visitor to nearly every part of the British

Islands, and an irregular migrant over the greater part of Europe.

Star-nose. See MOLE.

Starodub, a town of Russia, 120 miles NE. of Tchernigov.

Star of Bethlehem (*Ornithogalum*), a genus of bulbous-rooted monocotyledons of the family Liliaceæ, nearly allied to Squills and Hyacinths. The species are pretty numerous, natives almost exclusively of the eastern hemisphere, many of them of the Cape of Good Hope, and some of the south of Europe. The Common Star of Bethlehem (*O. umbellatum*), a native of France, Switzerland, Germany, the Levant, &c., is very common in flower-



Star of Bethlehem (*Ornithogalum umbellatum*).

gardens. Its flowers are large, six to nine, in a corymbose raceme, white and somewhat fragrant. This and other species of the genus have established themselves here and there in England.—The name Star of Bethlehem is extended to other genera of Liliaceæ (*Gagea*), Amaryllidaceæ (*Hypoxis*), &c.—even to starwort and St John's wort. *Gagea lutea*, formerly called *O. luteum*, with yellow flowers, is found in some parts of Britain in woods and pastures.

Star of India. See INDIAN ORDERS.

Star of Night (*Clusia rosea*). See CLUSIA.

Stars are in general distinguished from other celestial bodies by their fixity of position in the celestial sphere, by the scintillation of their light, and by the fact that they show no appreciable size even under the highest telescopic power. The first quality renders them of great use in that department of astronomy which relates to accurate time-keeping and to measures of latitude and longitude. They form fixed points of reference whose place from their minuteness can be very accurately determined; and as they are far removed from terrestrial and even solar influence we can refer the motions of the earth and other members of the solar system to them as to unvarying landmarks. Themselves immovable, they determine for us our own movement. It is true that many possess minute motions of their own, but these, as we shall see, are so small as in most cases to affect but little in any moderate time the accuracy of such observations. This practical fixity of the stars enables us to determine two fixed points in the sky, called the north and south *poles* of the heavens. Our Pole-star (q.v.) is not far removed from the first of these. Stars near these points are but little affected by the diurnal motion of the heavens, moving with it in *small* circles, while

stars in the Equator (q.v.) move with great rapidity, requiring to complete the entire circuit of the heavens in the same time (twenty-four hours) as the others take to traverse their shorter paths. Thus the changing aspect of the heavens is confusing to an observer at first; but on attentive watching it is seen that all the various speeds and paths of the stars result from one simple motion, viz. the apparent revolution of the whole sky once in every twenty-four hours, as if it were a vast hollow ball hung on opposite points at the two poles. The observer looks as from the centre of this ball, and, were it not for the earth intercepting his view, would see stars on all sides, below as well as above him. At sea or in a sufficiently extensive plain he will see almost exactly one-half of this sphere, the earth hiding the other. A celestial globe represents this sphere, but is necessarily examined from *without*, while the sky is seen from *within*, which must be remembered in using such globes.

Owing to the sun's yearly motion the stars present different aspects at successive times. In June we see nearly one-half of the sky at midnight. By December the sun, pursuing his annual track, has gained a position among the stars we saw at June midnight. They are above the horizon when the sun is in the meridian at noon. At midnight in December we therefore see the stars in the other half of the heavens. At intermediate seasons the condition of things is of course intermediate also. Speaking generally, the starry sky at midnight on the first of any month is the same as that visible at ten o'clock in the evening of the first of the following month, while the ten o'clock aspect in the first case has of course moved to eight o'clock, and so on.

On the inner surface of the sky sphere the stars are irregularly scattered in groups called Constellations (q.v.). From these groups the stars are named by adding a letter or number to the name of the group. The Greek alphabet is used for the brighter stars— α denoting the brightest, β the next brightest, and so on. Roman letters are used when the Greek ones are exhausted, and afterwards numerals. Sometimes, however, the stars are named by their number from some catalogue in which their positions are given. Thus Br. 750 means No. 750 in the catalogue of stars made from Bradley's observations about 1755. In recent years a very extensive catalogue of stars has been determined photographically by co-operation of a large number of observatories. This has been completed for a large part of the sky.

The Scintillation (q.v.) or twinkling of the stars, by which they are easily distinguished from the planets, is due to disturbances in our atmosphere, combined with the fact that the stars are to us mere luminous *points*. It is magnified by the telescope, and becomes often then sufficient to transform the star into something like a tangled mass of worsted. The various points on the surface of a planet, the sun, or the moon are similarly affected, causing an indistinctness of telescopic vision, which when the air is much disturbed renders accurate observation impossible. But the star, being *one* point of light, twinkles *as a whole*, while the planet, sun, or moon, being even in the smallest case *many* points, does not twinkle *as a whole*, and the *average* of its rays gives a steady impression to the eye. Scintillation is most observable on nights when the atmosphere is disturbed, and always greatest at the horizon, being least at the zenith and on quiet nights.

Movements of Stars.—The fixity of the stars relatively to one another is found to be only approximately true when sufficiently refined observations are made, or when they are compared after

a sufficient interval of time. Halley, by comparing the positions of Sirius and some other bright stars given in Ptolemy's catalogue with his own observations, found that they had moved through angles of about one-third the diameter of the moon. All the stars are, in fact, in motion. The largest 'proper motion' known, that of a very faint but near star, is $10''$ a year, so that the star will move a distance equal to the diameter of the moon in 180 years. About two hundred stars are known to have proper motions of more than $1''$ annually, but many thousands are known which have proper motions of a few seconds a century. These are at first sight very irregular. Herschel detected a general tendency to move directly away from a point in the neighbourhood of the bright star Vega. This he interpreted as due to a movement of the sun, carrying the whole solar system with it, in an opposite direction. Herschel's discovery has been confirmed many times, and, since the velocity of the sun has been determined by spectroscopic observations of the stars, has served as a most valuable method of determining the mean distances of stars of different magnitudes or of different colours.

A further systematic character in the proper motions of the stars was discovered by Kapteyn in 1905, who found that they were divided into two great streams moving in opposite directions along a line parallel to the plane of the Milky Way. It is not to be understood that the stars are moving in exactly parallel directions, but there is a general drift in these directions superposed on peculiar movements of their own. There are, however, several groups of stars, such as several of the stars in the Great Bear, and particularly a group in the constellation Taurus, discovered by Lewis Boss, to which the names of 'Moving Clusters' are given, and which consist of assemblies of stars having parallel and equal movements in space.

The application of spectroscopy to the stars enabled the velocities towards or from the earth to be determined in a large number of cases. If a star is approaching us, then the positions of the lines in its spectrum will be shifted to the violet side of their normal positions, and if receding from us, towards the red. This is known as Doppler's principle, and the amount of shift enables the velocity of approach or regression to be determined in kilometres per second. The first attempts by Huggins to put this into practice met only with partial success. The application of photography by Vogel, and still more the careful design of the large spectroscope mounted on the 36-inch refractor of the Lick Observatory, enabled results of high precision to be attained. For fainter stars the large reflecting telescopes of Mount Wilson and British Columbia have been very successful. It is found that the linear velocities of stars, after the effect of the earth's movement round the sun and the motion of the solar system in space have been eliminated, have average velocities to or from the earth of from 10 to 20 kilometres a second, and in individual cases are much larger. Discussion of the velocities found spectroscopically confirms the direction of the solar motion found from 'proper motions,' and also furnishes a value of the amount, viz. 19 kilometres a second. It has also confirmed the two-stream movement discovered by Kapteyn. The discussion of 'proper motions' and 'radial velocities' has led to a number of conclusions as to the difference in the movements of different kinds of stars. One of the most interesting of these, though it still needs more confirmation, is that massive stars move more slowly than those of smaller mass, presenting analogy to the equipartition of energy in a mixture of gases.

Stars are classed in *magnitude* according to their brilliance. The brightest stars, some 20 in number, were called by Hipparchus 1st magnitude; the next brightest, 2d magnitude; down to those just visible to the naked eye, which he called 6th magnitude. Later a decimal notation was introduced so that a star of 1^m.2 is one-fifth of the way between stars of magnitude 1^m.0 and 2^m.0. The accurate determination of magnitudes led to the necessity for a definite scale. A star is one magnitude fainter than another when we receive from it $(2.512 \dots)^{-1}$ as much light, two magnitudes fainter when we receive $(2.512 \dots)^{-2}$ as much light, and so on, so that for five magnitudes difference the ratio is $(2.512 \dots)^{-5}$, or $\frac{1}{100}$. The faintest stars which have been photographed with large reflecting telescopes are beyond the 21st magnitude, and thus give less than one hundred millionth of the light of a star of magnitude 1^m.0. This scale is carried backwards, so that Arcturus is of magnitude 0^m.3, Sirius of magnitude -1^m.4. The full moon gives as much light as a star of magnitude -11^m.2, and the sun as much as a star of magnitude -26^m.7. This scale of magnitudes has the advantage of agreeing fairly well with magnitudes assigned before its adoption, and is now universally employed.

The number of stars increases with the magnitude. To the naked eye from 6000 to 10,000 are visible when both hemispheres are included. With a small telescope of two inches aperture the number is increased to more than half a million. With exposures of one hour with a 12-inch telescope of short focus, Franklin Adams photographed nearly 70 million stars in the whole sky. From the rate at which the number of stars increases and the diminution of this rate with fainter magnitudes, it is inferred that the number of stars in the sky, though very great and of the order of five thousand millions, is finite. The following table gives the numbers brighter than 2^m.0, 3^m.0, &c. obtained from the photometric researches of the Harvard College Observatory:

Limit of Magnitude.	No. of Stars.
2.0	41
4.0	454
6.0	4,750
8.0	45,710
10.0	373,000

As higher magnitudes are reached, the number of stars from one magnitude to the next being less than 2.512, the total amount of light from stars of one magnitude is less than that from the preceding magnitude. The total amount of light from all the stars together is a little less than would be given by 1000 stars of the 1st magnitude, and is about one-hundredth part of the light of the full moon.

Distances.—The great variety in the brilliance of the stars arises from two causes: (1) difference in distance; (2) difference in absolute luminosity. There is a great range in the absolute luminosity of the stars, so that were they at the same distance from us they would still differ from one another by more than 10 magnitudes. As regards distance, if a star were moved ten times as far away, we should receive one-hundredth as much light from it, and it would appear exactly 5 magnitudes fainter. The determination of the distances of the stars has been one of the great historic problems of astronomy. When the Copernican system was introduced, and the earth was shown to describe a vast orbit round the sun, the difference in its position at opposite times of the year furnished a base-line from which to measure stellar distances. These are so great in proportion to the distance of the earth from the sun that astronomers sought for centuries before they obtained a measure of the distance of a single star. In the

course of this search Bradley discovered 'Aber-ration of Light' (q.v.) and Herschel the existence of systems of double stars circulating around one another. Success came almost simultaneously to three astronomers about the year 1838. Henderson at the Cape Observatory found for a Centauri a Parallax (q.v.) of 1''-0, corresponding to a distance 200,000 times that of the sun from the earth. Struve at Dorpat found a distance of 800,000 times that of the sun for the bright star Vega. Bessel at Königsberg found a distance of 600,000 times that of the sun for the fainter but quick moving star 61 Cygni. These values are fairly correct, but have been altered somewhat by modern observations. Bessel used an instrument called a *heliometer*, made by the great optician Fraunhofer, and specially designed for the accurate measurement of a star from neighbouring stars. The same kind of instrument was used throughout the 19th century, and in the hands of Auwers, Brunnow, Peters, Gill, Elkin, and others led to a good determination of the distances of some 50 to 100 stars, Gill's measures at the Cape Observatory being particularly accurate. In the present century large photographic telescopes have been employed with conspicuous success. Pioneer work was done by Hinks and Russell at Cambridge and by Schlesinger at the Yerkes Observatory. Working in concert through a committee, of which Schlesinger is chairman, a number of observatories in the United States with Greenwich in England have determined the parallaxes of some three thousand stars. If the radius of the earth's orbit round the sun (92 million miles) be called α , the distance at which it will subtend an angle of 1'' is 206,265 α . This distance is called one *parsec*, and light will take three years to transverse it. There are known to be 26 stars nearer than 5 parsecs, 104 nearer than 10 parsecs, and 700 nearer than 35 parsecs. In these counts double stars are counted once only. Probably the number found nearer than 5 parsecs is about two-thirds of the actual number within this distance, but for the larger distances becomes more and more incomplete. These figures serve to show how widely apart stars are scattered in comparison with their sizes. A model would be supplied by 40 or 50 tennis-balls inside a globe the size of the earth.

When the distances have been determined it is easy to find the actual *luminosities* of the stars in comparison with the sun. Luminosities are usually expressed by means of *absolute magnitudes*, i.e. the magnitude a star would have if brought to a distance of 10 parsecs, at which its parallax is 0''-1. The following table shows how widely these differ:

Star.	Luminosity (Sun = 1).	Absolute Magnitude.
Sun	1	5.0
Sirius	30	1.3
Aldebaran	120	-0.3
Rigel	7500	-4.7
α Centauri	1.3	4.8
61 Cygni	0.064	8.0
Lalande 21185	0.0054	10.7
Companion of a Centauri	0.0001	15.0

Angular Diameters.—In a few instances the actual diameters of stars have been measured. A star seen in a telescope when the air is very steady is a small bright disk surrounded by a dark ring, then a bright ring, and so on. This appearance is an optical phenomenon, and the larger the object-glass, the smaller is the central disc. With the large 40-inch glass of the Yerkes Observatory the angular diameter of the central disc is 0''-10, while with a 4-inch glass it is 1''-0. Thus, however small the actual angular diameter of a star may be, the star cannot be seen as a smaller disk than 0''-10 with a 40-inch glass. By means of an interferometer applied to the 100-inch reflector of

the Mount Wilson Observatory by Michelson, the angular diameter of Betelgeuse was measured as $0''.041$. As the parallax of Betelgeuse has been measured, the actual size of this star has been found. If its centre were at the centre of the sun, the star would extend beyond the earth. This enormous size was in agreement with a prediction by Eddington and others from consideration of the amount of the magnitude and colour of the star.

The difference between the *colours* of different stars is apparent to the naked eye. Aldebaran and Betelgeuse are red, while Sirius is a bluish white, and Arcturus and Capella are yellow like the sun. Colours of stars indicate differences of temperature; the blue stars being hottest, and the red coolest. On this account they have been studied with some care. The eye-estimation does not admit of great accuracy. Two other methods are employed. The difference of the photographic magnitude (which differs from the visual magnitude since photographic plates are more sensitive to blue light than the eye) from the visual magnitude gives the *colour index*. If the visual and photographic magnitudes are taken as the same for blue stars there is a progressive difference as redder stars are taken, which in extreme cases may amount to two magnitudes. Another method is by determination of the *effective wave-length*, or the position in a very short spectrum of the wave-length where the intensity on an ordinary photographic plate is greatest.

These methods of determining colour, though useful when it is desired to examine large numbers of faint stars, are subsidiary to the investigations by means of the *spectroscope* (see SPECTRUM). This was first applied to the stars about 1860 by Huggins in England, Secchi in Italy, and Rutherford in America. It has been developed to a great extent with the introduction of large telescopes and photographic methods. The original classification of Secchi has been developed and extended; but putting the matter broadly, it may be said that the great majority of stars fall into three classes:

- I. BLUE STARS.—Those having a continuous spectrum crossed by broad hydrogen lines.
- II. YELLOW STARS.—Those having a continuous spectrum crossed by sharp metallic lines like the sun.
- III. RED STARS.—Those having a continuous spectrum crossed by bands.

In the blue stars the spectrum extends far into the ultra-violet, but less so in the yellow stars, and still less again in the red stars.

The essential point in the spectroscopic classification of the stars is that it is *linear*. Stars can be arranged by their spectra in one continuous order, differing from one another by insensible gradations. The differences in spectra cannot then arise from differences of chemical composition, which would give rise to many different varieties. The spectroscopic classification is mainly one of *temperature*. The hottest stars (known in the Harvard classification as B stars, and showing certain lines of helium, as well as the broad lines of hydrogen) send light to us from a source near their surfaces which indicates a temperature of $20,000^{\circ}\text{C}$. The stars like Sirius, with broad hydrogen lines, have an effective temperature of about $10,000^{\circ}\text{C}$. When we reach the yellow stars like the sun the temperature is about 6000°C , while the red stars like Betelgeuse and 61 Cygni are the coolest, with temperatures of about 3000°C .

The *effective temperatures* of stars are determined from the distribution of light in the continuous spectrum. In a perfect radiator, if the intensity of the light be plotted against the wave-length, the

curve rises to a single maximum, and the temperature is given by the formula $\lambda(\text{max.}) \times \text{Temp.} = \text{Const.}$ There are difficulties in the application of the formula, as the stars are not perfect radiators, but are surrounded by absorbing atmospheres. Nevertheless the results obtained from its use probably give fairly correct values of the temperatures of the stars near their surfaces.

In the comparison of the spectra of stars and other celestial bodies, Lockyer drew attention to the important role of lines which he called 'enhanced,' from the fact that their intensity in a spectrum obtained from an electric arc was strengthened as compared with that of the arc. The researches of A. Fowler have thrown much light on these lines which occur when outer electrons of an atom are torn off or the element is 'ionised.' The temperatures and pressures at which different elements are ionised may be calculated. By examination of the lines belonging to different elements in the stars the extent of the ionisation of their atmospheres was determined by Saha in 1921, and their surface temperatures inferred. The method was subsequently developed by R. H. Fowler and E. A. Milne. The results are in reasonable accord with those obtained from the intensity curves of the continuous spectra giving the results of a previous paragraph, except for the hottest stars.

Although the spectra of stars naturally arrange themselves in an order which is essentially one of temperature, differences in the intensities of some of the enhanced lines have been found by Adams and Kohlschutter, which enable a discrimination to be made between stars of great and small luminosity. By comparison of the intensities of neighbouring lines, one of which comes from an ionised element and the other unionised, a measure of the luminosity is obtained. The necessary constants for stars of different temperatures are found from stars whose luminosities are already known. This method, though of an empirical character, is of great importance, as it gives a means of determining the luminosities and thence the distances of stars which are beyond the range of trigonometrical determination, and is still in course of development.

Double Stars.—Herschel, in searching for stars which are near one another as seen by us, and (supposing one to be distant and the other comparatively near) could thus be employed in the determination of parallax, discovered pairs of stars which are physically connected, or *double stars*. The observation of these bodies has been continued by many astronomers to the present time, among whom W. Struve, O. Struve, Dembowski, Burnham, Hussey, and Aitken are the most prominent. Large telescopes are generally required for these observations, as the stars are frequently so near that they are only seen as single stars in small telescopes. These stars are found to circulate round one another in elliptic orbits, and their movement is in accordance with the description of an ellipse according to Kepler's laws, but seen projected on a plane perpendicular to the line of sight. The periods of making a complete circulation round one another for some stars are only a few years, and for others many thousands. Again, the component stars are sometimes of nearly equal brightness, and in others, e.g. Sirius, the difference amounts to as much as 10 magnitudes. Double stars have played an important part in stellar astronomy, as they have enabled astronomers to determine the *masses* of stars. When the distance of a star is known, then, from the angular distance apart of the two components measured in the telescope, their linear distance is derived. Calling a the semi-major axis of the orbit measured in units of the earth's distance from the sun, P the period of revolution

in years, M and m the masses of the two components, then Kepler's third law gives $M + m = \frac{a^3}{P^2}$.

This formula gives the sum of the masses in units of the sun's mass. It is found in this way that the masses of stars do not show a great range like the luminosities, but generally lie between one-fifth and twenty times the mass of the sun.

Many stars which are too near to be resolved into their components at the telescope have been proved to be double by spectroscopic observations. In the course of its orbital motion round its companion a star is sometimes approaching and sometimes receding from us. The variation in velocity is indicated by a small shift in the lines of the star's spectrum from their normal positions. If the components are of nearly equal brightness, lines belonging to each of them are shown. But if one is much brighter than the other the spectrum of the brighter component alone is impressed on the photographic plate. From a sufficient number of observations of velocity the periods and other elements of the orbits may be obtained, as in the case of visual double stars. It is not, however, possible to find a , but only $a \sin i$, where i is the angle between the plane of the orbit and the plane perpendicular to the line of sight. The quantity $a \sin i$ is found in linear measure independently of the star's distance. The number of these close binary stars is very considerable, amounting to no less than one star in five. The components are closer together, and have shorter periods than visual binaries. Although the masses of individual stars cannot be found, in consequence of the indeterminateness of $\sin i$, statistical treatment of numbers of stars confirms the conclusion that the masses of stars do not show any great range.

There are many stars whose light is *variable*. Some of these go through their changes in a few days, and others have long periods exceeding 150 days. The causes of variation in the two cases are entirely different. *Short-period variables* are divided into *eclipsing variables* and *Cepheids*. The variation in the former class is caused by the revolution of the two bodies round one another, so that partial eclipses occur periodically as seen from the earth. Algol is a star of this kind. It goes through its changes in approximately 70 hours. For the greater part of this time it remains nearly at magnitude $2^m.3$. In five hours it drops to $3^m.5$ (i.e. to one-third of its former brilliancy), and in five hours more has risen again to $2^m.3$, near which it stays for another sixty hours. It is clear that in these cases the bodies must generally be large in comparison with their distance apart. In the case of Algol, the diameters of each of the bodies are about $\frac{1}{4}$ times the distance between their centres, but one star is much more luminous than the other. Spectroscopic observations confirm the conclusions arrived at from the study of the way in which the light regularly increases and decreases.

The study of eclipsing variables gives us a direct knowledge of the *mean densities* of stars. If a_1 and a_2 be taken as the radii, ρ_1 and ρ_2 the densities, b the distance apart of the centres, and P the period of the light changes, then by Kepler's third law

the combined mass $\frac{4}{3}\pi\rho_1a_1^3 + \frac{4}{3}\pi\rho_2a_2^3$ is proportional to $\frac{b^3}{P^2}$. Now the ratios $a_1 : a_2 : b$ are determinable

from the way in which the light varies, and the period P is also known. It was thus found that there is a great diversity in stellar densities. While the mean density of the sun is 1.2 that of water, Algol has a density of 0.07, and many stars have been found to have very small densities, some even much less than that of atmospheric air.

These results are confirmed and extended from those stars whose masses, distances, and luminosities are all three known or can be reasonably assumed. From the distance and luminosity (making due allowance for colour) the radius of the star can be determined, and then from the mass the density is deducible. Some stars are clearly huge globes of gas, others from their density might be inferred to be partly liquid or solid, though Eddington has given reasons (see SIRIUS) for believing all to be of gaseous constitution.

Cepheids.—Another class of short-period variables are called Cepheids after δ Cephei, which is a typical example. In $5\frac{1}{2}$ days this star regularly changes its magnitude from $4^m.3$ to $3^m.6$, taking $1\frac{1}{2}$ days to go from faint to bright, and 4 days from bright to faint. These changes are accompanied by changes in the radial velocity, the star apparently approaching us when it is brightest, and receding when it is faintest. These phenomena cannot be explained by the rotation of a bright star around a darker companion, but are attributed to a pulsation in size, an explanation which is not, however, free from difficulties. Generally, the extent of variation of Cepheids is not greater than 1 magnitude, and the period may be anything from 1 to 60 days. These stars are all of great luminosity.

Hertzsprung showed how these stars may be used to gauge very great distances. Miss Leavitt, from the mode of variation of light, had detected a number of Cepheids in the lesser Magellanic Cloud—a feature in the southern sky like a bit torn off the Milky Way—and noticed that the period of variation was related to the *apparent* magnitude of the star. Hertzsprung observed that these stars, being in the Magellanic Cloud, were all at the same distance from us, and that the period of variation was thus dependent on the *actual* luminosity of the star. This is a universal property of Cepheid stars. From a study of the near Cepheids, whose distance can be determined, it has been shown by Hertzsprung and by Shapley that Cepheids of period 1½ days have absolute magnitude $-1^m.0$, those of period 4 days $-2^m.0$, those of period 8 days $-3^m.0$, and so on. These are the magnitudes Cepheid variables would have if their parallax were $0''.1$, or their distance 10 parsecs, i.e. two million times the distance of the sun. If then, e.g., a Cepheid variable of period 8 days has an apparent magnitude $12^m.0$, the difference from its absolute magnitude is $15^m.0$. A diminution of 5.0 magnitudes implies a ten-fold distance. Thus the distance of this star would be inferred as 10,000 parsecs. By reasoning of this kind, the distance of the Magellanic Clouds has been inferred to be 30,000 parsecs. Quite recently Hubble has found very faint Cepheids in the *Andromeda Nebula*, and has inferred a distance of 300,000 parsecs, a distance travelled by light in a little less than a million years.

The *long-period variables* are usually irregular both in the length of their period and the extent of their range. They are always red stars. Mira or α Ceti is the best-known example. It has a mean period of 33 days. At its brightest it may be anything from $2^m.5$ to $5^m.0$, and at its faintest from $8^m.5$ to $9^m.5$. No variation of its radial velocity is indicated by spectroscopic observations.

Besides the stars which repeat more or less regularly their variations of light, a number of *Novæ*, or new stars, have appeared in the heavens at different times. The appearance of one of these stars is said to have caused Hipparchus to make his catalogue of stars. In 1572 one appeared in Cassiopeia, and was discovered by Tycho Brahe. This was so bright that it was visible in the daylight. Within the present century *Nova Persei*,

discovered by Anderson in 1901, reached the magnitude $0^m.0$, and *Nova Aquilæ*, discovered in 1918, the still brighter magnitude $-0^m.5$. The history of these stars is very similar. A faint star, afterwards identified on photographs taken before the outburst, in a few days increases in luminosity ten thousandfold, and in the course of months falls gradually, with some oscillations in magnitude, to its previous brightness. Spectroscopic observations show very great displacements of lines due to hydrogen and calcium, as though gases were approaching us from the star with velocities of thousands of kilometres per second. The character of the spectrum also goes through a series of very remarkable changes. The genesis of these stars is not understood, and whether the outbursts are due to collision or explosion is unknown.

Following previous researches of Lane, Ritter, Sampson, Schwarzschild, Emden, and others, Eddington has investigated mathematically the *internal constitution* of stars. The stars of low density and great volume (and other stars have later been brought into the same category) are gaseous throughout, and obey the gas law connecting pressure, density, and temperature. In a steady state the attraction of gravitation is balanced at all distances from the centre partly by the elastic force of the gas and partly by the pressure of the radiation striving to escape outwards. The temperature increases from the circumference to the centre, and the outflow of radiation is constantly obstructed by the matter which it has to traverse. For the bright component of the double star Capella the data from observation are as follows: The mass is 4.18 times that of the sun, and the radius 13.74 times, while it radiates 127 times as much energy, its 'effective' temperature being 5200°C ., or somewhat less than that of the sun. Eddington concludes that at the centre the temperature is 7 million degrees, the density 40 times that of atmospheric air at the earth's surface, and the pressure 22 million atmospheres. About 0.7 of this pressure is gas pressure, and 0.3 the pressure of radiation. At the enormous temperature and pressure inside the star the atoms are largely stripped of their electrons, and the radiation is mainly of the short wave-length of the X-rays produced in the laboratory. For the sun the temperature at the centre is calculated to be 40 million degrees.

While gravity tends to condense a star, pressure of radiation tends to expand it. Eddington compares the pressure of radiation with gas pressure in globes of various sizes. For globes of much smaller mass than the sun it is quite trivial, for a globe half of the mass of the sun it is 10 per cent. of the whole pressure, while for a globe of mass 50 times that of the sun it is 85 per cent. This pressure, according to Eddington, is the main disruptive force which prevents the masses of stars increasing beyond a certain limit. On the other hand, a minimum mass is required for a globe of gas to acquire sufficient temperature to shine as a star. An explanation is thus suggested, though not a definite proof, of the cause why the masses of stars lie within comparatively narrow limits.

Evolution.—Astronomers are in the position of a person who has a momentary view of a crowd of people of all ages, and then tries to infer the life-history of a human being. Huggins took the view that the order of development was the order of the spectroscopic classification from the hot blue stars down to the red stars. Lockyer maintained that red stars, like Betelgeuse, intrinsically many times more brilliant than the sun, were in a wholly different stage from faint red stars a hundred times less brilliant than the sun. He therefore formulated a scheme of development beginning with

extremely diffuse red stars, which gradually condensed and grew hotter till their temperature reached a maximum in the stage of blue stars, when they grew colder, and went through the yellow stage again back to the red, contracting in bulk all the time. His method of discrimination of stars in which the temperature was increasing from those in which it was decreasing was not satisfactory, and his views were not generally accepted. In 1905 Hertzsprung gave cogent arguments in support of the existence of 'giant' and 'dwarf' stars; and in 1912 Russell marshalled together with great skill the numerous facts which had been elicited from recent observations in support of a similar theory. Red stars were, he found, of two groups—'giants,' roughly of absolute magnitude $0^m.0$ (100 times as luminous as the sun), and 'dwarfs,' of magnitude $9^m.0$ (40 times as faint as the sun)—and there were no stars of intermediate brightness. Passing towards the yellow stars he found 'giants' still of magnitude $0^m.0$, and 'dwarfs' of magnitude $5^m.0$ (as bright as the sun). Passing still further towards the blue stars, the 'dwarfs' approached more nearly to the 'giants.' Again, stars show little difference in mass, but very great differences in density. He therefore formulated an evolutionary scheme beginning with red stars of great volume and small density. As they contract under the influence of gravitation their volume diminishes, but their temperature rises. The increase of brightness compensates for the diminution of surface, and they still remain 'giants.' This process continues till the stars reach their maximum brightness at the blue stage, when their mean density is approximately one-tenth of that of the sun (and of water). They then cease to obey the gaseous laws, and with further contraction become cooler. Conditions are now reversed, and a diminution of surface takes place with a diminution of surface brightness, and the stars fall into the 'dwarf' yellow and red stages.

The following table (derived from *General Astronomy*, by H. Spencer Jones) gives a number of stars in these successive stages:

'GIANTS.'			
	Absolute Magnitude.	Diameter (Sun=1).	
M			
μ Geminorum.....	+0.3	65	Red.
Aldebaran	-0.2	48	
Arcturus.....	+0.1	24	
η Draconis.....	-0.7	21	Yellow.
α Leporis.....	-1.0	9	
Regulus.....	-1.1	5	
β Centauri.....	-1.3	4	Blue.
'DWARFS.'			
Sirius.....	+1.3	2.0	Blue.
Procyon.....	+2.9	2.0	
λ Serpentis.....	+4.1	1.5	
11 Leo Minoris.....	+6.2	1.5	Yellow.
61 Cygni.....	+8.0	1.1	
Lacaille 9352.....	+9.7	0.9	Red.
Lalande 21185.....	+10.7	0.6	

The division of stars into 'giants' and 'dwarfs' is an observational fact, and the order of evolution is still thought to be that indicated above. But the dynamical basis of the theory cannot be maintained, for it implies that the only source of the energy dissipated as radiation is acquired by contraction of the mass under gravitation. As shown by Helmholtz and Kelvin fifty years ago, this process furnishes sufficient energy to last only 30 million years. But there is conclusive evidence from the consideration of radio-active minerals in rocks and from other sources, that the age of the earth's crust is 1000 millions, and the age of the sun must be considerably greater.

In the last few years the question has been reconsidered in the light of the large store of

energy which physicists have discovered to be contained in the atom. There can be little doubt that the immense stores of energy radiated from the stars are in some way derived from sub-atomic sources in the interior of the stars themselves. The transmutation of elements would produce a supply of energy many times larger than that obtainable by contraction under gravitation. A supply much greater still will be given by the annihilation of matter. In the violet commotion in the interior of a star an electron and proton may collide, mutually destroying one another as matter and converting themselves into radiation. (See Jeans in *Nature*, 4th December 1926; and Eddington, *Internal Constitution of Stars*, chap. xi.)

By radiation stars are constantly losing mass which, on the theory of relativity, is another mode of expressing energy. The sun is losing 5 million tons per second, and Capella 500 million tons per second. Although these seem large amounts, the time taken for an appreciable diminution in their masses is many millions of years. This implies a slow development from heavy to less massive stars. Eddington has found a remarkable relationship between the masses and luminosities, which, with few exceptions, appears to hold for 'dwarfs' as well as 'giants.' According to a theoretical investigation which is confirmed by observation, masses and luminosities are connected as follows:

Mass (Sun=1).	Absolute Magnitude.	Luminosity (Sun=1).
25	-4.3	5200
10	-2.7	1800
4	-0.3	130
1	+5.0	1
0.40	+8.8	.03
0.25	+10.8	.005

Thus the most luminous stars are the most massive, and the history of a star is a continuous loss by radiation of luminosity and mass with a shrinkage of volume and increase of density. The star gradually burns itself out. Apparently the gas laws apply to nearly all stars, even where the density is greater than that of water. (See SIRIUS.)

The large diffuse stars, though at a lower internal temperature than stars like the sun, are radiating energy at a much greater rate. It appears from this that the new stars have some source of energy which has been used up in the older ones. Jeans concludes that these stars contain atoms of greater atomic weight than uranium, having greater capacity for the generation of radiation. For all these new and somewhat speculative researches which are not free from difficulties, reference should be made to the writings of Eddington and Jeans.

Stellar Universe.—The number of stars may be tentatively estimated at 5 to 10 thousand millions. They are arranged, as was pointed out by Herschel, in a form somewhat like a watch or a penny, with the Milky Way as fundamental plane. In the plane of the Milky Way the clustering of the stars is irregular in great star clouds, of which the densest is in Sagittarius. In the direction perpendicular to the Milky Way the stars have thinned out to a very great extent at a distance of 1000 parsecs. In the plane of the Milky Way the stars extend to a hundred times this distance. The solar system is a little out of the plane of symmetry; but it is hardly possible as yet to estimate its distance from the centre of the Galactic system. There are, in addition, groups of stars, so-called 'island universes,' which appear to us as spiral nebulae—that in Andromeda being the nearest—and about ten times as far away as the boundary of the Milky Way.

See Newcomb, *The Stars* (1902); Eddington, *The Stellar Universe* (1912); Jeans, *Cosmogony and Stellar*

Dynamics (1919); H. S. Jones, *General Astronomy* (1922); Stratton, *Astronomical Physics* (1925); Eddington, *The Internal Constitution of Stars* (1926); Jeans, 'Recent Developments of Cosmical Physics,' in *Nature*, 4th December 1926.

Stars and Stripes. See FLAG.

Star-stone, a kind of Sapphire (q.v.).

Star-thistle. See CENTAUREA.

Start Point, a projection of the coast of Devon, 8 miles S. of Dartmouth, forming the south-eastern extremity of the county. It is crowned by a lighthouse (92 feet), whose light, 204 feet above high-water, is visible for 20 miles.

Starvation. See FAST.

Starwort, or STITCHWORT, a genus (*Stellaria*) of Caryophyllaceae. See CHICKWEED. The name Starwort is also applied to the genus *Aster* (q.v.).

Starwort, WATER, is a name given to the genus *Callitriche*, which by itself forms the family Callitrichaceae, whose affinities are very obscure. Engler and others place it near Euphorbiaceae. The genus is almost world-wide in distribution. Several species are common in ditches and ponds in Britain. Land forms are found, but normally the water-starworts are water-plants. The stem is thin and frail. The leaves are opposite, the lower submerged leaves somewhat lengthened and narrow, the uppermost crowded in a floating rosette. The flowers are very small, with no sepals or petals. The male flower consists of a single stamen; the female of two united carpels, with a 'false septum' (forming four locules, each with one ovule), and two styles. The fruit is a schizocarp.

Stassfurt, in the Prussian province of Saxony, on the Bode, 20 miles S. of Magdeburg, has iron-mills and chemical-works, but is notable chiefly for its ancient salt-works, which mine potash and rock salts; pop. 20,000.

Staten Island, (1) a beautiful island, forming (since 1898) part of New York city. It is separated from Long Island by the Narrows, and from New Jersey by the Kill van Kull and Staten Island Sound. Area, 57 sq. m. Its shores are dotted with villages, and its heights crowned with villas. Forts guard the entrance to the Narrows. The island constitutes the southernmost borough (Richmond; pop. 116,531) of New York.—(2) An Argentine island separated from the south-east point of Tierra del Fuego by Le Maire Strait (16 miles). It is long (45 miles) and narrow in shape, with steep coasts penetrated by deep fiords, and rises to nearly 3000 feet. Snow covers it almost all the year.

State Papers. See RECORDS.

State Religion. A state religion and a national religion are two different things. A nation may, with more or less of universal concurrence, accept a certain type of religion—as the people of the United States for the most part accept Christianity—yet they may not commit to their government the task either of representing officially or of maintaining financially their religion. In that case it is a national but not a state religion. Wherever, on the other hand, we witness either establishment or endowment committed to the government—even if, as in Ireland till 1869, the religion thus favoured is very far from being national—there we have the spectacle of a state religion. Now such a spectacle almost invariably presents itself to our view on the first emergence of any people from tribal confusion into national order. The previous multiplicity of local gods and diversity of religious ideas became fused together into a conglomerate state religion, and then were compacted by time and by priestly labour into a sort of incoherent unity. As to any rights of the individual conscience to worship according to its

own private judgment, such a notion had not so much as dawned upon men's imagination. In ancient China, for instance, public worship was regulated down to its minutest details by six ministers of state, who were responsible even for the sacred music and religious dancing. The emperor alone might offer sacrifice to the supreme spirit; the nobility might do homage to the various subordinate spirits of the earth; the high officials to the spirits of house and home, and so on, in ever-descending order. Even the soothsayers, magicians, and spirit-charmers were reckoned among public functionaries of the state. Nor did the reforms of Confucius (500 B.C.), nor yet the uprise of the Taoists and the Buddhists, alter this Erastian character of the Chinese system.

In ancient Mesopotamia, too, the supreme head of the state religion was the king; he alone could penetrate into the innermost sanctuary, he alone could offer sacrifice for the whole people; and from the ruins of the palaces at Nineveh and Babylon come the records that unfold to us the sacred history of this remarkable form of state religion; displaying to us the gradual amalgamation of a hundred tribal beliefs, the ultimate emergence of a Sennacherib or a Nebuchadrezzar to rule, like some incarnation of divine despotism, over all the prostrate nations, and the absolute predominance of the civil over the ecclesiastical power.

In India, on the other hand, a religion which began with the lay poets who composed the Vedas emerged at last completely organised on a caste system; and this system assigned irrevocably the first place to the priesthood and the second place to the secular authorities. In ancient Egypt something analogous may be observed. Here, indeed, as in ancient Mesopotamia, the local gods long held sway, and suffered at last agglomeration into the state religion. But the greater state deities were immensely more powerful. They were endowed with vast estates; they employed thousands of labourers, agents, scribes, overseers. The Egyptian state religion dominated the entire life of the people, and for long centuries reigned in uncontested supremacy.

When we cross the sea, however, and disembark in imagination among the bright and mobile populations of southern Europe, we soon find that these vast sullen state religions of the eastern river-basins have been left behind. The gods of ancient Greece were as Bohemian and passionate as their worshippers, and no crushing priestly tyranny could find a footing among its small and quarrelsome communities. Yet even there, as childish fancies about Olympus and its happy denizens hardened into dogma, and nursery legends became enshrined to the people and fixed in beautiful forms of epic, dramatic, and statuary art, then here, too, a state religion came into being. To ridicule the gods became perilous, even to an Aristophanes; to mutilate their images became an unpardonable crime; and to replace them by other and worthier conceptions of divine things was a treason which even a Socrates must expiate by his death. In more grim and serious Italy the mingled native and Greek theology became characteristically transmuted into downright law. Offences against the state religion were supposed to bring down on army and navy, on agriculture and commerce, the anger of a justly indignant heaven. And as for any such unheard-of novelty as a catholic or world-wide religion, unacknowledged as its own even by any subject state—still more, for any preposterous claim to worship according to each man's private conscience—away with people possessed of such ideas 'to the lions!' For Christians, therefore, and all state heretics of that sort there was but one answer to be made, *non licet esse vos*, you have no right to exist, you have placed

yourselves outside the protection of the Roman empire.

With the conversion of Constantine (313 A.D.), of course, all this was entirely changed; but it was only changed by the parts being reversed. The state religion had now become Christian; and paganism was ere long held to have no right to exist. It is true that with Christianity a new and gentler spirit had found entrance, and that a day might certainly be foreseen when men would cease to persecute and to be persecuted for religion; but that day did not, in fact, come for more than a thousand years. Under the imperial legislation of Justinian the orthodox alone possessed the full privileges of citizenship. And even when the Roman empire was broken up at all points by the irruption of the barbarians, and everything else became changed, still the old-world system of state religions remained unchanged. The Mohammedans, who broke in from the south-east, have always regarded intolerance as a sacred duty; and the Teutonic tribes, who broke in from the north-east, accepted as a matter of course, along with Christianity, its traditional outward forms. Thus, Clovis (500) established the new religion in his Frankish kingdom; Charlemagne (800) even drove the Saxons to conversion at the point of the sword, and with his 'missi,' or royal commissioners, inspected and managed church affairs throughout his wide dominions; and the English kingdoms, gradually blended into unity, combined in intimate connection the authorities of church and state, without any suspicion that they might one day turn against each other.

But the dangers of such a feeble patchwork of state religions, covering the face of Europe, were obvious and manifold. There was first the insidious danger of 'Simony'—i.e. of a corrupt use of patronage by the laity. Then there was the danger of violent destruction of small state-churches in detail by the fierce and greedy barons of the neighbourhood; and lastly, there was the yet larger peril looming in the future, that each kingdom might finally set up a state religion for itself, and thus hopelessly break up the unity of Christendom. To meet and cope with all these dangers some powerful churchman of large ideas was urgently required, and such a man providentially appeared (1050) in Hildebrand (Pope Gregory VII.). Under his vigorous rule all the existing state religions of Europe were crushed and cramped together into a sort of imperial religion; and for two centuries (till 1300) it seemed as though one all-embracing empire religion were destined to swallow up and destroy all the minor state religions of the world. But when the vast war waged by the papacy in the Crusades had ended in ignominious failure, and when the insensate ambition of men like Innocent III. and Boniface VIII. had roused both France and England to resistance, that great movement of return to state religions (in the proper sense) began which culminated at last in the Reformation. And then the effect of prolonged and obstinate resistance to all change, and of desperate recourse to fire and sword and fraud and treachery, in maintenance of a despotic system in the church which the free strong nations of the north would not endure, was seen in a general break-up of Christendom.

The first thought naturally was to revert to the previous long-tried system of state religion. But when that seemed reduced to an absurdity in the Augsburg settlement (1555) of *cujus regio ejus religio*—making the church an aristocracy instead of a despotism, and every petty duke and count a pope in his own dominions—the tormented nations had recourse to the sword. Germany was torn to pieces and ruined for two hundred years. France

was steeped to the lips in blood, Spain and Austria were silenced, the Netherlands thrown into revolt, and England plunged into her great rebellion, till out of the seething strife between papal religion and state religion there gradually emerged a third form—democratic religion. It began, naturally enough, in Switzerland—at Zurich and Geneva. It permeated and honeycombed, to their ultimate downfall, the despotisms in church and state which ‘concordats’ had conspired to establish; till at last the various acts of toleration in England, the secular ‘Constitution’ of the United States, and the French revolutionary enactments of 1789 and 1830 completed the transformation of every state religion throughout Europe into a congeries of virtually free churches—sometimes with, sometimes without, a survival from the past in the shape of a central establishment fully tolerating all its neighbours. Thus, at the present moment, England (but not, since 1914–20, Wales) and Scotland retain, along with absolute toleration for every other form of religion, modified state churches; while Ireland—like the United States—has none.

The most prominent example of a lately surviving state religion, with intolerance for all other forms of faith, was to be found in Russia, where the Orthodox Greek Church reigned supreme and dissent was severely persecuted. Religious freedom and disestablishment followed the revolution. In Greece there is full toleration, though the state religion is that of the Greek Church. In Italy, ‘by the fundamental law of the kingdom’ in 1870, the state religion is Roman Catholic, but there is now complete toleration for other forms of faith. In Spain the state religion is also Roman Catholic, and toleration is still limited. The Portuguese republic separated church (Roman Catholic) and state. Till of late France recognised Roman Catholics, Protestants, Jews, and (in Algeria) Mohammedans as entitled to state-payment (in very varying proportions); but since 1906 no religious institution is thus recognised. In Belgium the state does not interfere with the internal affairs of any religious body, but it subsidises the Roman Catholics, the Protestants, and the Jews. In Germany there is universal toleration. Under the empire the various states subsidised their religious communities in various ways. The republican constitution declares that there is no state church, but allows the various lands to aid religious bodies as before, pending legislation. In Denmark, Iceland, Sweden, and Norway there is full toleration for all, but the state religion is Lutheranism. In Holland Protestants, Roman Catholics, and Jews are subsidised by the state, but there is toleration for all. In Turkey the state religion is Mohammedanism. In Switzerland there is absolute freedom for every form of faith. The republican constitution of China prescribes no state religion, though it was agreed that national teaching in ethics should be based on Confucianism. On the whole it would seem that the system of state religion is, by the advancing tide of democracy, threatened with extinction; but that some countries retain it, as an axis round which other communions may crystallise, or at least as a security against Atheism, Ultramontanism, and other dangers which some fear the future may have in store for democratic states.

The special relation of the church and state in the Jewish theocracy will be gathered from the articles **BIBLE**, **JEWS**. The growth of nonconformity in England led to keen controversy between the defenders and the opponents of church establishments; and, especially since the foundation of the ‘Society for the Liberation of Religion from State Patronage and Control’ in 1844, there has been an increasingly outspoken demand for the disestablishment with or without the disendowment of the Church of England, especially (till it was achieved) in Wales. For the ‘Erastian Con-

trovery,’ see **ERASTUS**; for the ‘Bangorian Controversy,’ see **HOADLY**; for the rivalry between the church and dissent in the schools, see **EDUCATION**. The great Scottish ‘Voluntary Controversy’ (see **UNITED PRESBYTERIAN CHURCH**) between the defenders of the church and dissenters was at its height in 1822–24; the Free Church (q.v.) long insisted on the establishment doctrine in a modified form. The disestablishment of the Irish Church (1869) rendered the controversies as to the established churches in the other parts of the United Kingdom more acute. For other controversies bearing more or less directly on the question, see **CATHOLIC EMANCIPATION**, **JEWS** (for the removal of Jewish disabilities), **CHURCHYARDS**, **HOOKE**, **NEWMAN**, **OATH**, **PERSECUTION**, **TEST ACTS**, **TITHES**, **TOLERATION**; and the articles on **Independents**, **Friends**, and other **Nonconformists**, as well as that on the **Church of England**. Of the British colonies, it may be generally said that those which have representative government have no state church, though provision has long been guaranteed for Catholic education in Quebec province. And in most of the Crown colonies also the disestablishment of the Church of England, and the withdrawal of state aid where there was concurrent endowment, has been carried out, especially since 1868. In India there is a small Anglican establishment for the army and other English residents. In the articles on the several countries notes will usually be found as to whether there is an established church or not. And for the view that the church should finally be merged in the regenerated state, see **ROTHER (RICHARD)**. Of the copious literature, see, of works favourable to establishments, *Selden, On Tithes* (1618); *Coleridge, Church and State* (1830); *Stanley, Church and State* (1870); *Curtis, Dissent in relation to the Church of England* (1871); *Warburton, Alliance of Church and State*; *Maitland, The Voluntary System* (1837); *Moore, Englishman's Brief for his National Church* (1880); *Selborne, Defence against Disestablishment* (1886); *Hughes, The Old Church and the New* (1891); *Story, The Church of Scotland* (1891); *W. H. Abraham, Church and State in England* (1905). Unfavourable: *Looke, Letters on Toleration* (1689); *Wardlaw, National Establishments* (1839); *Baptist Noel, Church and State* (1849); *Vaughan, English Nonconformity* (1862); *Miall, The Voluntary Principle* (2d ed. 1850); *Skeats, Free Churches* (1869); *Religious Republics* (1869); *The Case for Disestablishment* (1884). Of books on church and state in general, the following may be consulted: *De Marca, De Concordantia Sacerdotii et Imperii* (fol. 1641); *Francck, Philosophie du Droit Ecclésiastique* (1864); *Zeller, Staat und Kirche* (1873); *Geffcken, Church and State* (trans. 1877); *A. Taylor Innes, Church and State* (1890); *Schaff, Church and State in the United States* (1888); *Phillimore, Ecclesiastical Law* (1895); *Hon. A. Elliot, The State and the Church* (2d ed. 1889); *Church Problems*, ed. Hensley Henson (1900). See also **GALLICAN CHURCH**, **NONCONFORMISTS**, **CONCORDAT**.

States-general (Fr. *états généraux*), the name given to the representative body of the three orders (nobility, clergy, burghers) of the French kingdom. In the time of Charlemagne and for seventy years after his death there were assemblies of clergy and nobles held twice a year to deliberate on matters of public importance. There is no trace of any national assembly in France properly so called earlier than 1302, when the States-general or representatives of the three orders were convened by Philip the Handsome in his quarrel with Pope Boniface VIII. The States-general, however, though their consent seems in strictness to have been considered requisite for any measure imposing a general taxation, had no right of redressing abuses except by petition, and no legislative power. Under Charles VI. and Charles VII. they were rarely convened. Louis XIII. convoked them, after a long interval, in 1614, but dismissed them for looking too closely into the finances; and from that time down to the Revolution (1789) they were never once summoned to meet. As soon as they did assemble—the clergy, 291; noblesse, 270; *tiers état*, 557 (nearly half lawyers)—the Third Estate, after inviting the noblesse and clergy to sit with them, on the advice of Sieyès, constituted themselves

a National Assembly (17th June). About 150 of the clergy joined them (22d June), and nearly 50 of the nobles, with Philip of Orleans, on 25th June; the rest followed by the king's command two days later.

The title *States-general* was likewise borne by the representatives chosen by the provinces of the old republic of the Netherlands to exercise sovereign power. They met at the Hague (1593-1795), and voted by provinces. The name is retained for the existing legislative body or parliament of the kingdom of the Netherlands. See also *ESTATES*.

States of the Church. See *CHURCH* (*STATES OF THE*).

States' Rights, in the history of the United States, refers to a construction of the Constitution and to a doctrine based on that construction, to the effect that the several states of the Union were and are independent sovereigns, federate to attain and maintain certain common interests by means definite and limited, and that to them alone allegiance is due by their citizens; that the general government is not raised by the Constitution to the position of a national sovereign, but is merely a diplomatic agency whose acts must be ratified by the independent states from whom its authority is derived; and that these are each entitled to judge of any infractions of the Constitution, and to nullify any acts of congress which they may hold to be in excess of its authority, or even to secede from the Union. It will be evident that this position rests on a false assumption, for not one of the thirteen colonies which first formed the United States ever possessed an independent sovereignty, nor could sovereignty have been attained by them otherwise than by united action; so that in 1776 it was a single possessor of the entire sum of sovereign powers that came into being in the person of thirteen states manifesting the will and force to hold such power as one national state within all the territory known as the United States; nay, each several state jurisdiction is actually dependent on that federal will and force, and the sovereign powers exercised in the government of each state, as well as those exercised in and for the whole country by congress, are derived from the will and force of all the states, existing as one integral sovereignty. See Dr J. C. Hurd's *Union-State* (New York, 1890).

Invalid as the doctrine appears, however, it has played a prominent part in the country's history, and brought on finally the war of secession. Its earliest appearance was during the troublous years that followed the French Revolution, when the unsettled condition of affairs in that country alarmed congress and led it to pass certain Alien and Sedition laws, authorising the president to remove from the United States aliens whose presence might seem to him of public danger, and to punish seditious and seditious publications. This action of congress appeared to some to overstep its powers, and in 1798 the legislatures of Kentucky and Virginia protested vigorously on States'-Right grounds; but the other states dissented from the position thus for the first time formally assumed. In 1811, and again in 1819, the question was raised in connection with the United States Bank Charter, Henry Clay, and afterwards the state of Maryland, maintaining that congress had no power to incorporate companies or to create a bank. So far the advocates of States' Rights had spoken only; in 1832, in South Carolina, they made the first attempt to carry the principle into action (see *NULLIFICATION*); in 1860-61 (South Carolina again the first), and in the years which followed, the seceding states carried out that principle, of which they assumed the truth, to the full. The war of secession was the logical outcome of the disputes and agitation of sixty years; with its failure it

may be presumed that the doctrine which inspired it, at least in its extreme form and as a factor in practical politics, fell too.

Stattice. See *PLUMBAGINACEÆ*.

Statics, the branch of dynamics which treats of equilibrium. The ordinary Balance (q.v.) is one of the most important of statical instruments. With it we balance the weight of a body of unknown mass against the combined weights of a number of standard masses, and so determine the unknown mass in terms of recognised units. The general principle of statics is that which describes the condition of equilibrium amongst a number of given forces. The condition is that the vector sum of the moments of the forces about any and every point vanishes. It is more usual in text-books to break this statement up into two, which admit of ready application. The first is that the sum of the components of the forces along each of three non-coplanar directions vanishes; and the second that the sum of the moments of the forces about each of these three directions also vanishes (see *MOMENT*). These two rules give six conditions for the equilibrium of a rigid body, three for translation, and three for rotation. Used in combination with other roots, the word statics always implies equilibrium or relative rest. Thus we have *Hydrostatics* (q.v.) dealing with the equilibrium of fluids, and *Electrostatics* (see *ELECTRICITY*) treating of the equilibrium of electrified bodies. See also *DYNAMICS*. Minchin's *Statics* is the standard English treatise on the subject. See also *GRAPHIC STATICS*.

Stationers' Hall, the hall of the 'Master and Keepers or Wardens and Commonalty of the Mystery or Art of the Stationers of the City of London.' The Company was incorporated in 1557, and had until the passing of the Copyright Act in 1842 an absolute monopoly, as all printers were obliged to serve an apprenticeship to a member of the Company, and every publication, from a Bible to a ballad, was required to be 'Entered at Stationers' Hall.' This registration is no longer compulsory, but is still useful in making good claims of Copyright (q.v.). The series of registers, commencing in 1554, is of enormous value in the history of English literature; see Arber's transcripts (from 1554 to 1640, 5 vols.), and the Roxburghe Club's (1640 to 1708, 3 vols.). Before the days of printing, the stationer, like the Roman *stationarius*, was the copyist or transcriber of MSS., or the man who had them copied for him; and as *stationarius* was often also *librarius* or bookseller, the stationer at the invention of printing was often printer, publisher, and bookseller in one (see T. G. Law's *Collected Essays*, 1904).

Stationery Office, an office established in 1786 to provide books, stationery, &c., for the government offices at home and abroad; but its main function is in making contracts for the printing of all reports and other matters laid before the House of Commons. There are branches in Edinburgh and Manchester.

Station Island. See *DERG* (*LOUGH*).

Stations (Lat. *statio*), a name applied in the Roman Catholic Church to certain places reputed of special sanctity, which are appointed to be visited as places of prayer. The name is particularly applied in this sense to certain churches in the city of Rome, which, from an early period, have been appointed as churches which the faithful are particularly invited to visit on stated days. The names of these churches are found on the several days in the Roman missal prefixed to the liturgy peculiar to the day. The word, however, is employed in a still more remarkable manner in reference to a very popular and widely-received

devotional practice of the Roman Catholic Church, known as that of 'The Stations of the Cross.' This devotion prevails in all Catholic countries; and the traveller often recognises it even at a distance by the emblems which are employed in directing its observance—the lofty 'Calvary' crowning some distant eminence, with a series of fresco-pictures or bas-reliefs arranged at intervals along the line of approach. But the same series of images or pictures is ranged round most Roman Catholic churches, usually starting from one side of the high altar and ending at the other. These representations, the subjects of which are supplied by scenes from the several stages of the Passion of our Lord, are called Stations of the Cross, and the whole series is popularly known as the *Via Calvarii*, or Way of Calvary. The origin of this devotional exercise, like that of local pilgrimages, is traceable to the difficulty of access to the Holy Places of Palestine, consequent on the Moslem occupation of Jerusalem and the Holy Land; these representations being designed to serve as some analogous incentive to the piety and faith of the Christian worshipper of our Lord in His Passion. The number of the so-called 'stations' is properly fourteen, although in some places fifteen, and in others, as Vienna, only eleven; but, whatever may be their number, the subject of all is a sort of pictorial narrative of the Passion. The devotional exercise itself is performed by kneeling at the several stations in succession, and reciting certain prayers at each. Forms of prayer are prescribed to those who can read. The poor and ignorant recite the Lord's Prayer and Hail, Mary! all being directed to fix their thoughts in grateful memory upon 'the sufferings which each representation describes our Lord as having undergone, in atonement for the sins of mankind.' Many 'indulgences' are granted to those who, having duly repented of their sins, shall piously perform this exercise. One Anglican church at least, that of Frome in Somerset, has sculptured Stations of the Cross.

Statistics, that branch of Political Science which has for its object the collecting and arranging of facts bearing on the condition, social, moral, and material, of a people. The collecting of such facts, and the taking of censuses for military purposes, have been in use since the earliest times: King David numbered his people, and Egyptians and Romans had censuses. But the treatment of the statistics of all nations as a branch of study dates from the time of Conring (1606-81), in Germany, to whose distinguished successor Achenwall of Göttingen (1719-72) the name of the study (Ger. *Die Statistik*) seems to be due. As distinguished from the early and simple 'descriptive statistics,' in which the figures were but illustrations to the text, a more scientific arithmetical or mathematical method may be credited to Sussmilch (1707-67), whose work had been simplified by the working out of probabilities and averages in connection with mortality tables and otherwise, by Petty and Halley in England, and others. But most of all to Quételet (q.v.), the great Belgian statistician, is the science indebted for its present standing. The principle lying at the foundation of the science as ultimately developed is that the laws which govern nature, and more especially those which govern the moral and physical condition of mankind, are constant, and are to be discovered by the investigation and comparison of phenomena extending over a very large number of instances. Accidental diversities tend to neutralise each other, their influence diminishing as the area of investigation increases; and if that area be sufficiently extended, they so nearly disappear that we are entitled to disregard them altogether. While the length of a single life cannot be counted on, an average of

1000 or 10,000 lives gives us a constant quantity, sufficiently near the truth to answer the purposes of insurance companies. Even the acts which are the most purely voluntary as regards individual men have been found to be subject to laws which, in respect of the masses which make up society, are invariable in like circumstances, and discoverable.

The science of statistics has a twofold relation to political and social economy. The facts collected by the statistician are the bases on which political economy rests; their application to social and economical problems is an appeal from imagination to fact. But the statistician must be guided by the political economist in what direction to extend his investigations: without political economy we should have had no statistics. There have been keen and useless controversies as to whether statistics is an adjunct to other sciences, and a mere method, or an independent science; and as to whether it should limit its scope to national and social phenomena (in which acceptance the word 'demography' has been proposed as a descriptive name), or should be extended into meteorology and other natural sciences. It is impossible to give any convenient and comprehensive classification of the multifarious topics that fall within the sphere of the statistician—population, trade inland and foreign, wealth, currency, prices, banks, social conditions, the people, &c.

There was a kind of statistical bureau in France in Sully's days; such an institution was permanently set agoing in 1800. But the perfecting of statistical methods owes more to the foundation of the Belgian statistical bureau under Quételet in 1831. Since then most civilised lands have devoted much time, labour, and money to collecting and tabulating their statistics—France, Italy, and Germany, and the United States being perhaps remarkable for the fullness and systematic organisation of their statistical returns. What is done in England is not managed by any one central bureau or board, and is less systematic, though very varied and valuable (see BLUE-BOOKS).

There was a statistical section added to the British Association in 1833, and the Statistical Society of London was established in 1834. Under Quételet's influence a great statistical congress was brought together at Brussels in 1853, and many like congresses have been held since. The International Institute of Statistics was founded in 1885.

Quételet's influence has also been felt in biology, along with that of Galton, Karl Pearson, and W. F. R. Weldon. The three last-named founded the periodical *Biometrika* in 1902. Results of statistical study of variation are already valuable, and promise much.

See CENSUS, MORTALITY (BILLS OF), INSURANCE, GRAPHIC METHODS, AVERAGE, PROBABILITIES, HEREDITY (for Mendelism); annuals like the *Almanach de Gotha*, *Statesman's Year-Book*, and such almanacs as Whitaker's; Mulhall's *Dictionary of Statistics*; Kolb's *Condition of Nations* (Eng. trans. 1880); Hübnér's *Statistische Tafel*; Webster's *Trade of the World* (1880); Block's *Traité Théorique et Pratique de Statistique* (1878); and other works and articles about statistics by statisticians like Bodio, Haushofer, Knies, Gabaglio, Farr, Giffen, Rawson, Mayo-Smith, Von Mayr, Liesse (1905). There are short works by Bowley (1921) and Elderton (1910).

Statius, ACHILLES. See ACHILLES TATIUS.

Statius, PUBLIUS PAPINUS, Roman poet, was born at Naples 40 to 45 A.D., son of a poet and schoolmaster at Naples and at Rome. From early youth addicted to poetry, he gained prizes in the contests at Naples, won the Alban olive-wreath three times, and flourished as a court poet in the favour of Domitian, whom he flattered almost as shamelessly as his rival Martial himself. He lost

the wreath of oak-leaves at the Capitoline competition in 94, and thereafter retired to Naples with his wife Claudia, where he died about 96. His chief work is the *Thebais*, an epic in twelve books on the famous theme of the struggle between the brothers Eteocles and Polynices of Thebes. The poem took twelve years to write, yet its construction is slovenly enough—one episode alone occupying one-sixth of the whole poem. It is tedious as a whole, and marred by over alliteration and allusiveness, but is redeemed by passages of exquisite art. Of another epic, the *Achilleis*, only a fragment consisting of one book and part of another remains. His *Silvae*, or occasional verses, apparently half improvisations, are thirty-two in number, extending to nearly 4000 lines, mostly in hexameters. They have the freshness and vigour, together with the artistic imperfections, of unpremeditated effort, but, putting aside the flatteries to the emperor, they show not seldom a spark of the right Promethean fire. The quick touches of pathos, on separation and death, and on the sweet charm of childhood, would alone preserve some of these slight poems from oblivion.

The *editio princeps* of the epics appeared in 1470, of the *Silvae* in 1472. Throughout the middle ages the fame of Statius was great, as readers of Dante (*Purg.* xxi.) will remember. Markland, O. Müller, Kohlmann, Baehrens, and Postgate (*Corpus Poetarum Latinorum*, Fasciculus iv. 1904) have been amongst his editors. D. A. Slater translated the *Silvae* (1908), with introduction.

Statuary. See SCULPTURE.

Statute of Frauds. See FRAUD.

Statutes express the will of the legislature, and take effect from the first moment of the day of passing. Except in Scotland, a statute remains in force though obsolete; and when repealed it is not revived by the repeal of the repealing act. It is always to be construed 'according to the intent of them that made it.' Primarily, technical words are understood in their technical, other words in their popular sense. When precise and free from ambiguity, they receive their literal meaning and grammatical construction, whatever may be thought of the wisdom or policy of the enactment. But language is so imperfect, and general words are so elastic and open to such varieties of meaning and force, that the literal construction often does not express the real intention. Where such a doubt arises it is necessary to consider what was the earlier law, what its defect, and what the proposed remedy and its object; in other words, to examine the history of the act and the context. The whole act is read, every part in the sense best harmonising with the rest. The preamble is especially invoked to explain what is doubtful. Earlier acts, though expired or repealed, and even later ones on the same or analogous subject, are resorted to, also, for light. All statements of members of the Houses and draftsmen as to what was intended are disregarded; but the rule that the title, marginal notes, and punctuation are to be disregarded has, as regards the title, become obsolete, and as regards the marginal notes, is now of imperfect obligation.

The scope and object of the act being thus ascertained, it generally receives a beneficial construction which best 'suppresses the mischief and advances the remedy.' Sometimes words receive an unusual stretch of meaning; for instance, a married woman living apart from her husband would be included in the expression a 'single woman,' where the object of the act was to give the mother of an illegitimate child a claim on the father for its support. So a generic term usually includes species which did not exist when the act was passed. Thus, an act of George II. against

copying copyright engravings includes photographic copies, and one of William IV. against 'furious driving' applies to bicycles, though photography and bicycles were not then known. In the same spirit all devices resorted to for evading a law, or misusing powers which it conferred, are defeated by including such attempts within it.

To give effect to the intention expressions are sometimes strained; for instance, 'beyond the seas' is read in an old act as equivalent to 'out of the British dominions.' Sometimes the collocation of the words is altered, or they are rejected altogether, or even words are interpolated. But such modifications are made only when obviously necessary in correction of a careless text which did not make sense or was incomplete as it stood.

Beneficial construction is applied less freely to penal acts. There is a reluctance to supply in them the defects of language, or to eke out their meaning by doubtful inferences. Where a word or phrase is open to reasonable doubt, the benefit of the doubt is given to the subject. An omission, also, would probably not be supplied; but the extreme strictness of construction of former times has now materially given way to the paramount rule that a statute is to be expounded according to the real intention. Acts which impose on the subject burdens or formalities, or otherwise restrict natural liberty, or create monopolies, or confer privileges are construed in the same spirit as penal acts. The language of local and personal acts, which invest persons or bodies with rights and privileges for their own profit or interfere with the rights of others, is regarded as rather that of its promoters than of the legislature, and is consequently construed most strongly against them.

Certain constructions are always rejected, if the language can admit it. Any which would lead to inconvenience and injustice or absurdity would be avoided as probably foreign to the real intention. For this reason a construction which made an act operate retrospectively on vested rights would be avoided; and so would any which conflicted with international law—a construction, for instance, which extended a criminal statute to a foreigner for an offence committed abroad. Again, an act would not be read as affecting the prerogative rights or property of the crown, unless the intention was plainly expressed or irresistibly inferable. A like reluctance is felt to attribute an intention to oust the jurisdiction of the superior courts, or to extend that of new or inferior tribunals and authorities.

If two statutes, or two passages in one, are contradictory, the earlier is abrogated by implication. But, as self-contradiction was probably not intended, such a construction is rejected unless inevitable, or unless there be inconvenience or incongruity in both enactments being in force, or the later would be inoperative if the earlier was not repealed. Special and local acts are unaffected by general acts inconsistent with them, being regarded as not in the contemplation of the legislature when making the general act.

Another and most important axiom is that no change of the law is intended beyond the specific object immediately in view. Words and phrases, therefore, however comprehensive literally, are so restricted as not to affect any general principles of law. An act, for example, which empowered 'any' justice to try a case would not include a justice who was incapacitated by interest or otherwise from trying it. To confine an act to its immediate object, it is often construed as operative only between certain persons, or under certain circumstances, or for certain purposes only. Thus, an act which made a bill for money lost at

play 'void to all intents and purposes' would not affect the validity of the bill in the hands of an innocent indorsee for value, but would apply to it only when in the hands of the drawer or of others with no better title.

It follows that incidents are sometimes found imported into an act which give it an operation different from its strictly grammatical meaning. Thus, where a power is conferred, everything in the way both of right and obligation which is indispensable to its due exercise is tacitly included by law. When, therefore, a statute enacts that a public officer 'may' do some act of a judicial or public nature, it also by implication directs that he 'must' exercise the power whenever the occasion arises; and if its exercise may prejudice a person, it involves the further duty of first giving the latter an opportunity of being heard against it.

When a statute grants a right subject to certain formalities, compliance with such prescriptions is essential on pain of invalidation. But when the prescriptions relate to a public duty, and invalidation for neglect would be unjust to persons who have no control over the defaulting official, without promoting the object of the act, non-compliance does not invalidate. In the former case the act is imperative, in the latter directory only. A penalty for doing something implies a prohibition; this makes the prohibited act unlawful; and all contracts connected with illegal acts are void.

There are some minor rules of interpretation which hardly call for notice here. Some will be found in the Act 52 and 53 Vict. chap. 63. But it may be mentioned, in conclusion, that usage, or a long and general public or professional practice, sometimes impresses on an enactment a meaning not in accord with the natural sense of the words, which is nevertheless accepted as conclusive.

See Maxwell's *Interpretation of Statutes*, 1920 (6th ed.); Craie's *Statute Law*, 1923 (3d ed.).

Statutory Rules and Regulations. See BY-LAWS.

Statutory Small Tenant. See CROFTER.

Staubach, FALL OF. See LAUTERBRUNNEN.

Staunton, capital of Augusta county, Virginia, in the Shenandoah valley, 96 miles WNW. of Richmond. It is the site of the state lunatic and deaf and dumb and blind asylums, and contains several women's schools, large ironworks, and flour and planing mills. Pop. 10,600.

Staunton, HOWARD, chess-player and Shakespearean scholar, was born in 1810, studied at Oxford, early settled down to journalism in London, and died June 22, 1874. His victory in 1843 over M. St Amand made him the champion chess-player of his day. To this subject he contributed the following works: *The Chess-player's Handbook* (1847), *Chess-player's Companion* (1849), *Chess-tournament* (1851), *Chess Praxis* (1860). His edition of Shakespeare (1858-60) offered a number of textual emendations so excellent as to give him rank among the best critics of that time. It was enriched by 824 illustrations by Sir John Gilbert. Staunton also published an edition without illustrations, and in 1866 a careful photo-lithographic fac-simile of the first folio text of Shakespeare.

Staupitz, JOHANN VON, friend of Luther (q.v.).

Staurolite (Gr. *stauros*, 'a cross'; *lithos*, 'a stone'), a silicate of alumina with ferrous oxide, magnesia, and water, crystallises in orthorhombic forms, and often occurs as twinned cruciform crystals in certain gneisses and schists. It is reddish, yellowish brown, or brownish black.

Stavanger, the most important town in the south-west of Norway, stands on the southern side of Bukken Fjord, 100 miles S. of Bergen. It has

two harbours, and derives its importance from its connection with the fisheries of the adjacent coast. The town dates back to the 9th century at least, but has been frequently destroyed by fire, and is now quite a modern place. The cathedral, a Gothic structure, was founded by an English bishop (Reinald) in the 11th century, but was restored in 1866. The bishopric was revived in 1924. Stavanger has become a favourite rendezvous of tourists. Pop. (1920) 43,778.

Stavesacre (*Delphinium Staphisagria*), a species of Larkspur (q.v.), a native of the south of Europe. The seeds which contain the alkaloids delphinine, delphinoidine, and delphisine, and a considerable quantity of a fixed oil, are poisonous. From them an ointment is made which is used to kill lice.

Stavropol, a town of Russia in the North Caucasian Area; pop. 64,000.

Stead, WILLIAM THOMAS (1849-1912), son of a Congregational minister at Howdon-on-Tyne, became editor of the *Northern Echo* at twenty-two, and assisted and succeeded Lord Morley as editor of the *Pall Mall Gazette*. He was a public-spirited, audacious, and influential journalist, and suffered imprisonment for well-meant indiscretion in promoting social purity. He retired from the *Pall Mall* in 1889 to found the *Review of Reviews*, which became the organ of his independent and sometimes puzzling views in religion, ethics, and politics; and he carried on also a spiritualist paper. He perished in the *Titanic* disaster. See *Life* by his daughter (1913), and by F. Whyte (1925).

Stealing. See THEFT.

Steam is the vapour of water; when dry it is invisible and transparent like air. The formation of steam is naturally enough connected popularly with a high temperature, but the two things do not necessarily go together. In the open air water will evaporate slowly at any temperature lower than that at which it boils. The only limit to such a process is when the air in contact with the water is already saturated with water vapour of the maximum density which the water can give off at the existing temperature. Though this vapour pressure is necessarily lower than the air pressure, the vapour given off passes away by diffusion, the air pressure remaining unchanged.

The properties of steam are most conveniently studied by consideration of what takes place when steam is generated under constant pressure. Suppose we have a long vertical cylinder fitted with a piston moving freely but steam tight in the cylinder, and that we can load this piston so as to maintain a steady pressure on any fluid below the piston, and that we introduce one pound of water into this cylinder below the piston, and apply heat to the bottom of the cylinder. This heat will, if its application is continued long enough, produce the following three effects:

(a) The temperature of the water will rise steadily from its initial value of t_0 till a temperature t is reached, the value of t depending on the pressure p exerted by the piston, the substance still remaining water; the heat so expended is termed *sensible*.

(b) At the conclusion of the first stage the water begins to evaporate, the temperature remaining steady at t , and as a result the piston will rise, since the volume occupied by the steam is greater than that of the original water. This process will go on till all the water has been turned into vapour, which is termed *saturated steam*. The heat which has been absorbed during this stage, since it produced no change in temperature, is termed *latent*.

(c) If the application of heat is continued, the

volume of the steam and its temperature will increase, the pressure remaining unchanged, and the steam is now termed *superheated*.

Briefly the difference between saturated and superheated steam may be explained in the following manner—when water at the temperature of the steam is added to a mass of superheated steam some of this water would at once be converted into steam, but if the water had been added to a mass of saturated steam it would remain quite unaffected. Any vapour which is in contact with the liquid from which it was formed is necessarily saturated, and in this condition it usually differs considerably in its properties from those of a perfect gas; on the other hand superheated steam begins more and more, as the temperature of superheat is increased, to approximate in its properties to those of a perfect gas.

The factors we require to consider in regard to steam are the temperature, the specific volume, or volume of one pound, and the quantity of heat required per pound in its generation, and the way in which these three quantities change in value as the pressure at which the steam is formed is varied.

Saturated Steam.—Relation of temperature and pressure. The variation of temperature with change in pressure was experimentally determined by Regnault (*Mém. Inst. France* 1847, vol. xxi.); the following table gives the values of t for pressures varying from 0.5 to 260 lb. per sq. inch, as calculated by Callendar; his results agree closely with those experimentally determined by Regnault.

PROPERTIES OF SATURATED STEAM.*

Pressure. lb. per sq. inch.	Temperature. Centigrade.	Volume. Cub. ft.	L	H
0.5	26.4	640.5	26.3	580.4
1.0	38.7	333.1	38.6	573.8
14.7	100.0	26.79	100.0	539.3
20	108.9	20.08	109.0	533.9
30	121.3	13.74	121.5	526.0
40	130.7	10.50	131.0	519.9
60	144.8	7.18	145.5	510.2
80	155.5	5.49	156.6	502.6
100	164.3	4.45	165.7	496.1
140	178.3	3.25	180.4	485.3
180	189.5	2.56	192.3	476.2
220	198.9	2.12	202.3	468.4
260	207.0	1.81	211.2	461.3

* This table is extracted by kind permission of Prof. Callendar and the publishers, from *The Callendar Steam Tables*, published by Messrs Edward Arnold & Co. in 1915.

An inspection of this table will show that the pressure of steam increases at a far higher rate than the temperature, doubling the temperature say from 100° to 200° C. increases the pressure nearly 15 fold. This is a matter of extreme importance in the use of steam for generating power, since the thermal efficiency of the motor depends primarily on the range of temperature available, while the amount of the steam pressure is of vital importance in the design of the boiler.

Relation of temperature and specific volume.—It is very difficult to determine this relation by direct experiment, though some very reliable experiments have been made, notably those at the Technical High School, Munich. The figures for the specific volume of steam given in modern steam tables are based upon the characteristic equation of Callendar; by the use of this equation and certain others derived from it, and by utilising at the same time certain experimental results, Callendar was able to calculate both the specific volume and the amount of heat expended in the formation of saturated steam under any given temperature conditions.

The characteristic equation is $V = \frac{RT}{P} + b - c$;

in this equation T is the absolute temperature centigrade of formation, P is the pressure in lb. per square foot, R and b (co-volume) are constants,

and c (co-aggregation) is a term which varies inversely with a certain power of T . If steam were a perfect gas this equation would be $V = \frac{RT}{P}$; the

other two terms are necessary to express the way in which the specific volume of dry steam (whether saturated or superheated) varies from the ideal volume it would occupy if it were a perfect gas. In the table above, the values given for V are those obtained from Callendar's equation. For approximate results, and when steam tables are not available, the formula $PV^{1.2} = 490$ may be employed to find the volume in cubic feet of 1 lb. of saturated steam under any given pressure P measured in lb. per square inch.

The pressure-gauges of boilers always give the pressure of the steam, in pounds per sq. inch above the atmosphere; in the steam tables the pressures are always absolute, hence it is necessary to add to the gauge pressure the atmospheric pressure at the instant in question, as obtained from a barometer reading taken at the same time; the pressure per square inch corresponding to the standard atmosphere is very nearly 14.7 lb.

Heat units required to generate steam under constant pressure.—It is convenient to take as the unit of heat quantity the *pound-calory*, that is the amount of heat needed to warm 1 lb. of water 1° C.; this quantity, however, varies slightly with different initial temperatures of the water, since the specific heat of water is not constant; it diminishes slightly from 0° C. to 35° C., and thereafter increases continuously. The unit is therefore sometimes taken as the heat needed to warm 1 lb. of water 1 degree at some definite temperature, say 15° C.; or we may take as the unit of heat one-hundredth of the whole heat needed to warm 1 lb. of water from 0° to 100° C. under a constant pressure of 14.7 lb. per square inch.

In the first stage of the process of generating steam under constant pressure, that is, the stage during which the liquid is being warmed from its initial temperature to that at which the steam begins to form, the heat needed in pound-calories is very nearly equal numerically to the difference between these two temperatures, that is, it is nearly equal to $t - t_0$. It is always a little greater than this owing to the fact that the specific heat of water increases continuously from 35° C. upwards; the values for this sensible heat h given in the table allow for this change in the value of the specific heat. Since the volume of the water has increased by an exceedingly small amount during this rise of temperature, most of this heat has gone in increasing the stock of internal energy possessed by the water.

In the second stage, during which the steam is generated and the temperature remains constant, a large amount of heat is supplied, and since it does not change the temperature it is called the latent heat of evaporation and is denoted by the symbol L . For steam generated at 100° C. it is per lb. of steam 539.3 pound-calories, or more than five times the heat needed to warm the lb. of water from 0° to 100° C. As the temperature of evaporation increases from 0° C. upwards, the quantity of latent heat required steadily diminishes; values of L are given in the table. A certain proportion of this latent heat has gone in doing external work, since the volume occupied by the steam is much greater than that originally occupied by the water from which it was formed, and this change of volume has been against a constant steady resisting pressure. Expressed in pound-calories the external work done is $= \frac{P(V_s - V_w)}{1400}$, where P is the constant pressure in lb. per square foot,

and V_s and V_w the volumes in cubic feet occupied respectively by 1 pound of steam and 1 pound of water at the given temperature. The remainder of the latent heat has gone in increasing the stock of internal energy of the substance. The total heat of formation under constant pressure of a pound of dry saturated steam from a pound of water at any initial temperature is therefore $= h + L$.

If we now, by the addition of further heat, change the steam from the saturated to the superheated state, the amount of heat expended will be equal to the rise of temperature, as shown by a thermometer, multiplied by the mean specific heat of the steam, or in symbols, the pound-calories expended per pound of steam will be $k_s (t_s - t)$, where t is the temperature of saturation, t_s the temperature to which the superheat is carried, and k_s the mean specific heat of steam for the range of temperature in question. The specific heat of steam is not constant; the mean values for temperatures of superheat used in modern steam engines vary from about 0.48 to 0.59; the higher values occur when the temperature of saturation from which the superheat begins is high, that is from 180° to 200° C.

Hitherto we have considered only dry-saturated or superheated steam; few boilers, however, which have not been equipped with superheaters supply absolutely dry steam; from this and other reasons in any engine-cylinder the working substance is usually a mixture of water and steam, and the relative proportions of the two are constantly changing. The dryness of wet steam, which is in thermal equilibrium, that is, when the temperatures of steam and water are the same, is measured by the fraction of dry steam present in each pound of the mixture and is denoted by the symbol q . It is an easy matter to calculate the values of the volume, latent heat, &c., of such wet steam; the volume of 1 lb. will be $= qV_s + (1 - q)V_w$, the latent heat $= qL$, and so on.

In thermodynamic problems it is useful to know the total heat in a pound of steam, a quantity Ewing denotes by the symbol I . (In Callendar's tables it is denoted by the symbol H , which must not be confused with the same symbol H as used by Rankine in a different sense.) The total heat is equal to the total internal energy plus the external work which has been done in the process of formation; in calculating the value of I , the internal energy of the water at 0° C under a pressure equal to the vapour pressure at 0° is considered to be zero, and the external work being an extremely small quantity is also treated as zero for these conditions, hence the total heat of 1 lb. of water at 0° C. is taken as 0. For any given temperature the total heat of 1 lb. of steam is equal to the total heat of formation of the steam

under constant pressure from 0° plus $\frac{PV_0}{1400}$, where P is the constant pressure under which the steam has been formed in lb. per sq. foot, and V_0 is the volume of 1 lb. of water at 0° C. This quantity $\frac{PV_0}{1400}$ is always small numerically; for example, when $P=200$ lb. per sq. inch, it is equal to 0.33 pound-calories.

In the table above, the column headed H gives the total heat of 1 lb. steam, and the column headed h the total heat of 1 lb. water; the difference, therefore, of these two columns gives the latent heat of the steam.

Whenever steam passes from any one condition to another, the gain or loss of heat in the process may be determined by the equation: Heat taken in = increase of internal energy + external work done; any of the three terms may be negative.

Expansion of Steam.—If the process is isothermal the steam must, during the whole process, be in contact with water, that is, in the wet state; in other words, during expansion when it is isothermal, evaporation must be proceeding, and in compression condensation must occur. If, on the other hand, initially dry steam is expanded adiabatically, that is, without taking in or giving out heat, some of the steam is condensed. Since the pressure and the temperature both fall, and as the steam which remains is in a saturated state, the relations between pressure and temperature are precisely those we have shown above to exist for saturated steam.

The dryness of the steam at any point in an adiabatic expansion can be calculated from the formula

$$q_0 = \frac{T_0}{T_1} (q_1 \frac{L_1}{T_1} + \log \frac{T_1}{T_0})$$

where the suffix ₁ indicates the initial steam conditions, and the suffix ₀ the final conditions.

Steamboat Springs, a town of Colorado, U.S.A., 110 miles north-west of Denver. Coal, metals, petroleum, onyx-stones, and hot and cold springs are found locally, and there is a considerable agricultural and lumbering industry. Pop. 1200.

Steam-crane. See CRANE.

Steam-engine, a machine, employing steam as the working agent, in order to convert heat energy into useful work. Some of the heat supplied to the machine is transformed into work, and the rest of the heat is rejected as heat at the end of the cycle. Coal or oil burnt in the furnace of a boiler supplies the heat which converts the water supplied to the boiler into steam; the steam then passes into the engine; in the engine the steam, by change of volume during expansion, does work, and after this it passes away into the atmosphere in non-condensing engines, or in condensing engines into a condenser, where by the action of cold water it is again reduced to water. The thermal efficiency of a steam-engine is measured by the ratio of the heat it transforms into work to the total heat it receives from the boiler in a given interval of time. The mechanical efficiency of a steam-engine is the ratio of the useful work the machine gives out to the total work done in the cylinder by the steam during any definite interval of time. Steam-engines in their infancy were known as 'fire' (i.e. *heat*) engines; and in point of fact the older term is the more correct, because the water or steam is only used as a convenient medium through which the form of energy which we call heat is made to perform the required mechanical operations. In modern engines sufficient heat is added to the steam to raise it to a very high pressure, and the excess of this pressure over the pressure opposed to it (either atmospheric pressure or the still lower pressure in a condenser) is both the cause and measure of the work done by the engine. In earlier machines, however, the steam was raised only to atmospheric pressure, and admitted into the engine only to be at once condensed by a jet of cold water. The excess of the atmospheric pressure above the pressure in the partial vacuum caused by the condensation was then the direct cause of work. Engines of this kind were called *atmospheric* engines.

The invention of steam as a moving power is claimed by various nations; but the first extensive employment of it, and most of the improvements made upon the steam-engine, the world indisputably owes to Britain and the United States.

Among the first notices we have in England of the idea of employing steam as a propelling force, is in *The Art of Gunnery* (1647), by Nat. Nye, mathematician; in which he proposes to 'charge a

piece of ordnance without gunpowder,' by putting water instead of powder, ramming down an air-tight plug of wood, and then the shot, and applying a fire to the breach 'till it burst out suddenly.' But the first suggestion of the use of steam in a more or less practical manner was that of the Marquis of Worcester. In his *Century of Inventions*, the manuscript of which dates from 1655, he describes a steam-apparatus by which he claimed to raise a column of water to the height of 40 feet. A machine, of which no accurate description survives, under the name of 'Fire-waterwork,' appears actually to have been at work at Vauxhall in 1663-70. Sir Samuel Morland in 1683 submitted to Louis XIV. a project for raising water by means of steam, accompanying it with ingenious calculations and tables. The first patent in Britain for the application of steam-power to various kinds of machines was taken out in 1698 by Captain Savery. In 1699 he exhibited before the Royal Society a working model of his invention. His engines were the first used to any extent in industrial operations; they seem to have been employed for some years in the drainage of mines in Cornwall and Devonshire. He employed one vessel for the generation of the steam, and two other vessels in which the steam did its work, following in this respect the plan outlined by della Porta in his treatise on pneumatics, published in 1601. He made use of the condensation of steam in a close vessel to produce a vacuum, and thus raise the water to a certain height, after which the elasticity of steam pressing upon its surface was made to raise it still further in a second vessel.

In all the attempts at pumping-engines hitherto made, including Savery's, the steam acted directly upon the water to be moved without any intervening part. To Denis Papin (q.v.), a French physicist, is due the idea of the *piston*. It was first used by him in a model constructed in 1690, where the cylinder was still made to do duty also as a boiler; but in an improved steam-pump invented about 1705 he used the piston as a diaphragm floating on the top of the water in a separate vessel, or cylinder, and the steam, by pressing on the top of it, forced the water out of the cylinder at the other end.

The next great step in advance was made about 1705 in the 'atmospheric' engine, conjointly invented by Newcomen (q.v.), Cawley, and Savery. This machine (fig. 1) held its own for nearly seventy years, and was very largely applied to mines. In it the previous inventions of the separate boiler and of the cylinder with its movable steam-tight piston are utilised, although in a new form. The 'beam' was used for the first time, and for the first time also the condensation of the steam was made an instantaneous process, instead of a slow and gradual one. Newcomen's engine was chiefly used, like all former steam-engines, in raising water. To one end of a beam moving on an axis, I, was attached the rod, N, of the pump to be worked; to the other the rod, M, of a piston, P, moving in a cylinder, C, below. The cylinder was placed over a boiler, B, and was connected with it by a pipe provided with a stopcock, V, to cut off or admit the steam. Suppose the pump-rod depressed, and the piston raised to the top of the cylinder—which was effected by weights suspended at the pump-end of the beam—and that the steam-cock being open the cylinder was full of live steam, the steam-cock was then turned to cut off the steam, and a dash of cold water was thrown into the cylinder by turning a cock, R, on a water-pipe, A, connected with a cistern, C'. This condensed the steam in the cylinder, and caused a vacuum below the piston, which was then forced down by the

pressure of the atmosphere, bringing with it the end of the beam to which it was attached, and raising the other along with the pump-rod. The cock was then turned to admit fresh steam below the piston, which was raised by the counterpoise; and thus the motion began anew. The opening and shutting of the cocks was at first performed by an attendant, but subsequently a boy named

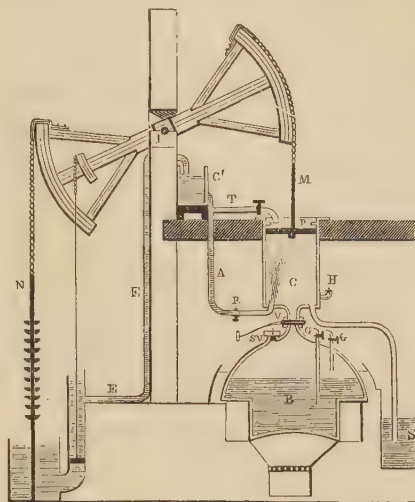


Fig. 1.

Humphrey Potter (to save, it is said, the trouble of personal superintendence) devised a system of strings and levers by which the engine was made to work its own valves. In 1718 Henry Beighton, an F.R.S., invented a simpler and more scientific system of 'hand-gear,' which rendered the engine completely *self-acting*. During the latter part of the time that elapsed before Watt's discoveries changed everything Smeaton brought Newcomen's engine to a very high degree of perfection. As the result of study and experiment he made many improvements in it, in the form of the boiler, the proportions of the cylinder, &c. It was he, too, who invented the *cataract*, a very ingenious self-acting valve arrangement, which is still used in Cornish engines. Though a great improvement as compared with the Savery engine, Newcomen's engines were still extremely wasteful of fuel. In 1725 Leupold invented an engine in which steam of a higher pressure than that of the atmosphere was employed in the cylinder, but his engine possessed defects that prevented its practical use.

The next essential improvements on the steam-engine were those of Watt, which began a new era in the history of steam-power. The first and most important improvement made by Watt was the separate condenser and air-pump, patented in 1769. He had observed that the jet of cold water thrown into the cylinder to condense the steam necessarily reduced the temperature of the cylinder so much that a great deal of the steam flowing in at each upward stroke of the piston was condensed before the cylinder got back the heat abstracted from it by the spurt of cold water used for condensing the steam in the cylinder. The loss of steam arising from this was so great that only about one-fourth of what was admitted into the cylinder was actually available as motive-power. Watt therefore provided a separate vessel in which to condense the steam, and which could, by means of the air-pump, be kept constantly in

a state of vacuum, without the loss which arose when the cylinder itself was used as a condenser. This device, which now looks simple enough, was the greatest of Watt's inventions, and forms the foundation of his fame. His genius was such that in a few years he changed the steam-engine from a clumsy, wasteful, almost impracticable machine into a machine practically the same as that which we now have. The principal improvements since his time have been either in matters relating to the boiler; in details of construction consequent on our increased facilities, improved machinery, and greater knowledge of the strength of materials; in the enlarged application of his principle of expansive working; or in the application of the steam-engine to the propulsion of carriages and vessels. His principal inventions were: (1) The condensation of steam in a vessel separate from the cylinder, so as to avoid the cooling of the latter; (2) the use of a pump, called an 'air-pump,' to withdraw the condensed water and mixed steam and air from the condenser; (3) the surrounding of the cylinder with a steam-jacket, in order to prevent loss of heat from condensation (these three, with others, were included in the specification of 1769); (4) the use of the steam expansively in the way explained further on in this article (this was invented before 1769, but not published till 1782); and (5) the now universally used double-acting engine, and the conversion of the reciprocating motion of the beam into a rotary motion by means of a crank (both these were invented before 1778, the engine being patented in 1782, the crank having before that date been pirated and patented by another). In 1784 Watt also patented and published his parallel motion, throttle-valve, governor, and indicator; all four of which are in substance still used.

The common mode of employing steam in an engine is by causing it to press alternately on the two surfaces of a movable diaphragm or piston enclosed in a fixed, steam-tight, cylindrical box. In fig. 2 A is the piston and B a section of the box. The piston, by means of a rod, E, passing through the end of the box, is made to communicate motion to the rest of the machinery. The steam is first admitted to one end of the cylinder through an opening or 'port,' D, and forces the piston along to the other end. The current of steam from the boiler is then allowed to pass into the other end of the cylinder through the opening C, and forces the piston back again to its original position, and so on. But it is obvious that while this return-motion is going on the steam previously admitted at D must be allowed some exit, or the piston could not be forced back. The manner of this exit constitutes the difference between the two principal classes of engines, according as the steam is allowed simply to rush out into the atmosphere or is conducted into a separate vessel, and there 'condensed.'

The simplest way in which steam can be used in a cylinder is at the same time the most wasteful. It consists in filling each end of the cylinder alternately full of steam direct from the boiler, and practically at the full boiler pressure, and thus forcing the piston along in exactly the same way as that in which it would have to be forced were water the fluid used instead of steam. If we imagine the cylinder to have a capacity of 7 cubic feet, then, if it be filled entirely with steam from the boiler at 60 lb. absolute pressure, it will contain nearly one pound-weight of steam. The total heat

in this pound of steam (above 0° C.), as given in the steam-tables, is equivalent to 655 lb.-calories in excess of that possessed by a pound of water at 0° C. When the piston, A, has reached the end of its stroke, the steam contained in the cylinder is thus in itself a great storehouse of work, for each lb.-calory is equivalent to 1400 'foot-pounds' of mechanical energy, so that the total represents about 917,000 foot-pounds, of which we shall see later on only about $\frac{1}{10}$ has been utilised during the stroke, leaving $\frac{9}{10}$ untouched. Instead of making any attempt to utilise this huge balance, at the moment when the cylinder is full of steam the opening C is put into communication with the boiler, the opening D with the atmosphere, and the steam immediately rushes out of the cylinder, and dissipates its contained energy through the air. Although the steam, when allowed to go into the atmosphere, is immediately reduced to the pressure corresponding to the temperature of the air (which in ordinary cases would be only a fraction of a pound per square inch), still the full pressure of the atmosphere itself will always be acting on the back of the piston during its stroke, and therefore, to find the force with which the piston is being pushed along, we must subtract that pressure from the steam-pressure. On the one side of the piston will be the atmosphere with its uniform pressure of nearly 15 lb. per square inch, and on the other side the steam-pressure of 60 lb. The effective pressure thus will be 60 - 15, or 45 lb. per square inch only.

Let us now consider the somewhat more economical case of an engine in which the steam is first used as described above, but afterwards, instead of being allowed to pass into the atmosphere, is conducted through a pipe into a closed vessel, which is maintained at a low temperature, and there in great part condensed. This reduction of temperature has a double effect on the steam: (1) the cooling and liquefaction of a part of it; and (2) the reduction of the rest to the pressure corresponding to the reduced temperature. It is not possible to do one of these things without the other. What is commonly called 'vacuum' simply means pressure less than the atmospheric pressure; and, in the case of steam-engines, a vacuum generally implies a pressure of between 2 and 3 lb. per square inch—i.e. from a seventh to a fifth of the ordinary pressure of the air. The most common way of condensing steam is by bringing it into contact either with a jet of cold water or with surfaces kept continually cool by a current of water. In either case, directly the steam is brought into contact with the water or cooling surface, it transfers to these cold bodies the larger portion of its heat. During this process the greater part of the steam is liquefied, and the remainder retains only such a pressure as corresponds to its greatly reduced temperature.

The advantages possessed by a condensing over a non-condensing engine will now be obvious. When the piston is being forced from C to D by steam entering through C, the force on the back of the piston resisting its motion in that direction, instead of being equal to the pressure of the atmosphere, is only the pressure of the steam in the condenser, or about 2 lb. per square inch. The net effective force is therefore 60 - 2 or 58 lb. instead of 60 - 15 or 45 lb.

We have supposed that our cylinder when full of steam contained just one pound-weight at 60 lb. pressure. Let us now find out how much useful work this pound of steam has done for us, and we will then show how the same weight may be made to do a great deal more, by utilising more of its great store of heat. Let us suppose that the area of the cross-section of the cylinder is 2 square feet, while

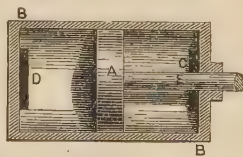


Fig. 2.

its length (the stroke of the piston) is $3\frac{1}{2}$ feet. It will thus have a capacity of 7 cubic feet, as before assumed. In the first case described we should have a pressure of 45 lb. per square inch exerted on an area of 288 square inches through a distance of $3\frac{1}{2}$ feet. This is equal to 45,360 foot-pounds of work. In the second case we have a pressure of 58 lb. per square inch on the same area and through the same distance. This is equal to 58,464 foot-pounds of work, or about $\frac{1}{5}$ of the total heat in the steam. (For simplicity's sake we have here assumed that the water in the boiler has to be raised from 0°C to 144.8°C , and evaporated at that temperature. If the water were supplied at 100°C , then the work done would be about $\frac{1}{3}$ instead of $\frac{1}{5}$ of the total heat.) We may now proceed to examine the way in which the same weight of steam, generated by the consumption of an identical weight of fuel, may be made to perform much more work by 'working expansively.'

One of the properties possessed by steam, in common with all other gases, is a tendency to expand indefinitely; its pressure varies nearly inversely as its volume. For simplicity's sake we shall here assume that steam is a perfect gas, and follows Boyle's law, the pressure varying *exactly* inversely as the volume. If then we have a cylinder of the same area as before, but of twice the length, but only intend to admit 1 lb. of steam into it at a time, it will be necessary, when the piston has travelled $3\frac{1}{2}$ feet of its stroke, to shut the entrance valve, so as to prevent more steam entering; this is called 'cutting off' the steam. The piston, however, still continues its motion in the same direction as before, propelled by the internal separative energy among the particles of steam. But as it is pressed forward the space occupied by the steam is always increasing, and its pressure always decreasing in proportion, until at length, when the piston has reached the end of its stroke, the steam occupies exactly double its original volume—viz. 14 cubic feet, and is reduced in pressure to half its original pressure—viz. to 30 lb. per square inch. We have thus during the first half of the stroke a constant pressure on the piston of 60 lb. per square inch, and during the second half a pressure gradually decreasing from 60 to 30 lb. The mean pressure during this second half of the stroke will be found on calculation to be almost exactly 41.5 lb. Let us now, in the same way as before, see what work we have been able to get out of our pound of steam by expanding it in this way. In the first half of the stroke we have 58,464 foot-pounds of work exactly as before, and then we have in addition a mean pressure of 41.5—2, or 39.5 lb. per square inch, exerted over 288 square inches for a distance of $3\frac{1}{2}$ feet. This equals 39,816 foot-pounds, making a total of 98,280 foot-pounds of work obtained from the steam which only gave us 58,464 before. The economy of working expansively, however, goes much further than this. If the cylinder had been four times its original length, and the steam had been cut off at the same point as before (which would then be quarter instead of half stroke), we should have obtained

from the 1 lb. of steam about 140,000 foot-pounds of work. If we had gone still further and expanded the pound of steam into eight times its

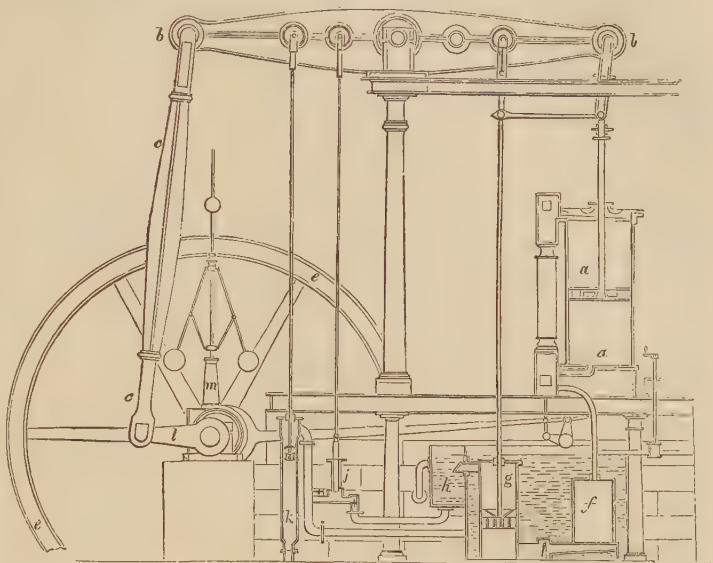


Fig. 3.

original volume, we should have obtained about 178,000 foot-pounds of work, which is more than three times as much as at first. (In actual working, owing to various causes—such as imperfect action of the valves, radiation from the cylinder, bad vacuum, &c.—the work obtained from the steam is not more than .65 to .75 of that given in this paragraph.) All modern engines are worked more or less on this principle of expansion, and the general tendency seems to be every year to adopt higher initial pressures and (within certain limits) larger ratios of expansion.

Fig. 3 represents Watt's 'double-acting' condensing engine. By 'double-acting engine' we mean an engine such as was sketched in fig. 2, in which the steam acts on both sides of the piston instead of only on one, as in Newcomen's engine. Watt's engine, though not of the form now generally used, contains all the parts now considered essential. The steam from the boiler passes direct to the valve-chest, *v*, which is simply a long box attached to the cylinder, *a*. In this chest are placed valves, which are so regulated as to open communication between the boiler, cylinder, and condenser, in such a way that when the top of the cylinder is open to the boiler the bottom communicates with the condenser, and *vice versa*. When the steam has done its work it passes out through the bent pipe into the condenser, *f*, where it is met by a jet of water (not shown in the engraving), and condensed, as before explained; *g* is a pump called the air-pump, which continually draws away the contents of the condenser, and discharges them into a cistern, *h*, called the hot well. A small force-pump, *j*, draws part of the water from this cistern, and sends it back again to the boiler, there to be reconverted into steam, while the rest of the water is allowed to run to waste. A suction-pump, *k*, supplies water to the large tank round the condenser, and also for the condensing jet. Inside the cylinder are the piston and the rod (called the piston-rod) connecting it with the beam, *bb*. In Newcomen's engine the rod had only to pull the beam down, and not to push it up; it could, therefore, be connected to it by a chain, as

shown in fig. 1. In the double-acting engine the piston-rod is required both to pull and to push the beam, so that the chain is no longer admissible. It is obvious that as the head of the rod must move in a straight line, while every point in the beam describes an arc of a circle, the two cannot be rigidly connected. Watt invented the arrangement of rods shown in fig. 3, by which the piston-rod head is guided in a line, very approximately straight, while the end of the beam is left free to pursue its own course. This is called a 'parallel motion.' The end of the beam farthest from the cylinder is connected by a rod, *cc*, called a connecting-rod, to the crank, *l*, which is firmly fixed on the shaft; and by this means the reciprocating motion of the beam is converted into the rotary motion of the 'crank-shaft,' *r*. The governor, *m*, and the flywheel, *ee*, will be explained further on.

The cylinder and its piston are both made of cast-iron or cast-steel. The former is very accurately bored in a special machine, and ought always to be covered outside with non-conducting material to prevent radiation of heat. It is frequently enclosed in another cylinder, and the annular space or 'jacket' between them filled with steam from the boiler, principally with the object of preventing liquefaction in the cylinder, which is fatal to economical working. The openings for the entrance and discharge of the steam (shown at *C* and *D* in fig. 2) are both called *ports*.

The valve or valves which regulate the admission of steam to the cylinder vary very much in construction and design. In small engines one valve, called a *slide-valve*, does the whole work in a way which we shall explain by the aid of fig. 4. This figure shows the valve in two positions—viz. those corresponding to the times when the piston is at the middle of its stroke, going in the two different directions; *c* and *d* are the ports, the ends of which are denoted by the same letters in fig. 2; *b* is the 'exhaust port,' or opening through which the steam passes to the condenser; and *a* is the slide-valve working inside the steam-chest (the latter not shown). The sketch to the left shows the position of the valve when the piston is moving upwards. The steam enters the cylinder through *d*, as shown by the arrows, while the steam in the other end is free to rush out by *c* under the valve, and through *b* into the condenser. By the time the piston has reached the same position, going in the opposite direction, the valve is in the position shown in the right-hand sketch, and the motion of the steam is exactly reversed. The valve in fig. 4 opens one port at the same moment as it closes the other. This corresponds to entirely non-expansion working. In order to 'cut off' the steam before the end of the stroke the breadth of the ends of the valve must be increased. This is called giving 'lap' to the valve. When it is desired to 'cut off' the steam earlier than half-stroke, a separate valve called an *expansion valve* (of which there

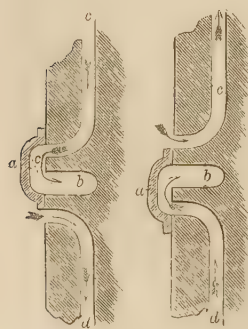


Fig. 4.

are innumerable varieties), is generally used. To relieve the pressure of the valve on its seat, in the case of large slide-valves, steam-tight rings are arranged so as to exclude the steam from the greater part of the back of the valve. A still better method

is to employ piston slide-valves, a common device in the H.P. cylinders of marine engines. In this form the valve face forms a complete cylinder, and the ports extend right round this cylinder. Another common form of valve in land engines is the lift or mushroom; this type reduces the clearance volume at the end of the cylinder, and it is easy to make such valves close almost instantaneously from the fully open position. The rod to which the piston is attached is called the *piston-rod*, and the rod which actually drives the crank the *connecting-rod*. In Watt's engine and similar machines these are connected to opposite ends of a *beam*, but in the common type of engine shown in fig. 6 (below) the two rods are directly attached. The *flywheel* is a large wheel fixed on the crank-shaft, and having a very heavy rim. As it revolves this contains, *stored up* in itself, a great quantity of energy, and so equalises the motion of the shaft, and by *restoring* some of the energy enables the engine to pass the 'dead-points,' or points at which the connecting-rod and crank are in a line. The *jet condenser* is simply a cast-iron box of any convenient shape. The water for condensing the steam is introduced into it in a jet in such a way that its particles mix with the steam at once on entering, and condense it almost instantaneously.

The *governor*, shown in fig. 5, is an ingenious application by Watt of mechanism long used in water-mills. Its object is to make the engine to

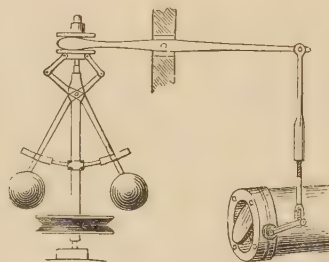


Fig. 5.

caused to revolve fixed on it. Two levers are pivoted on a pin near the top of the spindle, and at the lower end of each is fixed a heavy cast-iron ball. When the engine is running at its proper speed the balls revolve with the spindle in the position shown; but if that speed be increased the centrifugal force causes them to fly outward, and consequently upward; and conversely, if it be decreased they fall downward towards the centre. At the upper end of the spindle is a system of levers, by which it will be seen that the raising of the balls tends to close, and their lowering to open, the *throttle-valve* at the right of the engraving. The valve in the figure is simply a disc of metal placed in the steam-pipe near the cylinder, but a great many other types of valve—more expensive but more efficient—are now used for the same purpose. The further this valve is opened the greater the amount of steam admitted to the cylinder, and *vice versa*, and so the tendency of the engine to alter its speed arising from causes extraneous to itself is just balanced by the alteration made in the amount of steam admitted through the throttle-valve. In order that economy as well as regularity of working may be attained, it is in many cases necessary that the governor should be so arranged as to control the 'cut-off' instead of throttling the steam as in the figure.

The 'Cornish' engine, so called from the fact that it was principally used in the Cornish mines,

a great extent regulate its own speed, so that it shall neither be pulled up altogether by a sudden increase of load, nor 'race' when any part of its load is suddenly removed. It consists essentially of a spindle or upright rod, with a pulley by which it is

resembles Watt's engine in general appearance. Like Newcomen's engine it is used exclusively for pumping and has no rotary motion, and it is virtually single-acting; but, unlike his, the steam-pressure and not that of the atmosphere actually does the work. Cornish engines are fairly economical of steam, but are very costly and extremely heavy and unwieldy.

Engines in which the piston-rod and connecting-rod are directly attached are called *direct-acting engines*, of which the horizontal engine shown in fig. 6 is the most common type. For all ordinary purposes direct-acting engines have superseded every other form. They possess the merit of having great simplicity and few working parts, and of all these parts being easily accessible to the engine-driver; and at the same time any required degree of economical working can be obtained in them as well as in any other form. They were at first only used as non-condensing (or so-called 'high-pressure') engines, but are now as frequently made with a condenser attached.

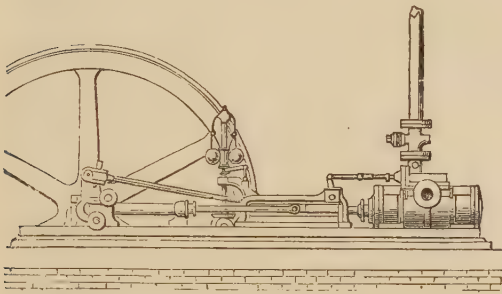


Fig. 6.

Direct-acting engines are now built to run at extremely high speeds, for driving dynamos direct. For this purpose they are sometimes made single-acting only, so that the steam-pressure tends always to keep the working surfaces pressed together, and there is none of the shock and noise

found in ordinary engines where the direction of pressure is reversed at each stroke. By improvements in design, and by the use of a system of forced oil lubrication, double-acting engines, such as the Belliss, are now run at very high speeds for dynamo-driving and similar purposes. Much labour and ingenuity have been expended in devising rotary engines, in which the reciprocating parts of the ordinary engine are abolished; but, except in the case of the Steam-turbine (q.v.), they have always proved a failure, being very uneconomical and expensive to maintain.

In *locomotive engines* it is necessary that the whole machinery should be compressed into the smallest possible bulk, and this necessity is the cause of their principal peculiarities. The engine itself is much the same as an ordinary horizontal engine, and has usually two cylinders placed side by side near the front of the locomotive. These cylinders are sometimes placed inside the main framing, which runs the whole length of the engine, and sometimes outside it. Fig. 7 is an outline section of a simple form of 'inside cylinder' goods-locomotive to illustrate the principle. (For more recent forms, see RAILWAYS.) At the back of the locomotive is the firebox, *a*, the bottom of which is formed by the grate, *b*. Fuel is introduced by the door, *c*. The firebox is enclosed in a casing, *d*, and the space between is filled with water. This space communicates freely with the barrel, *e*, *e*, of the boiler, a long steel cylinder. From the back of the firebox numerous small tubes traverse the boiler (through the water) to the smoke-box, *f*, and conduct the products of combustion to the chimney, *g*. The steam-pipe, *h*, is led away from near the top of the dome, *h*, and fitted with a regulator valve, *l*. At *m* are a pair of spring safety-valves. Both cylinders discharge their steam through the vertical blast-pipe, *p*, and by this means a sufficient draught is caused, notwithstanding the small height of the chimney. The cylinders, *r*, are placed in the bottom of the smoke-box, and partly enclosed in it.

Stephenson link motion or some similar device such as the Joy valve gear is essential in all locomotives to secure rapid reversal of the direction of rotation of the crankshaft, and thus enable the

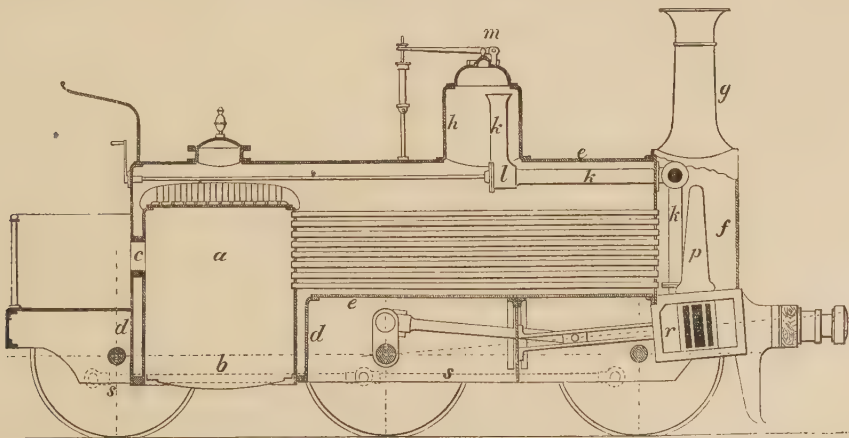


Fig. 7.—Section of a Simple 'Inside-cylinder' Goods Locomotive.

locomotive to move with equal facility forward or backward.

Locomotive engines are now often made compound, and superheaters are frequently fitted between the boiler and the high-pressure cylinders in order to raise the temperature of the steam con-

siderably above the temperature of saturated steam corresponding to the boiler pressure, this superheating reducing initial condensation of the steam upon its entrance into the cylinders, and thus promoting economy in both steam and fuel, the saving in coal being from 20 to 25 per cent.

Two of the greatest improvements in the modern engine—the *surface-condenser* and the *compound engine*—were first brought to perfection chiefly in connection with marine engines. In the surface-condenser the steam is condensed by contact with the exterior surface of a great number of small tubes, through the interior of which a current of cold water is kept constantly flowing by the action of a pump termed the circulating pump. By this means the condensing water and the condensed steam are kept separate, the former being returned to the sea in marine engines, or into cooling-ponds or cooling-towers in the case of land engines (in pumping-engines some of the cold water pumped may be passed through the condenser tubes), and the latter only is sent into the hot well. In the case of marine engines the boilers are therefore fed only with distilled water, and the old wasteful process of ‘blowing off’ to get rid of the unvaporisable matter, which would otherwise be deposited in the boiler, is rendered unnecessary. Oil-filters are now usually fitted in order to remove the oil carried forward with the condensed steam to the hot well, and thus secure a pure water-feed for the boiler.

In ‘compound’ engines the steam passes through two or three or four stages in the process of expansion. Each stage of the expansion is carried out in its own cylinder or cylinders, and these cylinders are of unequal size, the smallest being the one into which the steam first enters from the boiler, and the largest the one from which the steam passes to the condenser. The steam is admitted from the boiler into the smallest cylinder—called the high-pressure cylinder—in the usual way, and is cut off generally at from $\frac{3}{8}$ to $\frac{5}{8}$ of the stroke; and after doing its work there, it is conducted to the next cylinder, which in the case of a double expansion engine is called the low-pressure cylinder, where its reduced pressure, by acting on an increased piston area, does as much work as in the high-pressure cylinder, and thence it goes to the condenser. In engines of large power, triple expansion or quadruple expansion may be adopted; that is, the steam has to pass through one or more intermediate pressure cylinders, after leaving the high-pressure cylinder, before it gets to the low-pressure cylinder, these cylinders being intermediate in size between the high-pressure and the low-pressure, and the cylinders are so proportioned that the amount of work done in each of them is about equal. This system has several notable advantages, among which are that the driving pressures are more uniform than in the simple engine; that leakage past the piston becomes of less importance; that for any given *large* measure of expansion (an absolute necessity when high boiler pressures of 180 to 250 lb. per square inch are employed) the mechanism of the engine is much more simple than for the same degree of expansion carried out in one cylinder; and that the losses due to initial condensation of the steam in its entry into the cylinder after the valve opens (now known to be one of the most serious of all causes of waste) are much reduced. This reduction in the amount of initial condensation is due to the fact that by dividing the whole range of expansion of the steam over two or more cylinders, the range of expansion in each cylinder is lessened, and consequently the range of temperature in each cylinder is reduced.

Modern marine engines and mill engines are now always worked on the compound system. For the marine engine the inverted vertical type is now almost universal, the cylinders being placed right above the shaft. A common form is one having three cranks, especially where the engine is of the triple-expansion type; though for ships of high

speed it is usual, while still retaining the triple-expansion type, to have four cranks and four cylinders, there being two low-pressure cylinders of the same size; this arrangement secures a better balancing of the engine. Ordinary flat slide-valves are used for the low-pressure cylinders, and sliding piston-valves for all the other cylinders. For reversing the direction of rotation, and thus propelling the ship astern, the Stephenson link motion or some similar device is employed. A piston speed of 1000 feet a minute is not uncommon in some large marine engines, and even higher speeds under certain conditions; in this case some system of forced lubrication must be employed for crank-pins, main bearings, eccentrics, &c.

For mill engines, working compound, the tandem system, in which one cylinder is immediately behind the other, is often employed; or else the two cylinders may be on independent bed-plates, with the flywheel between them. When triple expansion is used, if there are three cylinders, two may be placed tandem on one bed-plate, and the third cylinder on a separate bed-plate. Trip valves are now usually fitted to the high-pressure cylinder; this system reduces the clearance volume, and enables the period at which the cut-off of the steam takes place to be changed without altering the period at which the steam is released from the cylinder, since the steam admission valves are quite distinct from the exhaust valves. In the Corliss system the exhaust valves are opened and closed by a link which is reciprocated by an eccentric; the steam admission valves are opened in precisely similar fashion, but are closed suddenly by springs when released or tripped by means of the governor. The governor controls absolutely the period in the piston-stroke at which this closing of the valve shall occur, but the valve opens in the same way and at the same instant in each stroke no matter at what period the shutting of the valve may occur.

Many pumping-engines are non-rotative, as, for example, the Worthington steam-pump; in most cases these pumps are not very economical, since the inertia of the reciprocating masses is insufficient, owing to low speed, to secure uniform pump effort if steam is cut off at all early in the stroke. In the large-sized Worthington pumps, however, this difficulty is overcome by the use of ‘compensators.’ During the early part of the piston-stroke, when there is full steam pressure upon the pistons, part of the work is absorbed in driving in the pistons of the two compensating cylinders against a considerable hydraulic resistance of 200 to 300 lb. per square inch (these compensating cylinders are supported on hollow trunnions on which they can oscillate); this continues until the main pistons are at about mid-stroke and steam has been cut off; then during the rest of the piston-stroke, while the steam pressure is falling owing to expansion, the oscillation of the two compensators brings them into such a position that the pressure behind these pistons now tends to drive their pistons outwards, and so increases the force delivered to the pump-rams and the work available for pumping. In fact, apart from small friction and other losses, the whole of the work absorbed by the compensators in the first half of the stroke is given out again during the second half of the stroke.

Efficiency of the Steam-Engine.—Thermodynamic principles show that in the working of any heat engine it is essential that the working substance must in the course of a complete cycle pass from a higher temperature, at which it takes in heat, to a lower temperature, at which it rejects heat, the amount of work done in the cycle being measured by the difference between heat received and heat rejected. In the ideal cycle, in which every process

of the cycle is reversible and in which heat is only received at the higher temperature T_1 and only rejected at the lower temperature T_0 , the thermal efficiency would be given by the expression $\frac{T_1 - T_0}{T_1}$, the temperatures being measured on the absolute scale. It used to be the practice to compare the actual thermal efficiency of any steam-engine as found by a test with this ideal 'Carnot' efficiency. An engine on the ideal Carnot cycle with steam as the working agent presupposes that we should combine the separate functions of boiler, engine, and condenser in a single vessel; but provided the working agent undergoes the same cycle of operations when these three vessels are, as they are in the actual steam-engine, separate organs, the thermal efficiency would be unaffected. It is necessary, therefore, to consider whether in this latter case we can practically carry out the same cycle of operations as in the Carnot cycle. The cycle of the actual engine, working between the same temperature limits as that of the Carnot engine, as a matter of fact does not do so; in its cycle it differs from the Carnot cycle in the omission of the adiabatic compression during the return stroke. The engine in the so-called Rankine cycle receives dry saturated or superheated steam at the temperature of the upper limit, T_1 , for a portion of the outstroke, this supply is then cut off, and the remainder of the outstroke is completed by adiabatic expansion, until the temperature and pressure of the steam has fallen to that which corresponds to the lower temperature limit, T_0 , the cylinder being then filled with wet steam; during the instroke the whole contents of the cylinder are discharged at constant temperature and pressure into the condenser. The feed pump then delivers this condensed steam into the boiler, where it is heated gradually from T_0 to T_1 , thus completing the cycle. Fig. 8 shows the pressure volume diagram for such a cycle. Since part of the heat supplied in the cycle—that required to warm the substance from T_0 to T_1 —is supplied at lower temperatures than the upper limit T_1 , this cycle must of necessity be less efficient thermally than the Carnot cycle, but it is a much better standard of

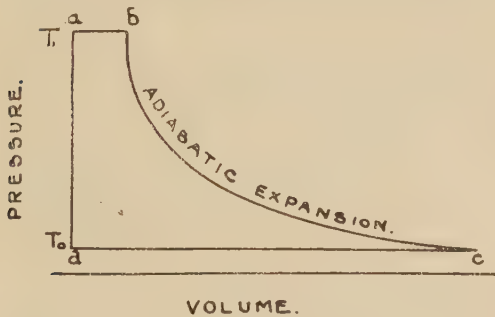


Fig. 8.

reference, since it is the actual cycle of the modern steam-engine with the sole difference that for practical reasons it is not possible to carry the expansion to such an extent as to reduce the temperature and pressure to that corresponding to T_0 . The Rankine cycle is therefore now adopted as the standard of comparison. The thermal efficiency of such a cycle, when the ideal engine uses dry saturated steam, can be found from the following expression:

$$\text{Efficiency} = \frac{\text{Work done}}{\text{Heat received}} = \frac{(T_1 - T_0) \left(1 + \frac{L_1}{T_1}\right) - T_0 \log_e \frac{T_1}{T_0}}{T_1 - T_0 + L_1}$$

The suffix ₁ indicates initial, and ₀ final, conditions; and L_1 and L_0 are the latent heats of the steam at the upper and lower temperatures T_1 and T_0 .

Thermodynamic problems in the steam-engine are much more easily considered if we utilise the idea of entropy, and draw instead of pressure volume diagrams another diagram the co-ordinates of which are temperature and entropy. Entropy (usually de-

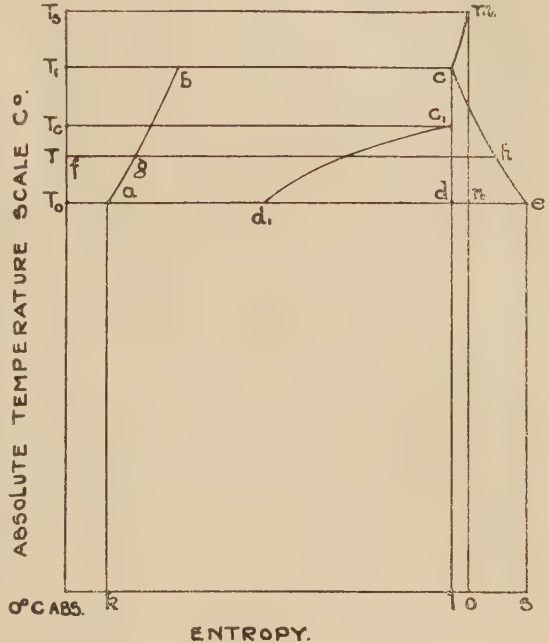


Fig. 9.

noted by the symbol ϕ) is defined by the fact that when a substance receives or rejects dQ units of heat at a temperature T , its entropy is increased or decreased by an amount $= \frac{dQ}{T}$. Since any small

change in the value of entropy such as $d\phi = \frac{dQ}{T}$, it follows that $T \times d\phi = dQ$; therefore any area in a temperature entropy diagram, or, as it is usually called, $\theta\phi$ diagram, represents to a known scale a quantity of heat; it follows, therefore, that such diagrams will simultaneously allow us to calculate the work done in a cycle and the total heat received and rejected.

In any cycle, such as the Carnot or the Rankine, the entropy at the end of the cycle is exactly the same as it was at the start, since the working agent is at the end of the cycle in the same condition in regard to temperature, volume, and pressure as it was at the beginning of the cycle. When a pound of water is heated from T_0 to T_1 and then turned into steam at this upper temperature T_1 , it gains

entropy $= \log_e \frac{T_1}{T_0} + \frac{L_1}{T_1}$ (assuming that the specific heat of water is constant and equals unity). Fig. 9 shows the $\theta\phi$ diagram for the Rankine cycle. The curve ab represents the term $\log_e \frac{T_1}{T_0}$, and the curve ce the

term $\frac{L_1}{T_1}$; that is to say at any temperature, say T , the length fg = to a selected scale $\log_e \frac{T}{T_0}$, and the length gh = to the same scale $\frac{L}{T}$. The figure

$abcd$ represents the Rankine cycle, ab the warming of the feed in the boiler from T_0 to T_1 , bc the evaporation of the water at the temperature T_1 , cd the adiabatic expansion to T_0 , and da the expulsion of the wet steam into the condenser at T_0 . Since in any adiabatic process no heat is received or rejected, an adiabatic process must be represented on a $\theta\phi$ diagram by vertical lines. The area $abcd$ represents the work done in the cycle, the area under the lines ab, bc , that is the area $kabcl$ the total heat received, and the area $adlk$ the heat rejected; hence it is possible to obtain at once from a $\theta\phi$ diagram the thermal efficiency for any chosen temperature range. The diagram further enables the dryness fraction at the end of the adiabatic expansion to be determined at once—it is given by the ratio $\frac{ad}{ae}$.

If the steam is released before the adiabatic expansion has reduced the temperature to T_0 , say at the point c_1 , that is at the temperature say T_{c_1} , and if the steam is then cooled to T_0 by the action of the condenser, the process is represented by the constant volume curve c_1d_1 , and the work done in the cycle is now only $abcc_1d_1a$, while the heat spent remains the same, hence the efficiency is reduced.

The $\theta\phi$ diagram can be extended to the case of superheating beyond T_1 to a temperature T_s at a constant pressure by drawing through c a curve cm , remembering that the gain of entropy in this process is nearly $=k \log_e \frac{T_s}{T_1}$, where k is the mean specific heat of superheated steam for this range of temperature; the extra work now available is represented by the area $cmnd$, and the additional heat spent by the area $cmol$. The real gain in efficiency by superheating is greater than would appear to be the case by inspection of the diagram, owing to the fact that superheating much reduces the initial condensation of the hot steam when introduced into a steam cylinder the walls of which have been cooled by the immediately preceding exhaust operation.

The actual efficiency of steam engines falls much below the possible efficiency as calculated for the same range of temperature in the ideal Rankine cycle, rarely exceeding 60 per cent. even under the best conditions; the loss is mainly due to incomplete expansion and initial steam condensation, though Callendar and Nicolson, as a result of their researches, express the view that leaky slide-valves, allowing steam to pass direct from the valve-chest to the condenser, account also for a certain not unimportant part of the loss of efficiency. The use of Corliss or drop-type valves much lessens initial condensation, the exhaust steam escaping by an entirely different valve and passage to that by which fresh boiler steam enters the cylinder.

It is usual to express the results of tests by giving the number of pounds of steam required per indicated horse-power hour; with saturated steam, figures as low as 11.2 lb. have been obtained, but for large well-designed engines the figure is more usually 13 or 14, and for ordinary compound engines 15 lb. is by no means a bad figure. When superheated steam is used—now a common practice—more economical results can be obtained, and figures as low as 9 to 10 lb. have been recorded in trustworthy trials, that is to say, a coal consumption of about 1.3 lb. per i.h.p. hour.

The steam-engine indicator, one of Watt's inventions, but greatly improved in details since his day, enables pressure-volume diagrams to be automatically drawn, giving not only a ready means of calculating very accurately the horse-power, but also of studying the action of the valves and of

determining the conditions of the steam at any point in the stroke after cut-off.

The mechanical efficiency of a steam-engine can be determined by absorbing the whole output of work by some form of brake—frictional or hydraulic—and the mechanical efficiency is the ratio of the work thus absorbed to the work done in the cylinder as determined by the indicator.

To determine the actual thermal efficiency of a steam-engine, its mean indicated horse-power must be determined for a selected period of time, the weight of steam used in the same period must be determined by measuring the weight of feed-water to the boiler, or the weight of condensed steam delivered by the air-pump, and the various pressures and temperatures of the water, steam, &c., must be accurately observed. From the data so obtained the efficiency can be calculated; tests should be made at full load, and at, say, $\frac{2}{3}$ load and $\frac{1}{2}$ load. The results, when plotted as graphs, showing total steam consumption per hour and steam per h.p. hour as compared with the h.p., will enable estimates to be made of the probable performance of the engine under any load. Where it is possible, brake tests should be carried out at the same time.

For other points, see articles STEAM, STEAM-TURBINE, ENERGY, THERMODYNAMICS, FUEL, SAFETY-VALVE, HORSE-POWER, INDICATOR-DIAGRAM, INJECTOR, AIR-ENGINE, INTERNAL-COMBUSTION ENGINES, RAILWAYS, SHIPBUILDING, &c. See also for theory, Cotterill's *Steam Engine as a Heat Engine*; Rankine's *Steam Engine*; Seaton's *Marine Engine*; Galloway's *The Steam Engine and its Inventors* (1881); Thurston's *History of the Steam Engine* (N.Y. 1878); Hughes's *Modern Locomotive* (1894); Ewing's *Steam Engine and other Heat Engines* (1926); Perry's *Steam Engine* (1899); Dalby's *Steam Power* (1915).

Steam-hammer, a contrivance originally invented by Nasmyth in 1839, and since greatly improved in design and increased in power, consists essentially of a heavy framing carrying on the top an inverted steam-cylinder; the piston of this cylinder is attached by its rod to the hammerhead, or tup, and on the ground between the framing is a fixed anvil. It is usually double-acting, and can be worked in four ways: (a) as a single-acting hammer, no steam being admitted above the piston, and the blow may be a dead one or a cushioned and elastic one—to secure this latter effect steam is readmitted under the piston before the blow is finished; (b) as a double-acting hammer—in this case the intensity of the blow is increased by admitting steam above the piston, and again the blow may be a dead one or a cushioned and elastic one. Of recent years powerful hydraulic presses have been substituted to a great extent for large steam-hammers in heavy forging work.

Steam-navigation. See SHIPBUILDING.

Steam-navvy. See EXCAVATORS.

Steam-plough. See PLOUGH.

Steam-turbine, a true rotary or non-reciprocating type of steam-engine. The working fluid, the steam, is either directed in the form of a jet or series of jets from one or several nozzles or guide-blades on to a series of vanes or buckets on the rim of the wheel, which is thus made to rotate; or the steam under pressure passes into the moving element of the wheel, and escaping by nozzles approximately tangentially, drives the wheel round by the reaction. The essential feature, in fact, is that the heat energy of the steam is first utilised to give motion to the steam, and thus give it kinetic energy, and then to do work upon the blades of the turbine.

Steam-turbines may be classed as (1) impulse or (2) reaction. The characteristic feature of the latter class is that the steam changes in pressure as it passes through the moving element of the wheel. Hero's aeolipile is an example of a pure reaction turbine, just as the De Laval turbine works purely by impulse. They may also be classed as (a) 'radial flow,' in which the steam either flows from the centre of the wheel outward to the circumference, or it may flow inward from the circumference to the centre; (b) 'parallel or axial flow,' the direction of flow being parallel to the axis of the wheel; (c) 'mixed flow,' in which there is both radial and axial flow. All three classes may be designed to work either as impulse or as reaction machines.

In order to understand the principle of the steam-turbine, it is necessary to consider the formation of the jet which is produced when steam is discharged under pressure. If we assume that the process is an adiabatic one, and if we neglect all frictional losses, the gain of kinetic energy is exactly equal to the loss of total heat, or, as it is commonly called, the 'heat-drop'; if we further assume that the initial velocity of the steam is

negligibly small, $\frac{V^2}{2g} = I_1 - I_0$, where V is the velocity acquired in feet per second, and I_1 and I_0 represent the total heat possessed by the steam in its initial and final conditions, hence it follows that $V = \sqrt{2g \times 1400(I_1 - I_0)}$, where I_1 and I_0 are measured in pound-calories, or $V = 300 \cdot 2 \sqrt{I_1 - I_0}$.

The volume occupied by the steam and its velocity both increase in value as the pressure of the steam falls during the process of expansion; at first the gain in velocity is relatively the greater, but in the later stages of the expansion the volume increases faster relatively than the velocity. This fact determines the cross-sectional shape of the nozzle through which the discharge takes place; the cross-section should contract from the entry to a narrow throat, and then should gradually enlarge to a size dependent on the final pressure of the steam.

In fig. 1 is shown somewhat diagrammatically the nozzle of a De Laval turbine set in the steam-chest D, and the moving buckets F. This nozzle

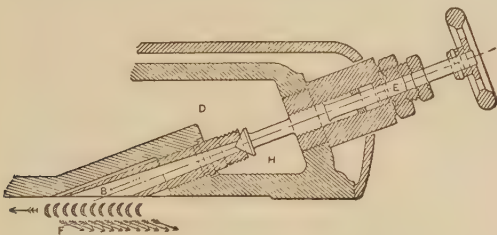


Fig. 1.—Nozzle for De Laval Turbine.

is of the divergent type; the throat or smallest cross-section is preceded by a rounded entrance so as to permit the stream lines properly to converge; then from the throat onwards the cross-section of the nozzle gradually enlarges, and is continued by a cylindrical shell cut off at B by a plane inclined at a small angle to the axis of the nozzle. In the figure the nozzle is shown fitted with a shut-off valve H, worked by the spindle E. A nozzle is properly designed when it provides for the discharge of a pre-determined amount of steam per unit of time, and when it allows such an expansion of the steam passing through it as to secure that the pressure of the steam leaving the discharge end of the nozzle shall be the same as that of the steam in the space into which discharge takes place.

It can be proved that the amount of steam discharged per unit of time by a nozzle depends only upon the initial steam-pressure and the cross-sectional area of the throat of the nozzle, and is quite independent of the final pressure, provided that the latter is not greater than about 0.545 of the initial pressure. The divergent portion of the nozzle enables the portion of the available heat-drop still unutilised to be employed in giving additional velocity to the steam. In a nozzle the expansion of the steam is too sudden for thermal equilibrium to be maintained; in the early stages of the expansion the steam is in a supersaturated state, and this condition is maintained beyond the throat, hence in this portion of the expansion the equation expressing the relation between the volume and pressure is $PV^{1.3} = \text{constant}$, and the steam-pressure in the nozzle-throat will be equal to 0.545 of the initial pressure. Owing to losses due to friction and other causes, the efficiency of nozzles is usually only about 0.9 to 0.95.

The De Laval turbine, the first patents in connection with which were taken out in 1882, carries out the whole expansion of the steam at a single step; or, in other words, the entire possible heat-drop is utilised at a single operation. The high-pressure steam enters one or more of the diverging nozzles shown in fig. 1, and issues from them in jet form and at an enormously high velocity, and impinges against the blades of the turbine-wheel, escaping at atmospheric or condenser pressure after giving up the greater portion of its kinetic energy to the wheel. In fig. 2 the thick curved line represents

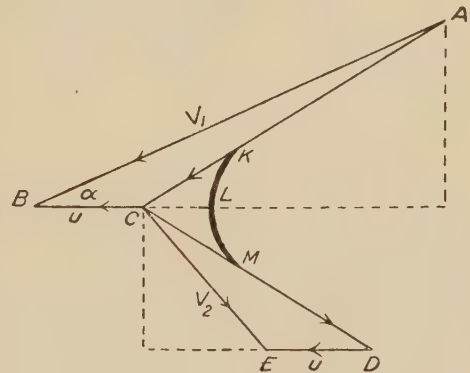


Fig. 2.—Velocity Diagram of Bucket of Turbine.

one of the buckets of the wheel, AB represents in direction and magnitude the velocity V_1 of the steam-jet as it leaves the nozzle, CB represents in direction and magnitude the velocity of the bucket, and hence AC represents in direction and magnitude the velocity of the steam 'relatively' to the moving bucket. The bucket deflects the steam-jet, and as the jet leaves the bucket its velocity 'relatively' to the bucket is denoted both in magnitude and direction by the line CD. Combining this with the actual velocity of the bucket itself, which is represented by the line ED=BC, we find that the line CE represents in direction and magnitude the absolute velocity V_2 of the jet after it has done its work upon the bucket. The steam has therefore lost, for each pound weight passing through the nozzle, energy in passing through the wheel proportional to the difference between $\frac{V_1^2}{2g}$ and $\frac{V_2^2}{2g}$.

The larger part of this has been transmitted to the shaft as useful work, but a certain proportion has been lost in friction of the steam on the bucket surface. The working of a De Laval turbine is

in fact almost analogous to the working of the well-known Pelton water-wheel. The wheel-shaft must of necessity revolve at an extremely high speed (in a 5 h.p. turbine the revolutions are 30,000 per minute, and in a 600 h.p. machine 9500), and special flexible supports carry this shaft; the speed is then geared down by connecting the power-shaft to the wheel-shaft by double helical tooth-gearing. In small sizes this turbine is relatively economical, but for generating large power compounded turbines are more economical. When worked with condensers the steam consumption of De Laval turbines per b.h.p. varies from 15 to 20 lb. per hour.

The De Laval is the only turbine of this type; other turbines are what is called compound, that is, there are a number of stages in the process of expansion, the total heat-drop being correspondingly divided into a number of stages, in each of which a new impulse is given to the steam after it has already given up a certain amount of kinetic energy to the turbine-blades it has just been in contact with. The number of such stages may be few, as, for example, in the Curtis type, or may be very many, as in the Parsons type. This division of the whole available heat-drop into a series of stages greatly reduces the necessary speed of rotation of the turbine-wheel to secure the best result, and the frictional losses due to the steam-jet rubbing against the blades are reduced; moreover, a steam-jet moving at excessive velocities, especially if it contains particles of water in suspension, exerts a cutting action on the wheel-blades.

The Curtis turbine is a pure impulse turbine; it uses what is termed a velocity-compounded wheel. There are two or more rings of jets, each taking up its own share of the energy of the steam. The action is as follows: A jet of steam, having acquired velocity in a fixed nozzle, impinges on a moving ring of blades, and gives up a certain portion of its kinetic energy to these blades. Leaving these moving blades with its velocity somewhat reduced, it impinges on a ring of suitably shaped fixed blades; these turn it in the proper direction to strike the second ring of moving blades, to which it gives up another portion of its kinetic energy; it may then go on to another ring of fixed blades, and from these to another ring of moving blades; and so on. The fixed blades merely change the direction of the stream; no loss of pressure takes place while it is passing over either fixed or moving blades. The Curtis turbine is generally worked on what is termed the compounded system; or, in other words, the available heat-drop is divided into two or more stages. Each stage consists of the nozzles and the wheel carrying the blades. In expanding through the first set of nozzles the steam pressure falls to that of the chamber in which are the first sets of moving and fixed blades. Having done its work in this chamber, the steam passes once more through a set of nozzles, the second set, into the second chamber, falling in pressure and again acquiring velocity. In this second chamber are a second series of moving and fixed blades, and the steam does further work in this chamber. From this chamber the steam may pass through a third set of nozzles, again falling in pressure and gaining velocity, into a third chamber with its series of moving and fixed blades, and so on until the complete available heat-drop has been utilised. This arrangement secures a moderate velocity at each stage, and a moderate speed of the blades. The Curtis turbine may have its shaft vertical, the wheels lying in horizontal planes, with the electric generator placed on top of the turbine, but when used for marine work the shaft is horizontal and the wheels lie in vertical planes. Many compound

impulse turbines utilise as the first stage of the expansion process a two-row Curtis wheel with partial admission, the nozzles being arranged in sets, one set supplying sufficient steam for, say, half load, two sets sufficing for the full load, and another set being only brought into use in case an overload is required. Since in modern turbine work superheating is practically always used, the Curtis wheel has certain practical advantages, as in the initial stage the steam temperature is reduced in the nozzles to a considerable extent before it comes into contact with the moving blades and the main portion of the turbine case, a matter of much importance if the casing is cast iron.

Another successful impulse steam-turbine is that designed by Rateau, which is like a series of De Laval wheels all strung on to the one shaft, each driven by the exhaust steam of the one before it. Each impulse-wheel is enclosed in its own chamber, and it is separated from the next by a diaphragm which contains the fixed vanes or nozzles which deliver the steam with increased velocity to the next wheel. To begin with, the fixed nozzles are only fitted to a portion of the circumference of the diaphragm. But the arc of the circumference over which the nozzles extend increases with each successive diaphragm. A turbine of this type was installed in the electric tramways generating station of the London County Council. The contract conditions specified that when running at 750 revolutions a minute, and supplied with steam at 180 lb. gauge pressure, and with a vacuum of 27 inches, each unit should be able to develop in normal working 5000 kilowatts with a power-factor of 0.85. The steam consumption under these conditions with the steam superheated to 500° F. was not to exceed 15 lb. per kilowatt hour, the vacuum being 28½ inches. It was also specified that each unit should be capable of taking a 25 per cent. overload at the same power-factor without the use of a bypass valve. The Zoelly turbine differs from the Rateau only in certain mechanical details.

The Parsons Turbine.—Mr (now Sir Charles) Parsons took out his first patent in 1884, and since that date he has so perfected and improved his turbines that turbines have now displaced the reciprocating engine for the generation of power on a large scale, both for marine and land work. His first successful condensing turbine was erected in 1891 for the Cambridge Electric Supply Company. It was a radial-flow machine, and under test it proved to be practically as economical in steam consumption as the best reciprocating steam-engine of equal power at that date. The Parsons turbine works in part by impulse and in part by reaction. The rings of moving blades receive the impact of the jets directed on to them by the fixed rings of blades. But in addition there is a drop of pressure in the moving-blade channels as well as in the fixed-blade channels, and to this extent, therefore, the turbine works by reaction. The steam is arranged to acquire velocity and to lose pressure to the same extent in a ring of moving as it does in a ring of fixed blades; each pair of rings of blades forms a 'stage,' the number of stages depending on the intended peripheral speed of the drum.

A section through a Parsons turbine is shown in fig. 3. This turbine was designed to develop 1500 kilowatts at 1500 revolutions per minute, when using steam at 175 lb. gauge, superheated 150° F. The rotor is made in four diameters; steam enters the casing at the annular port A, and passes away to the right-hand end through eight groups of blades before passing to the condenser. The end thrust on each of the four drums is balanced by a dummy piston of the mean diameter of the blading; these dummies are immediately to the left of the steam port A. Each drum is balanced separately by

means of equalising pipes shown on the figure, and this equalises the pressure on the dummy with that which acts on the drum. These pipes are all outside the casing, and they are curved so as to provide for expansion changes. For the purposes of overload, bypass steam is admitted to the port B.

The rotor is made of a steel forging machined inside and outside; the ends are bolted to heavy solid flanges on the two end shafts. The upper part of the casing is hinged to the lower at each end, so

that the turbine may be readily opened for inspection. For the reception of the moving and fixed blades, parallel grooves are turned in the rotor and bored in the casing. In these grooves the blades are inserted alternately with the distance or 'caulking' pieces made to the exact shape of the space between blades and groove walls, until the groove is filled with a complete ring of blades, and the distance pieces are then carefully caulked. A lacing strip let into notches cut in the blades is

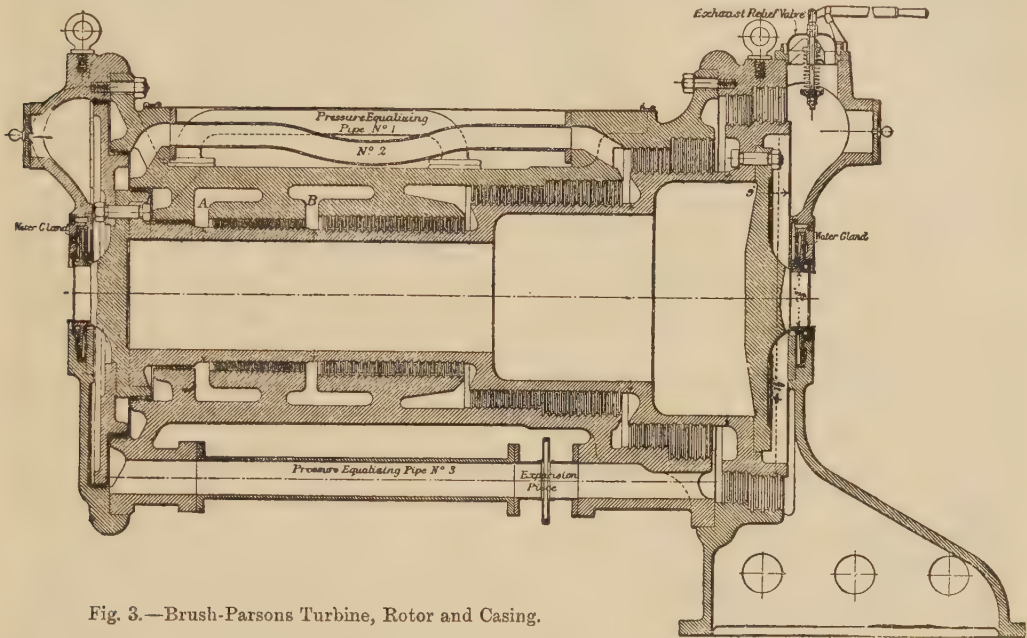


Fig. 3.—Brush-Parsons Turbine, Rotor and Casing.

then fixed in position, and finally cut at four or five places around the circumference to give flexibility and to allow for expansion. Each blade is reduced to a thin edge at its tip to diminish dangers of stripping. In the final stages leakage of steam past the blade tips is negligible, but with the short blades used in the earlier stages the leakage loss is serious unless special devices to reduce it are employed, and Parsons now shrouds the blade tips by means of a ring with a projecting sharp edge; this edge runs nearly in contact with a flat surface formed by one side of the bases of the next ring of blades, and there is a special device by means of which the clearance between the sharp edges and the flat surfaces can be adjusted to any desired amount. The roots of the rotor-blades and the grooves in the rotor into which they are fixed are corrugated to give more holding-power to the blades to resist the centrifugal forces. In the ideal form the steam passage should be continuously enlarged from row to row of the blades, so as to allow for the continuous increase in the volume of the steam as its pressure decreases. In practice it is more convenient to make the necessary changes in a comparatively few steps; in each step there are several rings of blades of the same size.

As an illustration of the wonderful development of the Parsons reaction turbine, the following particulars of a 50,000 kw. machine supplied in 1925 for a Chicago power-station are interesting. There are three cylinders, in the h.p. cylinder the boiler-steam at a pressure of 600 lb. expands through thirty-six stages to a pressure of 115 lb. absolute. The exhaust from the h.p. cylinder goes back to

the boiler-house to a reheater, where its temperature is raised to 700° F., then it passes through the i.p. cylinder and expands through twenty-three stages to an absolute pressure of 2 lb.; the exhaust from the i.p. cylinder then passes to the l.p. cylinder, where it expands in five stages down to a vacuum of 29½ inches; there are thus sixty-four stages in all. The blade-lengths vary from 2½ inches on the first ring to 40 inches on the sixty-fourth ring. The speed of the h.p. and i.p. shafts is 1800 revolutions per minute, that of the l.p. shaft 720, and the maximum blade tip velocity is 760 feet per second. It is estimated that when running at full load the normal electrical output will be equivalent to about one-third of the total heat supplied to the steam.

Application of the Steam Turbine.—On land the turbine has found its chief use in central stations for generating electrical energy on a huge scale for distribution over large areas of country for power and lighting purposes; being much more economical in steam consumption it has now practically entirely displaced the reciprocating steam-engine for such purposes. In the case of large units the turbine can be direct coupled to the alternator, and at the present day units of 20,000 kw. are in common use in central stations, and, as in the case of Chicago already mentioned, units of 50,000 kw. or of even greater output are not infrequently installed. The speed of the turbine may be from 1500 to 3000 revolutions per minute, which allows the best results to be obtained as regards consumption of steam. When continuous current dynamos are driven, it is usual to employ gearing between the turbine and the dynamo shafts.

For marine work, since the date of the successful trials of the famous *Turbinia* in 1897, and her performance at the great naval review in the Solent, the steam-turbine has almost displaced the reciprocating steam-engine. The decision in 1904 to fit the two great Atlantic liners the *Lusitania* and the *Mauretania* with turbines capable of developing the 70,000 h.p. required to drive them because of their exceptional size and speed was the turning-point in the struggle between the two types of steam-engines, and by 1918 over 15,000,000 turbine-generated horse-power was employed for marine purposes. In the *Aquitania* the turbines developed 60,000 h.p. and drove direct four propeller shafts each at 155 revolutions per minute. The two wing shafts had h.p. and l.p. turbines respectively, and the two middle shafts had a pair of l.p. turbines taking the steam in parallel; the steam thus expanded through three cylinders. For going astern the wing shafts had each a separate h.p. element running reversed, working in series with corresponding reversed elements on the l.p. turbines. In 1910 Parsons experimented with geared turbines on the *Vespasian*, a pair of 5-inch pinions on the high and low pressure turbine shafts was geared by double helical teeth with a wheel of 99½-inch diameter on the propeller shaft. The experiments were completely successful, and since 1914 the use of geared turbines for marine work has been greatly extended; by 1925 over 16,000,000 h.p. developed by geared turbines was in use; in the H.M.S. *Hood* 144,000 h.p. was supplied to the four propeller shafts through gearing. Both single and double reduction gearing are now employed in marine work, the latter being specially suitable for slow-speed steamers.

A steam-turbine can extract work out of steam when the pressure has become so low and the specific volume so great that an ordinary reciprocating engine would be quite ineffective. With the turbine it is, therefore, a matter of the utmost importance to maintain as perfect a vacuum as possible in the condenser, and various devices have been invented to secure this object, most of them based on Parsons's vacuum augmentor. In most cases the air is extracted from the condenser separately by means of two steam jets acting in series and discharging the air against atmospheric pressure. The condensed steam is dealt with quite independently by means of a small centrifugal pump delivering the condensate into the feed-tank. When there is an abundant supply of condensing water at a low temperature it is possible to obtain a vacuum of 29 inches.

The thermal efficiency of the steam-turbine has been steadily improved by increasing the temperature range, both by using higher boiler pressures combined with superheating and by securing a better vacuum in the condenser. In 1907 a steam consumption of 13·19 lb. per kilowatt hour was thought to be an excellent result—it meant that about 64 per cent. of the available heat-drop was utilised; in 1918 a test of a 25,000 kw. Parsons turbine gave a steam consumption of 10·84 lb. per kilowatt hour—in this case about 77 per cent. of the heat-drop was utilised.

By bleeding the steam at several points in the course of the fall of the pressure of the steam as it passes through the turbine for the purpose of heating the feed water, in combination with high initial pressure steam, high superheat, reheating the steam between the h.p. and the i.p. cylinder and the high vacuum now possible, a thermal efficiency of 33 per cent. may be obtained in the near future.

In a water-turbine there is no change in the volume of the working fluid—the same volume of water passes away into the tailrace as enters the

wheel; but in the case of steam it undergoes an enormous increase in volume as its pressure falls in passing through the turbine. For this reason a radial-flow turbine has many advantages, and was the type adopted by Sir Charles Parsons in the early days of his work; but difficulties connected with leakage at the tips of the blades led him to revert to the parallel-flow type. Another difficulty in turbine design arises from the necessity of securing a good ratio between steam speed and blade speed. In the radial type this difficulty might be got over, and many attempts were made to design such turbines to work with reasonable economy, but leakage difficulties always proved too serious an obstacle. Mr Ljungström, of Sweden, has, however, successfully attacked the problem, and designed a reaction turbine of the radial-flow type with high economy. In a test of a 5000 kw. machine the steam consumption was only 10·36 lb. per kw. hour, an extraordinarily good result.

To determine the horse-power given out by a steam-turbine the indicator cannot of course be employed, and for large turbines, especially those used for marine purposes, some form of torsion meter is now always employed. The angle of twist of a known length of the shaft is measured by a torsion meter while the turbine is running; then by a simple calculation, based upon the known cross-sectional dimensions of the shaft and the known modulus of rigidity of the steel out of which the shaft is made, the torque, M , of the shaft for the observed twist is determined; the work done by the turbine in foot-pounds per minute is equal to the torque M multiplied by 2π times the number of revolutions of the shaft per minute. The angle of twist is measured by the torsion meter by determining the relative angular displacement of two collars which are clamped to the shaft at a distance apart which is accurately known; optical or electrical methods are usually employed to make this measurement, and since the twist measured is always a very small angle, great care must be exercised in making the observations if the results obtained are to be at all reliable.

See H. M. Martin, *The Design and Construction of the Steam Turbine* (1913); Sir J. Ewing, *The Steam Engine* (1926); Stodola, *The Steam Turbine* (1905); Sir Charles Parsons, *The Steam Turbine* (1911); W. J. Goudie, *Steam Turbines* (1922); and numerous articles in *Engineering and Engineer*, 1900–1926.

Stearin, one of the fats occurring in animals and plants, may like the other fats be regarded as an ether of the triatomic alcohol glycerine, all three hydroxyl molecules being replaced by radicles of the fatty acid, stearic acid. It is the chief constituent of the more solid fats, such as mutton suet, and is characterised by its high melting-point—from 53° to 66° C.—by its slight solubility in alcohol as compared with palmitin and olein, and by its crystallising from its alcoholic solution in the form of brilliant quadrangular plates. For Physiology of Fats, see FATS. See also CANDLES, OILS.

STEARIC ACID, one of the solid fatty acids occurring as a glyceride (stearin) in most fats, is as known to commerce really a mixture of stearic and palmitic acids. Pure stearic acid, which may be easily separated from this mixture (by help of magnesium acetate, &c.), is a colourless crystalline substance having neither taste nor odour, and melts at 69° C. It is insoluble in water, on which it floats, but dissolves in alcohol and ether, its solution reddening litmus powerfully. The only stearates that are soluble in water are the stearates of the alkalis, whose solutions are frothy and form a lather. Free stearic acid occurs in decomposing pus and the caseous deposits of tuberculous. In combination it is found in faeces, in adipocere, in blood, and in serous fluids.

Stearns, WILLIAM AUGUSTUS (1805-76), born at Bedford, Massachusetts, studied at Harvard and Andover, was ordained to the Congregational ministry in 1831, and in 1854 became president of Amherst College. He published various addresses and discourses.

Steatite, or SOAPSTONE, a compact or massive variety of Talc (q.v.), is a hydrous silicate of magnesia, found massive, or assuming the forms of the crystals of other minerals which it has replaced. It is generally white, reddish white, or yellow, soft and greasy to the touch, and easily cut, but broken with difficulty. It is used by glaziers for marking plates of glass, and by tailors for marking cloth. It is also used in the manufacture of porcelain, by shoemakers in trying on new boots, in the process of casting, and for dressing some kinds of paper. Briançon Chalk, French Chalk, and Venice Talc, as it is called, readily absorbs oil or grease, and is the basis of Rouge (q.v.). It is used for imitating engraved stones, being easily cut, hardened by heat, and then coloured by metallic solutions. It also forms a polishing material for serpentine, alabaster, and glass. In China it is sometimes carved into images, miniature pagodas, &c.

Steatopygia, an exceptional accumulation of fat on and about the human buttocks, behind and round to the front of the thigh; common in Bushmen (q.v.) and Hottentots, and occurring also in central African pygmies, and specially conspicuous in women. In some tribes it is considered ornamental. The representation of this human formation in the prehistoric caves of France has been held to support the theory that a steatopygous race, possibly cognate with the African one, once existed in Europe.

Steatornis. See GUACHARO.

Stebbing, THOMAS ROSCOE REDE (1835-1926), born in London, studied at King's College School and King's College, and at Oxford was a scholar of Lincoln and a fellow of Worcester, where he was a tutor. He devoted himself to natural history, prepared the *Challenger* Report on the Amphipoda, and specially concerned himself about the Crustacea. His works include *A History of the Crustacea* and *Essays on Darwinism*, as well as a translation of Longinus *On the Sublime*.

Stedman, CHARLES (1753-1812), born at Philadelphia, Pennsylvania, was educated at William and Mary College, and studied law. He served under Howe and Cornwallis on the royalist side, and wrote a standard history of the Revolutionary War from the British point of view, specially valuable for its military maps.

Stedman, EDMUND CLARENCE (1833-1908), poet and critic, was the son of a merchant at Hartford in Connecticut. He studied at Yale, and early took to journalism, was on the staff of the *New York Tribune*, and was war-correspondent of the *New York World* during the war, but ultimately became a stockbroker at New York. He contributed actively to the more important magazines, and published various collections of verse: *Alice of Monmouth*, *An Idyl of the Great War*; *The blameless Prince*; *Hawthorne and Other Poems*; *Lyrics and Idyls*. His *Victorian Poets*, a handbook to the poetic literature of England for two generations, appeared in 1875, was at once accepted as a work of standard value, and passed through many editions. The *Library of American Literature*, edited by him in conjunction with Ellen M. Hutchinson, was completed in 1890 in 11 volumes. Some of his lyrics are very fresh and admirable, and most of his work shows careful and artistic finish. As a critic, he was less remarkable for profound insight or discrimination than for breadth and sympathy.

Steedman, CHARLES (1811-90), born at Charleston, S.C., became a naval officer, was attached to the naval observatory at Washington, and in the Civil War did distinguished service on the Federal side. Afterwards he commanded the Boston Navy Yard, and retired a rear-admiral.

Steel. See IRON AND STEEL.

Steel, FLORA ANNIE, née WEBSTER, born at Harrow, 2d April 1847, married a Bengal civilian, and lived in India 1867-89, returning subsequently to England. She was for some time inspectress of government schools in the Punjab. In conjunction with Colonel (afterwards Sir Richard) Temple she published in 1884 *Wide Awake Stories* and a collection of Punjab folk-tales. After her return she produced a series of novels and short stories illustrating Indian and Anglo-Indian life. Among the best known of her works are *From the Five Rivers*, *Red Rowans*, *On the Face of the Waters*, *The Hosts of the Lord*, *A Book of Mortals*, *India through the Ages* (a history), *A Prince of Dreams*, *The Gift of the Gods*, *Mistress of Men*, and *The Law of the Threshold*.

Steelbow (a word of doubtful origin), in Scots law, means goods, such as corn, cattle, straw, and implements of husbandry, delivered by the landlord to his tenant, by means of which the latter is enabled to stock and labour the farm, and in consideration of which he becomes bound to return articles equal in quantity and quality at the expiration of the lease.

Steele, SIR RICHARD, the father of the Queen Anne essay, was born in Dublin in March 1672 (n.s.), and was there baptised at St Bridget's Church. His father, Richard Steele of Mountain (Monks-town), was an attorney; his mother had been a widow named Elinor Symes. His father died when he was a child (*Tatler*, No. 181). Mrs Steele did not long survive her husband, and the boy fell to the charge of an uncle, Henry Gascoigne, secretary to the first Duke of Ormond. Through Ormond's influence, in November 1684 Steele was placed upon the foundation at the Charterhouse, where he had Addison, his junior by six weeks, for contemporary. In December 1689 he entered Christ Church College, Oxford, and in March 1690 he matriculated. He tried hard for a Christ Church studentship, but eventually (in 1691) gained a post-mastership at Merton. At the university he was popular and respected, but in 1694 he suddenly enlisted as a cadet in the second troop of Horse Guards, then commanded by the second Duke of Ormond, thereby surrendering, according to his own account, some rather vaguely described expectations as a Wexford landowner. Already at college a dabbler in verse, in 1695 he made his appearance as a printed poet by *The Procession*, a conventional effusion on the funeral of Queen Mary, which he dedicated to John, Lord Cutts, who forthwith made him his secretary, and finally gave him a standard in his own regiment of Coldstream Guards. In June 1700 he became involved in a duel with an Irishman named Kelly, whom he had the misfortune to wound severely. One outcome of this occurrence was the production of the devotional manual known as *The Christian Hero*, which was written at the Tower Guard, and published in April 1701. With the public it was popular, but, as might be anticipated, it was regarded by Steele's military comrades as incompatible with his calling as a 'gentleman of the army,' 'From being thought no undelightful companion,' he 'was soon reckoned a disagreeable fellow;' and the necessity to 'enliven his character' drove him to the odd expedient of writing a play. This, *The Funeral*; or, *Grief à la Mode*, was acted at Drury

Lane in December 1701. It was followed in 1703 by *The Lying Lover*, and in 1705 by *The Tender Husband*. About this time, it is supposed, being now a captain in Lord Lucas' Regiment of Foot, he engaged in certain researches for the 'philosopher's stone,' the details of which rest mainly upon the authority of that 'cornucopia of scandal,' the *New Atalantis* of Mrs De la Rivière Manley, although the fact of the researches is not denied. Their failure is practically synchronous with his marriage to a widow named Margaret Stretch (with estates in Barbadoes). The marriage took place in 1705, and the lady died two years later. In August 1706 Steele was appointed gentleman-waiter to Queen Anne's consort, Prince George of Denmark; and a few weeks after his wife's death, upon the recommendation of Arthur Mainwaring (who, like Steele, was a member of the Kit Cat Club), he was appointed by Harley, then a Secretary of State, to the post of Gazetteer, the annual salary of which was increased to £300. By this time, it is presumed, he had quitted the army; but he continued to be spoken of as 'Captain' Steele. The next notable occurrence in his life was his second marriage, in September 1707, to the beautiful Miss Mary Scurlock, the daughter of Jonathan Scurlock, deceased, of Llangunnor in Carmarthen, and the 'Prue' of her husband's correspondence. Shortly afterwards, by the death of Prince George, he lost his court appointment. Then, without much warning, appeared on the 12th April 1709, the first number of the famous tri-weekly paper known as the *Tatler*, the putative author of which was one 'Isaac Bickerstaff,' a pseudonym borrowed from Swift. In January 1710, during the course of the *Tatler*, Steele was made a commissioner of stamps, and for some obscure reason was deprived of his gazetteership. The *Tatler* came to an end on 2d January 1711, to be succeeded in March by the more famous *Spectator*, which ceased 6th December 1712. To the *Spectator*, in March 1713, followed the *Guardian*. In all these enterprises Steele enjoyed the aid, as a contributor, of his friend and schoolfellow Addison—an aid the incalculable value of which he acknowledged with loyal cordiality. 'I fared (he said) like a distressed prince, who calls in a powerful neighbour to his aid; I was undone by my auxiliary; when I had once called him in, I could not subsist without dependence on him' (Preface to *Tatler*, vol. iv.).

In beginning the *Guardian* Steele had made prudent profession of abstinence from political questions. But the moment was not favourable to restraint, even for less earnest men. From his youth he had been an ardent adherent of the Revolution, and now, as it was thought, the Hanoverian succession was in jeopardy. Before April 1713 he was involved in a bitter quarrel with Swift. Then the disquieting rumours that the demolition of the Durkirk fortifications, which was provided for by the treaty of Utrecht, would not be insisted on drew from him an indignant pamphlet entitled *The Importance of Dunkirk consider'd*, to which Swift, on the other side, grimly retorted with *The Importance of the 'Guardian' consider'd*. Steele in the meantime had resigned his commissionership of stamps, and entered parliament as member for Stockbridge, concurrently dropping the *Guardian* for the professedly political *Englishman*. Shortly afterwards he published *The Crisis* (1714), a pamphlet on the Hanoverian succession, to which Swift replied with matchless irony by *The Publick Spirit of the Whigs*. When Steele actually entered upon his duties in the House he found he was a marked man. He was promptly impeached for seditious utterances in *The Crisis*, and, although he made a capable defence, was expelled. But with Anne's death, a few months subsequently, his party came

into power and his troubles ended. In his best pamphlet, *Mr Steele's Apology for Himself and his Writings* (1714), he has given his own account of this part of his career.

That career, as far as literature is concerned, practically closed at this point. He again became a member of parliament, being returned for Boroughbridge; and a little later, upon presentation of an address to King George I., was knighted. He continued to produce periodicals and pamphlets, none of which are of great importance, though one of them, *The Plebeian*, had the effect of involving him in a painful controversy with his friend Addison. He was made a patentee of Drury Lane Theatre, where in 1722 he produced *The Conscious Lovers*, his best comedy. He also established the *Censorium*, a sort of æsthetic music-hall; and he devised an impracticable 'fish-pool' or well-boat for bringing salmon alive from Ireland. In December 1718 he lost his wife. He survived her for nearly eleven years, dying ultimately, 1st September 1729, at Carmarthen, where he was buried in St Peter's Church. Of his four children only two were living at his death. His daughter Mary soon followed her father; and the remaining and eldest child, Elizabeth, married a Welsh judge, afterwards the third Lord Trevor of Bromham.

Steele's character has suffered from various causes, among which may be reckoned the animosity aroused by his political writings, the careless candour of his own admissions of frailty, and the habitual comparison of his weaknesses with the colder and more equable goodness of Addison. He has been specially branded as intemperate, but there is no sufficient evidence why in this respect he should be singled out from his contemporaries. That he was incurably sanguine, and that he constantly mistook his expectations for his means, is manifest from his lifelong embarrassments. But these were the result of an improvident temperament and an uncertain income rather than of a vicious habit of mind; and he made a noble and successful attempt to pay his debts before he died. Upon the whole he was a warm-hearted and benevolent man, a devoted husband (some of his letters to his wife are among the most unfeigned in the language), a loving father, and a loyal friend.

As a literary man he may be more exactly estimated. Though he wrote verse, he has no claims as a poet. His plays are commendable efforts in the direction of the stage-purification advocated by Jeremy Collier; but their feeling for humorous character is more notable than their stage-craft, and they have never kept the boards. His political pamphlets were honest and straightforward, but not effectively polemical; and he had a terrible enemy in Swift, who as a former friend had learned his adversary's weakest side. His fame rests almost wholly upon his performances as an essayist. And here he was by no means the colourless colleague of Addison that is sometimes supposed. On the contrary, he was nearly always the fore-running and projecting spirit, and his ready sympathies and quick enthusiasm occasionally carried him to an altitude which Addison never attained. If he wanted Addison's restraint, his distinction, his exquisite art, he nevertheless rallied folly with admirable good-humour, rebuked vice with unvarying courage and dignity, and earned for himself the lasting gratitude of the 'beautiful sex,' as he called them, by the chivalry, the manliness, and the genuine respect with which, almost alone in his age, he spoke of women.

Steele has been written of by Macaulay and Thackeray, but most sympathetically by John Forster (3d ed. 1860). See the Memoir (1886) by Austin Dobson, the writer of the above article, and the detailed Life (1889) by G. A. Aitken.

Steell, SIR JOHN, R.S.A., sculptor, was born at Aberdeen in 1804, the son of a carver and gilder. He received his education as an artist at Edinburgh Academy, and afterwards at Rome. In 1832 he modelled 'Alexander and Bucephalus,' which, however, was not cast in bronze until 1883, being erected in Edinburgh the year after. The promise of this early work he subsequently fulfilled. Most of his chief works are in Edinburgh: the colossal figure of Queen Victoria crowning the front of the Royal Scottish Academy, which procured him the honorary appointment of Sculptor to Her Majesty in Scotland; the statue of Scott in the Scott Monument; the equestrian statue of the Duke of Wellington (1852); statues of Professor Wilson, Allan Ramsay (1865), and Dr Chalmers (1878). At the inauguration of the equestrian statue of Prince Albert in 1876 Steell was knighted. Other works, in bronze or marble, are statues of Admiral Saumarez in Greenwich Hospital; of the Marquis of Dalhousie at Calcutta; of Sir Walter Scott (1872) at New York; and of Burns at New York (1873), Dundee, and London. He died 15th September 1891.

Steelyard. See BALANCE. And for the London Steelyard, HANSEATIC LEAGUE.

Steen, JAN, Dutch painter, the son of a Leyden brewer, was born in that city in 1626, went (it is believed) to Haarlem about 1644 and studied under Adrian van Ostade, joined the Leyden guild of painters in 1648, for some time carried on the trade of a brewer at Delft, and died in his native city in 1679. Steen was a painter of the same stamp as Rembrandt. A sympathetic observer of human life, he painted genre-pictures from every plane of life, the lowest as well as the highest. Although there is a decided ethic leaven in his work, it is softened by the spirit of sympathetic toleration and lightened by the play of comedy. The grave humour of his style is best seen in such pictures as the 'Doctor Visiting his Patient,' a 'Cavalier giving Lessons on the Guitar to a Lady,' 'Domestic Life,' 'Tavern Company,' 'The Oyster Girl,' 'Work and Idleness,' 'Bad Company,' 'Old Age,' and particularly the pieces of childhood (e.g. the pictures called 'St Nicholas' and 'Twelfth Night'). See the Study (in German) by Rosenberg (1897).

Steenstrup, JOHANNES IAPETUS SMITH, zoologist, was born at Vang in Norway on 8th March 1813, taught on mineralogical subjects at Sorø in Denmark, and from 1845 to 1885 was professor of Zoology at Copenhagen and director of the zoological museum. His books treat principally of hermaphroditism in nature, alternation of generations, flounders' eyes, and Cephalopods. He also took a keen interest in exploring turf-moors and kitchen-middens. He died 20th June 1897.—Hisson, JOHANNES STEENSTRUP (b. 1844), professor of Northern Antiquities at Copenhagen, has written on Viking life and times, *Normannerne* (1876-82), and other works on Danish archaeology and ancient literature.

Steenwijk, HENDRIK VAN (c. 1550-1603), Dutch painter of architectural interiors, settled at Frankfort in 1579.—His son HENDRIK (1580-1649) came to London in 1629, and died there.

Steeplechase, a horse-race in which hedges (called 'fences' in horse-racing language) and ditches have to be leapt by the competing horses. The first race of this kind on record took place in Ireland in 1752, from the church of Buttevant (Co. Cork) to the church of St Leger, a distance of 4½ miles. The name, however, is said to have originated in a race run in Ireland in 1803 by a merry party of fox-hunters who agreed to race in a straight line towards a steeple visible in the distance. The sport began to assume its existing

shape about the year 1831. In 1866 the Grand National Hunt Committee was formed for the purpose of laying down rules and regulations for the proper conduct of steeplechase meetings. The principal race in this class of sport is the Grand National, instituted at Liverpool in 1839, where it is still run annually; this is almost the only steeplechase which is actually partly run over a hunting country, most of the others taking place on artificial courses. The Grand Military Meeting takes place at Sandown Park, Esher. Steeplechases have always been greatly in favour in Ireland.

See *Horse-racing and Steeplechasing*, by Arthur Coventry and Alfred E. T. Watson (Badminton Library, 1889), and Blew's *History of Steeplechasing* (1900).

Steer, P. WILSON, an important representative of the New English Art Club, was born at Birkenhead in 1860, studied in France, and at first was largely influenced by the Impressionists, though later he restricted himself in choice of pigments and laid more stress on line and form. He is almost equally distinguished as a figure-painter and landscapist.

Steering. A vessel may be steered by hand, steam, hydraulic, or electric power. When on board a vessel and looking towards the bow, the right-hand side of the vessel is called the *starboard* side, and the left-hand, the *port* side (formerly called the *larboard* side). When steering by hand with a free tiller projecting forward from the rudder head, the order 'port the helm' demands that the free end of the tiller be moved towards the *port* side of the vessel, and this gave rise to the terms of the order. The rudder is by this operation swung over towards the *starboard* side of the vessel and her head turns to the *starboard* side—when going ahead. Where a wheel is used the gearing is so fitted that to 'port the helm' the top of the wheel must be turned towards the *starboard* side of the ship, and her head, as before, turns to the *starboard* side—the idea being to preserve the same result as with a free tiller. The effect of the order to 'starboard the helm' is precisely the opposite of all this. The foregoing is the British rule; but some nations obey these orders by putting the wheel the opposite way to the above, therefore to 'port the helm' the top of the wheel is turned to the *port* side and the vessel's head turns to *port*.

A 'balanced' rudder is one which has about one-third of its area before the axis about which the rudder rotates. Bow rudders, as well as stern rudders, are fitted to ferry-boats, &c. where such vessels are required to run with either end first; one rudder is locked while the other is in use. Two rudders at the stern have been tried with good effect in special cases. The adoption of twin screw-propellers (one on each side of the line of keel) has enormously increased the rapidity of steering, by working one propeller only, or by simultaneously working one ahead and the other astern. A single screw-propeller has of itself a twisting action on the hull, more especially when the propeller is going astern, the effect being to turn the ship's head the opposite way from that in which the propeller rotates. In all these cases, while it is usual to speak of the rudder, propeller, &c. turning the ship's head, the ship's stern also turns the opposite way from the direction in which the ship's head turns. For steering racing boats, see ROWING. See also BOAT, YACHT, RULE OF THE ROAD.

Steevens, GEORGE, Shakespearian commentator, was born at Stepney in 1736, the son of an East India Company director, and became a foundation at Eton and scholar of King's College, Cambridge. He was kept in hot water all his days through his meddlesome and sarcastic temper and his dishonourable habit of making bitter attacks

on his friends from behind the anonymity of newspapers like the *St James's Chronicle* and the *Critical Review*. Johnson's judgment was almost too lenient when once, in reply to Beauchlerk's assertion 'He is very malignant,' he said, 'No, sir, he is not malignant. He is mischievous, if you will. He would do no man an essential injury; he may indeed love to make sport of people by vexing their vanity.' At another time Johnson hit him off in the phrase, 'He lives like an outlaw.' Another favourite trick of Steevens was to set up mock commentators, as Anner and Collins, on whom to father dirty annotations he did not wish to own. Steevens died at Hampstead, 22d January 1800, and was buried at Poplar under one of Flaxman's monuments. He began his literary life in 1766 with a reprint from the original quartos of *Twenty of the Plays of Shakespeare* (4 vols.). This work caused him to be employed as collaborator with Johnson in his edition (1773). Of this latter work a second edition appeared in 1778, to which Malone had contributed, and the latter printed in 1780 by way of supplement the doubtful plays and the poems, an act of independence which the jealous Steevens could not endure. Steevens now set to work, with the help of Isaac Reed, upon a completely new edition of *Shakespeare* (1793; 1803), in which 'instead of a timid and servile adherence to ancient copies,' is adopted the 'expulsion of useless and supernumerary syllables, and an occasional supply of such as might fortuitously have been omitted.' This doctored text held its authority till the publication of Malone's posthumous edition, the famous *Variorum Shakespeare* (ed. by Boswell, 21 vols. 1821). In his great edition Steevens did not print the poems of Shakespeare, 'because the strongest act of parliament that could be framed would fail to compel readers into their service.'

Stefanie, or STEPHANIE, LAKE, in Abyssinia, 35 miles long and 1900 feet above sea-level, lies 50 miles east of the north end of Lake Rudolf, and like it was discovered in 1888 by Teleki and Hölnel.

Stefánsson, VILHJÁLMUR, Arctic explorer, was born of Icelandic parentage on 3d November 1879 at Arnes, Manitoba, and educated at the state universities of North Dakota and Iowa and at Harvard, where for a time he was assistant-instructor of anthropology. After two expeditions to Iceland in 1904 and 1905, he took part in an ethnological expedition to the Eskimo of the Mackenzie delta (1906-7) and in the Arctic expedition under the auspices of the American Museum of Natural History and the Geological Survey of Canada (1908-12), a notable discovery being the Horton River, 500 miles long. In 1913-18 he headed the Canadian Arctic Expedition in its explorations north of Canada and Alaska, discovering new land north of Prince Patrick Island and west of Axel Heiberg Island, and exploring the Beaufort Sea. In 1924 he made a journey to the Macdonnell Ranges in the heart of Australia. Stefánsson's writings include *My Life with the Eskimo* (1913), *The Friendly Arctic* (1921), *The Adventure of Wrangel Island* (1925), *The Folklore of the Eskimos* (1927), and numerous contributions to scientific journals.

Steffani, AGOSTINO (1655-1730), priest, operatic composer, diplomatist, and friend of Handel, was born at Castelfranco, and served at the court of Hanover.

Steffens, HENRIK (1773-1845), born at Stavanger in Norway, studied at Copenhagen and in Germany, lectured at Kiel and Copenhagen, was professor at Halle and Breslau, and in 1832 went to Berlin. He was deeply influenced by Schelling and Schleiermacher, and in turn, and as one of the 'Philosophers of Nature,' influenced Ehlerschlager and Grundtvig. See a work by Petersen (1874).

Stegomyia. See GNAT, YELLOW FEVER.

Stegosaurus, one of the Jurassic Dinosauria (q.v.), as big in the body as a large elephant, with the (disproportionately long) hindlegs twice as tall as a well-grown man. The forelegs, on the other hand, were not a fourth of that length, and the head (and brain) were singularly small in proportion to the animal's size. The ridge of the creature's back was diversified with a deeply segmented crest. See Ray Lankester's *Extinct Animals* (1905).

Stein, CHARLOTTE VON (1742-1827), the friend of Goethe, married in 1764 the Duke of Saxe-Weimar's Master of the Horse. Her friendship with Goethe was broken by his relations with Christiane Vulpius (1788), but renewed before her death.

See German Lives of her by Düntzer (1847) and Bode (1910), and that by Calvert (New York, 1877).

Stein, HEINRICH FRIEDRICH CARL, BARON VOM, Prussian statesman, was born at Nassau on 26th October 1757. He prepared himself for public life at Göttingen (1773-77), and entered the service of Prussia in 1780. In 1804 he was summoned to take charge of the Prussian excise, customs, manufactures, and trade, but was unable then to modify the traditional methods, and resigned in 1807. After the Treaty of Tilsit Frederick-William III. had no alternative but to recall Stein, who in barely a twelvemonth wrought such changes as laid the foundations of Prussia's subsequent greatness. He abolished the last relics of serfdom, did away with the privileges of caste, freed land from the shackles of feudalism, created peasant proprietors, extirpated monopolies and hindrances to free trade, promoted municipal government, and supported Scharnhorst in his schemes of army reform. Napoleon insisted upon his dismissal, and Stein withdrew (1808) to Austria, but not before issuing his *Political Testament*. In 1812 he went to St Petersburg and forwarded the coalition against Napoleon. From the battle of Leipzig to the Congress of Vienna he was the ruling spirit of the opposition to the emperor. After the congress Stein, who was dissatisfied with its conclusions and the reaction that followed, gradually withdrew into private life. He died on 29th June 1831.

See the Lives by Pertz (6 vols. 1849-55), Seeley (3 vols. 1878), and Lehmann (1902-5).

Stein, SIR MARC AUREL, K.C.I.E., born at Budapest in 1862, as principal of colleges at Lahore and Calcutta carried out explorations for the government in Kashmir and elsewhere, and was made archaeological superintendent on the NW. frontier. In 1900-1, 1906-8, and 1913-16 he made very important explorations in Chinese Turkestan, the Gobi Desert, Central Asia, and Persia. His *Sand-buried Cities* (1903), *Ancient Khotan* (1907), *Ruins of Desert Cathay* (1914), *Serindia* (1922), and other works tell how from beneath the sand he uncovered shrines, temples, sacred grottos, watch-towers, military stations, and towns, and recovered notable MSS. and objects of art, Greco-Buddhist, Hindu, Tibetan, Chinese, and unknown scripts and types—frescoes, tablets, seals, paper documents, &c. He was knighted in 1912.

Steiner, JAKOB (1796-1863), born at Utzendorf, Bern, from 1834 was a Berlin professor, and by some mathematicians was regarded as the greatest geometrical genius since the days of the Greeks. See memoir by Geiser (1874).

Steinitz, WILLIAM (1836-1900), born at Prague, was chess champion of the world 1862-94, when Lasker defeated him. He settled in America.

Steinkerk, or STEENKERKE, a village in the Belgian province of Hainault, 5 miles N. of Soignies, was the scene of William III.'s defeat by the French under Luxembourg, 3d August 1692.

Steinle, EDUARD JAKOB VON (1810-86), born

in Vienna, became professor of art at Frankfort, and painted frescoes and oils of religious, romantic, and poetic subjects. He was influenced by Overbeck and Veit, and in turn deeply influenced Lord Leighton.

Steinlen, THÉOPHILE ALEXANDRE, born in 1859 at Lausanne, became known by his work in the illustrated French papers as a poster-designer and as a portrayer of Parisian low life. See *Steinlen and his Art* (cartoons and notes; 1912).

Steinmetz, CARL FRIEDRICH VON, Prussian general, born at Eisenach on 27th December 1796, fought through the campaign of 1813-14, winning the iron cross for valour, and in the war of 1866 routed three successive Austrian corps (June 27-29). On the outbreak of the Franco-German war of 1870 he was put in command of the right wing of the German advance; but he proved unequal to the task committed to him, especially at Gravelotte, and after that battle was nominated governor-general of Posen and Silesia. He died at Bad Landeck on 4th August 1877.

Steinthal, HEYMANN, was born at Gröbzig in Anhalt, 16th May 1823, studied philology and philosophy at Berlin, and from 1850 became a lecturer in the science of Language and Mythology. The years 1852-55 he gave to the study of Chinese at Paris, and in 1863 became an extra-ordinary professor of the science of Language at Berlin, from 1872 also lecturing at the Jewish High School on Old Testament criticism, ethics, and the philosophy and history of religion. His writings bear the stamp of a powerful intellect and of learning remarkable at once for profundity and width of range. His method shows the influence of W. von Humboldt, whose philological works he edited (1884). He died 14th March 1899.

Among his works are *Der Ursprung der Sprache* (1851); *Klassifikation der Sprachen* (1850), worked up later into the important book, *Charakteristik der hauptsächlichsten Typen des Sprachbaues* (1860); *Die Entwicklung der Sprache* (1852); *Grammatik, Logik, Psychologie* (1855); *Geschichte der Sprachwissenschaft bei den Griechen u. Römern* (1863); *Die Mande-Negersprachen* (1867); *Allgemeine Ethik* (1885). With Lazarus he edited from its foundation in 1860 the *Zeitschrift für Völkerpsychologie und Sprachwissenschaft*.

Steinway, HEINRICH ENGELHARD (1797-1871; originally STEINWEG), founded a piano-factory in the town of Brunswick, but in 1850 transferred the business to New York, leaving the German branch to be carried on by the eldest son.

Stella. See SIDNEY (PHILIP), and SWIFT.

Stellaland, a short-lived South African republic, formed in 1882 by Boer adventurers, but taken over by the British and incorporated (1895) in Bechuanaland (q.v.). The chief town, Vryburg, 125 miles N., now gives name to the district.

Stellaria. See CHICKWEED.

Stellenbosch, a South African town (pop. 7000), in a fertile vine-clad valley, 25 miles E. of Cape Town by rail, with a university.

Steller's Sea-cow. See RHYTINA.

Stelvio Pass (Ger. *Stilfserjoch*), the highest carriage-road across the Alps (9042 feet), leads from Bormio in the Valtelline for over 30 miles to the Val Venosta. It was completed by the Austrian Government in 1825, but is now entirely in Italian territory. A tunnel is projected.

Stem, the ascending axis of a plant, which usually bears leaves and flowers, and maintains communication between the roots and the leaves. In the Thallophytes no stem is differentiated. Among the Bryophytes some of the Liverworts again show only a thallus. In others, and in the Mosses, stem and leaf are differentiated. The moss stem may have simple conducting elements, long thin-

walled cells, sometimes associated with strengthening elements, connecting with the midribs of the leaves. The Mosses, however, are off the main road of development, and we confine ourselves here to the stems of higher plants.

Stems vary greatly in general habit; they may be upright and unbranched as in palms, or upright and much branched as in the oak; they may be scramblers as in the bramble, or twiners as in the hop, or climbers as in the ivy and Virginian creeper; they may be prostrate as in the strawberry, or underground root-like 'rhizomes' as in the Iris. Their usual function of lifting the leaves and flowers off the ground into the fresh air and sunlight may thus be lost, or subordinated to some other function, such as storage of nutritive material, as in the 'corms' of the crocus and 'tubers' of the potato, or storage of water, as in some succulents. When the rind is green it may assimilate as leaves do, and this is very important in such stems as those of cactuses, whose leaves are reduced to spines. It may also happen that branches of the stem are modified into flattened, leaf-like phyllodes as in *Ruscus*, into thorns as in the hawthorn, into tendrils as in the vine.

The stem is in many ways markedly contrasted with the descending axis or root, but few of the distinctions are rigid. Thus, most stems have some chlorophyll, which is absent from roots except perhaps in the case of one or two of aerial habit. Stems usually bear leaves, which roots never do. The tip of a stem is almost invariably a naked-growing point, while that of a root is usually protected by a root-cap. The branches of a stem arise as superficial outgrowths (buds), while rootlets arise from rudiments which develop in an internal layer in flowering plants the pericycle). The stem has a persistent tendency to grow upwards, while the root seeks the centre of the earth, and in regard to other forces than that of gravity, stem and root usually behave in opposite ways. See PLANTS (*Movements*).

In describing aerial stems we distinguish the nodes from which the leaves arise from the intervening internodes, the buds which appear in the axils of leaves from that which forms the apex, or from those which appear arbitrarily or adventitiously, the leaf-bearing branches from the flower-stalks, and so on. The branching of the stem is usually lateral, but there are divergent forms, such as false dichotomy in the mistletoe, false axis in the vine, or true dichotomy in some Lycopods (see BRANCH).

In order to present a clear picture of the internal structure of a stem, it will be convenient to restrict our attention in the first place to the young twigs of some Dicotyledonous tree, such as the oak.

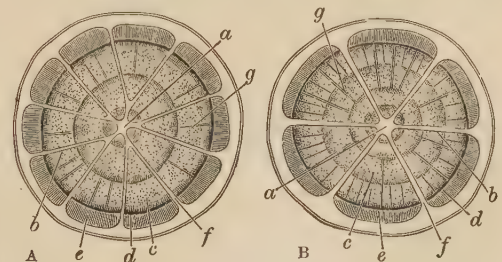


Fig. 1.—Diagrammatic cross sections of a young Dicotyledonous Stem:

A, a two-year old stem; B, a three-year old stem: a, pith; b, primary medullary rays; c, wood, in two layers in A, in three layers in B; d, cambium ring; e, bast; f, cambium (interfascicular) between the bundles; g, secondary medullary rays.

Every one knows that it is easy to peel off the 'bark' and to leave the white wood bare. This is

possible because the region known as the bark is separated from the internal wood by a cylinder of delicate, readily ruptured, actively dividing cells—the ‘cambium.’ When a ring of bark is cut off a tree, the leaves do not wither; therefore we conclude that the water which ascends from the roots passes up by the wood. But if in the ‘ringing’ the young wood be also cut, the leaves wither rapidly; therefore it is by the young wood that the water ascends—a conclusion corroborated by the fact that a tree may flourish well although its heart-wood has rotted away. But the wood includes many different kinds of elements—long vessels, tracheide cells, wood-parenchyma, and wood-fibres. It is certain that the younger tracheides and vessels are the paths for the ascent of the water. Again, if we tie a string very tightly around a stem so as to compress the bark, the stem sometimes swells just above the stricture; and if there be a fruit growing from the stem on that region, it will increase greatly in weight. This suggests that the nutritive materials elaborated in the leaves pass down outside the wood. But the tissue outside the wood and the cambium cylinder includes many different kinds of elements—an external epidermis, perhaps some cork, some softer rind or cortex, a set of hard bast-fibres, and, most internally, what is called soft-bast, including long ‘sieve-tubes’ and also ‘cambiform-cells.’ It is certain that this soft-bast is very important in the downward passage of elaborated sap.

If we examine—by means of thin sections—the delicate growing point of the stem, we find that it consists of an external epidermis and of an almost homogeneous ‘fundamental tissue.’ As we pass in our examination from the tip downwards—that is, to slightly older parts—we notice that within the fundamental tissue there gradually appear certain firm strands. These differentiations of the fundamental tissue are known as fibro-vascular bundles. Thus in the stem we distinguish

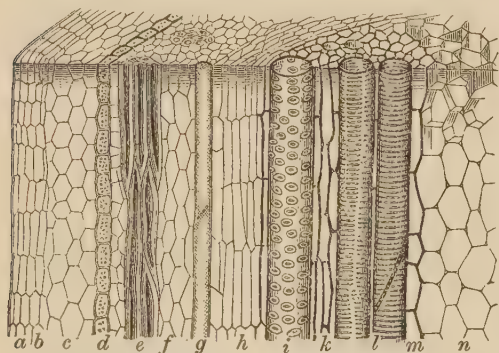


Fig. 2.—Longitudinal section of a portion of a woody Stem (after Kerner).

a, epidermis; b, cork; c, cortical parenchyma; d, bundle-sheath; e, hard-bast; f, bast-parenchyma; g, sieve-tubes; h, cambium; i, vessel with bordered pits; k, wood-parenchyma; l, vessels; m, medullary sheath; n, pith.

the epidermis, the fibro-vascular bundles, and what remains of the fundamental tissue, in the form of central pith and superficial cortex, and radiating plates or medullary rays extending between these. In Dicotyledons the fibro-vascular bundles are radially arranged, and each consists of an internal wood or xylem part, an external bast or phloem part, and between these a persistent young layer of cambium, which, by the division of its cells, adds internally to the wood, externally to the bast, and enables the stem to grow in girth. These fibro-vascular bundles are continued out into the

leaves, or, to state the fact in another way, each leaf contributes to the stem a ‘leaf-trace’ of fibro-vascular bundles which extend vertically down the stem, and eventually unite in a connected system. In the lower or older parts of the twig or stem there are necessarily very many fibro-vascular bundles, and these are intimately fused with one another. Almost always they are ‘collateral’—i.e. the bast lies in the same radius as the wood—and they are ‘indefinite,’ for the cambium persists. In Monocotyledons the fibro-vascular bundles which enter from the leaves pursue a curved course—first inwards and then outwards again—in the stem. In cross sections they therefore appear scattered in the fundamental tissue; they are also collateral but ‘definite,’ for the cambium is at an early stage used up. This last peculiarity explains the generally uniform thickness of a Monocotyledonous stem and the fact that the bark is not usually separable. In Ferns the bast surrounds the wood in each strand, forming ‘concentric’ bundles. So too there are structural peculiarities in the stems of Lycopods and Horsetails.

It is not easy to form an accurate conception of the internal structure of stems, but we must bear in mind the following physiological considerations. (1) As the stem is a supporting axis, often bearing heavy weights and resisting great strains, there is usually much *skeletal tissue*—e.g. sclerenchyma arranged in hollow cylinders, as girders, &c., and the hard wood which forms the heart of most trees. Schwendener and others have shown that the fibro-vascular bundles are always disposed to mechanical advantage. (2) As the outside of the stem is exposed to the weather and is often subjected to considerable strains, there is usually more or less *protective tissue*—e.g. the tough skin and a layer of cork. (3) As the stem mediates physiologically between the roots and the leaves, it contains *conducting tissue*—(a) the young tracheides and wood-vessels by which water and dissolved salts ascend; and (b) the sieve-tubes, cambiform cells, and conducting parenchyma by which elaborated materials descend. In the pith, medullary rays, &c. these materials are often stored.

See BARK, BAST, WOOD, RHIZOME, BRANCH, BUD, PHYSIOLOGY (VEGETABLE); Kerner and Oliver's *Natural History of Plants*; and the standard text-books of botany.

Stemonaceæ, otherwise called ROXBURGHACEÆ, a family of monocotyledonous plants. The species are very few, natives of the hotter parts of the East Indies. The stems of *Stemona viridiflora*, a native of Chittagong, the Malayan Islands, &c., reach a great length. The thick tuberous roots are boiled and soaked in lime-water to remove their acidity, and are then candied with sugar and taken with tea, but are considered rather insipid. The name Roxburghiaceæ was given by Sir Joseph Banks, in honour of the botanist Roxburgh.

Stencilling, a method of printing letters or designs. The process consists in cutting out the pattern in a thin plate, usually of metal; this is then laid on the surface intended to receive it, and the colour is rubbed into the cut space with a brush, the plate preventing the contact of the colour, except on the space cut out. It is much used for wall and other surface-decoration, as it is a rapid and cheap process.

Stendal, a town of Prussian Saxony, 36 miles by rail N. by E. of Magdeburg, was the former capital of the Altmark, and has a Gothic cathedral (1420–24), a Roland pillar, two old gateways, and a statue of Winckelmann, a native of the place. There are here large railway workshops and some textile industries. Pop. 30,000.

Stendhal. See BEYLE.

Stennis. See STONE CIRCLES.

Steno, NICHOLAS, anatomist and geologist, was born at Copenhagen in 1638. He was brought up a strict Lutheran, and was trained to medicine, winning great fame as an inquirer into the anatomy of the glands, the heart, and the brain. For many years he led a wandering life in Holland, France, Austria, Hungary, Italy, but in 1667 settled in Florence, and was converted to the Roman Catholic faith through the eloquence and earnestness of Bossuet. About this same period he turned his attention to geology. He was the first to point out the true origin of fossil animals; he treated of the structure of the earth's crust, clearly portraying the prevalent stratification of rocks, and discriminating between their volcanic, chemical, and mechanical modes of origination. Soon after settling in Florence he was appointed physician to the Grand-duke Ferdinand II., and later added thereto the office of tutor to the son of Grand-duke Cosimo III. But his conversion gradually drew away his mind from natural science; he became a man of marked piety, was made a bishop, and in 1677 was despatched by the pope to the north of Germany to act as vicar-apostolic of those regions. He died at Schwerin on 25th November 1687. See Professor Hughes in *Nature* for 1882.

Stenography. See SHORTHAND.

Stentor, one of the Greeks before Troy, whose voice was as loud as that of fifty men together.

Stephanie, LAKE. See STEFANIE.

Stephanite. See SILVER.

Stephanotis. See ASCLEPIADACEÆ.

Stephen, saint and protomartyr; see DEACON. His festival falls on December 26.

Stephen, the name of ten popes of the Roman Catholic Church. **STEPHEN I.** was the successor of Lucius III., and his pontificate (254-257) is memorable only for his hotly maintaining against Cyprian that heretics baptised by heretics need not be rebaptised on admission into the orthodox church. A martyr according to tradition, he was canonised, his day falling on August 2.—**STEPHEN II.** died two days after his election (March 27, 752), hence he is often omitted from the list of popes.—His successor, **STEPHEN III.**, was a native of Rome. When Astolphus, king of the Lombards, threatened Rome, and the Byzantine emperor, Constantine Copronymos, left unheeded his appeals for succour, Stephen turned to Pepin, king of the Franks, who forced Astolphus to withdraw, and gave the pope the exarchate of Ravenna, the real foundation of the temporal power of the papacy. Stephen died in 757.—**STEPHEN VII.**, elected in 896, is infamous from his disinterring the corpse of his penultimate predecessor, Formosus, and throwing it into the Tiber. The year after he himself was strangled in prison.—**STEPHEN X.** was elected in 1057, under the influence of the celebrated Hildebrand, but died after eight months' rule.

Stephen, king of England (1135-54), was the third son of Stephen, Count of Blois, by Adela, daughter of William the Conqueror, and was therefore nephew of Henry I. and cousin of Matilda, daughter of Henry. He was born in 1106, came over to England at an early age, and became a favourite with his uncle, who gave him the countship of Mortain in Normandy, while he gained that of Boulogne by marriage with its heiress, a niece of the famous Godfrey of Bouillon, and granddaughter of Malcolm and Margaret of Scotland. When his uncle Henry I. resolved to settle the crown on his daughter Matilda, whose first husband was Henry V., emperor of Germany—whence she is often styled the 'Empress Maud'—he held a council in London early in 1127, where Stephen with the rest took the

oath of fealty to Maud. A few months later the widowed empress married Geoffrey Plantagenet. On the death of Henry I. (December 1, 1135) Stephen hurried over to England from Normandy, was hailed with enthusiasm by the Londoners and the citizens of Winchester, and was crowned on the 22d of the same month. He promised many reforms, but though really a merciful and generous man he never received, or deserved to receive, confidence from his people. He attempted to strengthen his position by the unpopular policy of bringing into England bands of Fleming mercenaries, and he made enemies as fast as friends by the lavish favours he heaped upon certain of the great lords. King David of Scotland invaded the North on Maud's behalf, but suffered a severe defeat near Northallerton (1138), yet Stephen was not strong enough to do more than compromise with him by way of peace, David's son Henry being allowed to hold all Northumberland save Bamborough and Newcastle as a fief, while David kept Cumberland without homage. The first powerful enemy that the king made within England was Robert, Earl of Gloucester, an illegitimate son of Henry I., who held the strong fortress of Bristol; and next he arrayed against himself the whole power of the clergy by his quarrel with the Justiciar, Roger, bishop of Salisbury, his nephews the bishops of Ely and Lincoln, and his illegitimate son Roger the Chancellor. The realm now fell into sheer anarchy; the barons plundered and burned at their pleasure; 'men said openly that Christ and His saints were asleep.' In 1139 Matilda arrived in England, and in 1141 took Stephen prisoner at Lincoln. Matilda was now acknowledged as queen, but her harshness and greed soon disgusted Englishmen. The men of London rose, and she fled to Winchester before them. On the 1st November 1141 Stephen obtained his liberty in exchange for the Earl of Gloucester, who had fallen into the hands of his friends at Winchester, and the year 1142 saw him again in the ascendant. Earl Robert died in 1147, and the year after Matilda finally left England. Her son Henry was given the duchy of Normandy in 1149, and next year he became on his father Geoffrey's death Count of Anjou also. He married Eleanor the Duchess of Aquitaine in 1152, and now crossed over to England to pursue his ambition further. The death of his son Eustace took from Stephen all heart for prolonging the struggle, and by the peace of Wallingford and Westminster he agreed to acknowledge Henry as his successor, his continental property being secured to his remaining children, and all the 'adulterine' or unlicensed castles that had sprung up during the civil war, to the number of 1115, to be destroyed. Stephen died at Dover in October 1154.

Stephen, king of Hungary. See HUNGARY, Vol. VI. pp. 4-5.

Stephen, king of Poland. See POLAND, Vol. VIII. p. 257.

Stephen, JAMES, born at Poole, in Dorsetshire, of an Aberdonian stock, in 1758, was educated at Winchester, and became successively a parliamentary reporter, an official in St Kitts, an advocate in prize cases before the Privy-council, member for Tralee, under-secretary for the colonies, and a master of the Court of Chancery. He died at Bath, 10th October 1832. He was an abolitionist, and author of an able and exhaustive work on *The Slavery of the British West Indies* (1824-30).

HENRY JOHN STEPHEN (1787-1864), his son, was a serjeant-at-law, the author of a *Summary of the Criminal Law* (1834), *New Commentaries on the Laws of England* (1841), &c.—The third son, SIR JAMES STEPHEN (1789-1859), from Trinity Hall,

Cambridge, passed in 1813 to Lincoln's Inn, and became counsel to the Colonial Office and Board of Trade, then under-secretary of state for the colonies from 1834 to 1847, when he was knighted. From 1849 he was regius professor of Modern History at Cambridge. See the Memoir prefixed to the 4th edition of his *Essays in Ecclesiastical Biography* (1849), another well-known work by him being *Lectures on the History of France* (1851). See also his *Letters* with biographical notes by his daughter (1907).—The youngest son, SIR GEORGE STEPHEN (1794–1879), was successively a solicitor and barrister, was knighted in 1837 for his services in the reform of the poor-laws, imprisonment for debt, and the police force; in 1855 emigrated to Victoria; and like his father wrote on the slavery question.

SIR JAMES FITZJAMES STEPHEN, son of Sir James Stephen, was born at Kensington, 3d March 1829, and educated at Eton, King's College, London, and Trinity College, Cambridge. Taking his B.A. (1852), and called to the bar at the Inner Temple (1854), he travelled the Midland Circuit, and became recorder of Newark-on-Trent (1859–69), a Q.C. (1868), legal member of the Viceroy of India's Council (1869–72), professor of Common Law at the Inns of Court (1875–79), a K.C.S.I. (1877), and judge of the High Court of Justice (1879–91), on his retirement being created a baronet. The Indian Evidence Act was due to him; and among his works are a *General View of the Criminal Law of England* (1863); *Liberty, Equality, and Fraternity* (1873); *Digest of the Law of Evidence* (1876); *Digest of the Criminal Law* (1877); *History of the Criminal Law of England* (1883); *Story of Nuncomar* (1885); and *Horæ Sabbaticæ* (*Saturday Review* articles, 1892). He unsuccessfully contested Harwich (1865) and Dundee (1873) as a moderate Liberal. He died 12th March 1894.—His brother, SIR LESLIE STEPHEN (born 28th November 1832; died 22d February 1904), was educated at Eton, King's College, London, and Trinity Hall, Cambridge, where he was fellow and tutor. Relinquishing orders and removing to London, he became editor of the *Cornhill* (1871–82), and of the first twenty-six volumes of the great *Dictionary of National Biography* (1885–91, from 1890 conjointly with Sidney Lee, his successor). His works include *The Playground of Europe* (1871); he was president for a while of the Alpine Club; the delightful *Hours in a Library* (3 vols. 1874–79); *History of English Thought in the Eighteenth Century* (1876); *Johnson* (1878) *Pope* (1880), *Swift* (1882), and *George Eliot* (1902) in the 'Men of Letters' series; *Science of Ethics* (1882); lives of Fawcett (1885) and his brother (1895); *An Agnostic's Apology* (1893); *Social Rights and Duties* (1896); *The English Utilitarians* (1900); *Studies of a Biographer* (1898–1902). He was made K.C.B. in 1902. See his *Life and Letters*, by F. W. Maitland (1906).

Stephens is the English name of the famous printers called Estienne or Étienne. HENRY STEPHENS (c. 1460–1520) settled in Paris about 1500. His business was taken up in 1526 by his second son ROBERT (b. 1503), having in the interval been managed by his step-father. Robert specially distinguished himself by the excellence of his workmanship, and was in 1539 and 1540 appointed printer to the king in Latin, Greek, and Hebrew. Early in life he became a convert to the doctrines of the Reformation; and on more than one occasion he got into difficulties with the theological authorities of the university of Paris for introducing editorial changes in the text of the Bibles and Testaments he printed. In 1550 indeed he found it prudent to retire to Geneva. There he remained until his death, on 7th September 1559, and published several of Calvin's works. Robert Stephens was a scholar as well as a printer; he published and printed in 1532 a Latin

dictionary (*Thesaurus Linguae Latinae*) which remained a standard work down to the middle of the 18th century. Among his editions of the Holy Scriptures the Latin New Testament of 1523, the Latin Bible (folio) of 1528, and the Greek New Testament (folio) of 1550 deserve special mention. Being a lover of the New Learning he also printed several of the classic authors, numerous Latin grammars, and similar books. Robert's brother CHARLES STEPHENS (1504–64), who graduated in medicine and practised in Paris, took charge of his brother's business when he withdrew to Geneva, and wrote and printed himself an encyclopædic work (*Dictionary Historicum ac Poeticum*, 1553), a collection of ancient treatises on agriculture (*Prædium Rusticum*, 1554), and other books. Robert's eldest son HENRY STEPHENS (born at Paris in 1528) worthily sustained the reputation of the family. He received an excellent education, and became celebrated for his knowledge of Greek. Both before and after he settled down at Geneva (in 1551) he travelled in Italy, England, and the Netherlands, collating MSS. (mostly Greek), and consorting with scholars. In 1556 he set up a press of his own in Geneva, and issued from it a great number of the ancient Greek authors, including some twenty 'first editions.' His greatest achievement as a scholar was a Greek dictionary entitled *Thesaurus Græcæ Linguae* (5 vols. folio, 1572), on which he spent nearly all his fortune. In his editions of classic authors he indulged in many textual emendations, most of them based on MS. authority, but some purely conjectural. From about the year 1578 he led a very restless and wandering life, and his business was greatly neglected, till at length he died at Lyons early in 1598. He also wrote his mother-tongue with force and elegance, his most remarkable production in it being the semi-satirical *Apologie pour Hérodote* (1566). The traditions of the family were kept up by PAUL (1566–1627), the son of Henry (II.) Stephens, who printed valuable editions of Euripides (1602) and Sophocles (1603); and by Paul's son ANTOINE (1592–1674), who became king's printer at Paris, and amongst other books printed the Septuagint.

See Greswell's *View of the Early Parisian Greek Press* (1833); French works by Renouard (2d ed. 1843) and Bernard (1856); Mark Pattison's posthumous *Essays* (1889); and L. Clément's *Henri Estienne* (1899).

Stephens, ALEXANDER HAMILTON, an American statesman, was born in Georgia in 1812, admitted to the bar in 1834, and elected by the Whigs in 1843 to congress, where he sat till 1859. He advocated the annexation of Texas as early as 1838, and in 1854 defended the Kansas-Nebraska act. He at first opposed secession, but in 1861 became vice-president of the Confederacy, and in 1865 was imprisoned for five months. He sat in congress again from 1874 to 1882, was elected governor of Georgia in 1882, and died 4th March 1883. His *War between the States* appeared in 1867–70.

Stephens, GEORGE, archæologist, was born in Liverpool, 13th December 1813, and was educated in University College, London. He settled early at Stockholm, and was appointed in 1851 lector, later professor, of English in the university of Copenhagen. His works are numerous and learned, the most important his magnificent *Old Northern Runic Monuments of Scandinavia and England* (vols. i. to iii. 1866–68–84, vol. iv. ed. Söderberg, 1901), and its abridgment, containing, however, all the engravings and translations (1884). Other works are on the Ruthwell Cross (1863), on Bugge's *Studies in Northern Mythology* (1883), and his early translation into English of Tegnér's *Frithiof* (Stockholm, 1841). He died 13th August 1895.

Stephens, JAMES (1824–1901), Fenian, was born at Kilkenny, son of an auctioneer's clerk with more of Saxon than of Celtic blood. He had a good education, took early to mathematics, and at twenty obtained an appointment during the making of the Limerick and Waterford Railway. He next went to Dublin, and soon became one of the most active agents of the Young Ireland party. For some years he lived mainly at Paris, where he obtained an insight into the workings of continental secret societies, and in 1853 journeyed over Ireland making himself acquainted with its condition and preparing the soil for the Fenian conspiracy. As its 'Head Centre' he exercised an enormous and despotic influence, and visited America early in 1864 to attempt to overthrow the rival schemes formed there by patriots, but was arrested in Dublin on the 10th November of the same year. Fourteen days later he made his escape from Richmond Bridewell and found his way to New York, where he was formally deposed by the Fenians. He sank into obscurity, and returned to Ireland in 1891. See O'Leary's *Recollections of Fenianism* (1896).

Stephens, JAMES, Irish poet, born in 1882, was originally a clerk in a Dublin lawyer's office. His *Insurrections* (1909) gave promise of a vigorous poet, but his later work is in a calmer spirit. Of especial note are his *Songs from the Clay* (1914), *The Demi-Gods* (1914), *Reincarnation* (1917), *Deirdre* (1923), *Collected Poems* (1926), and a story *The Crock of Gold* (1912).

Stephenson, GEORGE, the father of the locomotive, was the son of Robert Stephenson, who again was the son of a Border shepherd in Oxnam parish, Roxburghshire, and had crossed the Cheviots in search of work at the Northumbrian coal-mines. He was born at Wylam, 8 miles from Newcastle, on the 9th of June 1781, in circumstances of great poverty, his father having to maintain a family of six children on twelve shillings a week, earned by tending a colliery-engine. George's first employment was herding cows at twopence a day, from which he was promoted to hoeing turnips at fourpence; subsequently he was appointed fireman at Midmill Colliery, and at fifteen we find him at Throckley Bridge, rejoicing in a salary of twelve shillings a week. The early life of Stephenson presents a record of determined purpose, industry, and sagacity. Out of his humble gains he contrived to pay fourpence a week for lessons in reading, writing, and arithmetic, which were conned over at night, and mastered by the light of his engine-fire. As fireman he applied himself to diligent study of the steam-engine, taking his machine to pieces during his leisure hours, and thus gaining a thorough practical knowledge of it. At Black Callerton Colliery in 1801, by dint of mending shoes and cleaning watches, in addition to his regular employment, Stephenson contrived to save his first guinea. At twenty-one he had saved enough to furnish a cottage in a humble way, and on 28th November 1802, he was married to Fanny Henderson, who died in 1806, while her husband was brakesman at Killingworth Colliery. In 1815 the invention of a colliery safety-lamp, the 'Geordie,' brought his name before the public, and led to a long controversy with the supporters of Davy's Safety-lamp (q.v.). He received a public testimonial of £1000 for his discovery. In 1812 he became engine-wright at Killingworth Colliery, and it was here, by Lord Ravensworth's permission (1814), that he constructed his first locomotive, 'My Lord,' for the colliery tram-roads. At first it was not very efficient; but subsequently the grand improvement of the 'steam-blast' carried his experiment to a triumphant issue (see RAIL-

WAYS). Further improvements followed, and in 1821 Stephenson was appointed engineer for the construction of the Stockton and Darlington Railway. In 1820 Stephenson married his second wife, Elizabeth Hindmarsh, the daughter of a farmer.

The rapid growth of the trade of South Lancashire, together with the unpopular management of the Bridgewater Canal, gave rise in 1821 to the project of a railway between Liverpool and Manchester. When the bill ultimately passed, on 16th March 1826, Stephenson was appointed principal engineer, with a salary of £1000 a year. After inconceivable difficulties the line was completed in 1829. There then ensued the memorable competition of engines, resulting in the complete triumph of Stephenson's 'Rocket' (see fig. in Vol. VIII. p. 529), which, to the astonishment of every one except himself, was found capable of travelling at the till then undreamt-of rate of 35 miles an hour. 'Now,' exclaimed one of the directors, 'has George Stephenson at last delivered himself.' While occupied in carrying out the vast system of railway which soon overspread the country Stephenson's home was at Alton Grange, near Leicester; but of it he saw little; as he was often travelling on business for weeks at a time. During the three years ending 1837 he was principal engineer on the North Midland, York and North Midland, Manchester and Leeds, Birmingham and Derby, and Sheffield and Rotherham Railways; in 1836 alone 214 miles of railway were put under his direction, involving a capital of five millions; and he would sometimes dictate reports and letters for twelve continuous hours. But in the midst of his immense business his heart remained as youthful as ever. In spring he would snatch a day for bird's-nesting or gardening, in autumn nutting was still a favourite recreation; and we find him writing to his son a touching account of a pair of robins. Strong as he had shown himself when the world was all against him, he was not less so in the midst of his success. During the railway mania his offices in London were crowded every day with men of every rank and condition, eager to strengthen their prospectuses by the weight of his name. Where he disapproved—and at this time he almost always did disapprove—he invariably declined, though by acceding he might have made enormous gain; but to make money without labour or honour had no charm for Stephenson. In the autumn of 1845 he visited Belgium and Spain. On his way home he was seized with pleurisy, from which attack he seems never to have thoroughly recovered. He occupied his later years in the quiet pursuits of a country gentleman, growing fruit and indulging his love of nature. He died at his country-seat of Tapton, near Chesterfield, on 12th August 1848. In his prime Stephenson was strong and full of elastic muscular vigour, and fond of feats of strength. He read little, as his youth and manhood had been spent in hard work; and most of his letters were dictated. But he enjoyed conversation, from which most of his imparted information was derived. The leading feature of his mind was honesty of purpose, and determination in carrying it out. 'I have fought for the locomotive single-handed for nearly twenty years,' he says; 'I put up with every rebuff, determined not to be put down.' Towards trickery and affectation he never concealed his contempt, while honest merit never appealed to his liberality in vain.

See Smiles's *Story of the Life of George Stephenson* (1857; new ed. 1873); and vol. v. of his *Lives of Engineers* (George and Robert Stephenson; new ed. 1874).

Stephenson, ROBERT, only son of George Stephenson, by his first wife, was born at Willing-

ton Quay on 16th October 1803. When a boy he attended a school in Newcastle; in 1819 he was apprenticed to a coalviewer at Killingworth. In 1822 his father's improving circumstances enabled him to send Robert to the university of Edinburgh, where he remained six months, and made excellent use of his time. In 1823 we find him assisting his father in the survey for the Stockton and Darlington Railway. Subsequently he took an active part in the locomotive engine-works started by his father at Newcastle. In June 1824 he went to Colombia, in South America, on an engineering appointment, but returned at the end of three years. He then assumed the management of the Newcastle business. During the discussion as to the power to be employed on the Liverpool and Manchester line, he was in constant communication with his father, to whom his quick perception and rapid judgment were of great assistance. The result was the successful construction of the 'Rocket.' Shortly after the completion of this line he was appointed engineer of the Leicester and Swannington Railway. Subsequently he was appointed joint-engineer, along with his father, of the London and Birmingham line, the execution of which immense work was ultimately almost wholly entrusted to him. In 1829 he married Frances, daughter of John Sanderson, merchant in London. She died in 1842 without issue. The London and Birmingham line was completed in such a manner as to raise Stephenson to the very highest rank in his profession. Amongst his great achievements were the Britannia and Conway Tubular Bridges, the Victoria Bridge across the St Lawrence at Montreal, the two bridges across the Nile at Damietta, the Royal Border Bridge, Berwick, and the High Level Bridge, Newcastle, several of which are described at BRIDGE, Vol. II, pp. 446-7. In 1847 he was returned to the House of Commons as member for Whitby. He was the recipient of many honours from abroad, and was much consulted about foreign railways. He died on 12th October 1859, and was buried in Westminster Abbey. Robert Stephenson inherited the kindly spirit and benevolent disposition of his father, to whom he was ever ready to attribute the chief merit of his own achievements. 'It was his thorough training,' he once said, 'his example, and his character which made me the man I am.'

See Smiles's *Story of the Life of George Stephenson* (1873) and *Lives of the Engineers*, vol. v., and J. C. Jeaffreson's *Life of Robert Stephenson* (2 vols. 1864).

Stepney, a metropolitan and parliamentary borough in east of London (q.v., Vol. VI, p. 738), with three parliamentary divisions (Limehouse, Mile End, and Whitechapel and St George's); pop. (1921) 249,738.

Stepniak ('Son of the Steppe'), the pseudonym of an exiled leader of the Russian revolutionary party, was born in 1852 of an old Little Russian family called Kravchinsky. Sergius Mikhailovitch studied at Kieff, held a commission in the artillery, and in 1870-73 was a professor at Kieff; but having become obnoxious to the government, and believed to have been the assassin of General Mesentseff, head of the Russian police in 1878, he left Russia and settled (1876) in Geneva, and subsequently (1885) in London. He published in Russian many articles and works on the ethnography, history, folk-lore, and literature of Little Russia, and lectured and wrote for the magazines in England and America, but was best known as author of *La Russia Sotteranea* (Milan, 1881; Eng. trans. *Underground Russia*, 1883), sketches of the Nihilist movement and its leaders; of *Russia under the Tsars* (Eng. trans. 1885), a terrible indictment; and of *The Career of a Nihilist*, a novel (1889);

Russian Wit and Humour (1894); *Nihilism as it is* (1894); *King Stork and King Log* (1895). With Kropotkin (q.v.) and Lavroff, he was one of the heads of the Nihilist party. See NIHILISM. He was run over by a train near London, 23d December 1895.

Steppes, the broad plains of southern Russia and western Siberia. See DESERT.

Sterculiaceæ, a family of dicotyledons closely allied to the Malvaceæ and the Tiliaceæ, consists of 700 species of large trees, shrubs, and herbs, natives of warm climates. The bark of some species is very fibrous, so that it is made into ropes and coarse cloth. *Sterculia fetida*, an Indian tree, with excessively fetid flowers, has pale wood, which is very durable, and susceptible of a high polish. Spars of this wood are called *Poon Spars*. The seeds of all the species are oleaginous; those of some are eatable, as those of the Chicha (*Sterculia Chicha* and *S. lasiantha*) of Brazil, which are about the size of a pigeon's egg, and have a pleasant flavour. They are roasted before being eaten. The Kola Nut (q.v.) of Africa is the seed of a plant of the family. The whole family agrees with Malvaceæ in possessing mucilaginous and demulcent properties. The Gum Tragacanth (see GUM) of Senegal and Sierra Leone is produced by *Sterculia tragacantha*. *Brachychiton populneus*, a native of Australia, is a favourite shade-tree at Monte Carlo and other Riviera resorts. *Brachychiton rupestris*, from Queensland, has a curious bottle-shaped trunk, and is found in Italian gardens too. The Byttneriaceæ or Buettneriaceæ have been by some considered a separate family. The most important of this section is Cocoa (q.v.). The fruit of *Guazuma ulmifolia* (Brazil) is eaten. *G. ulmifolia* was introduced into India, and at one time cultivated in Madras as Bastard Cedar, its foliage being used as fodder. This and numerous kindred species yield excellent bast, used for making cordage, &c.

Stere (Fr. *stère*, from Gr. *stereos*, 'solid'), the name given to the unit of cubic measure in the French metrical system. It is a cubic *Metre* (q.v.), and equivalent to 35'3156 English cubic feet. The *decistere* is equal to 10 steres, and the *decistere* to the tenth part of a stere. This measure is much used for wood, especially firewood.

Stereoscope (Gr. *stereos*, 'solid,' and *skokein*, 'to see'). Each eye of an observer forms its own retinal image of visible objects. These two images, being taken from slightly different points of view, are slightly different from one another, as may be seen by looking at near objects with each eye alternately; and they are the more so the nearer or the narrower the objects are. These two retinal images are blended by a process of interpretation of sensation, which interpretation is based on experience, into a mental image of the object seen as a solid object possessing three dimensions. Professor Wheatstone (see also BREWSTER, SIR D.) first pointed this out in 1838, and set himself the question, 'What would be the visual effect of simultaneously presenting to each eye instead of the object itself its projection on a plane surface as it appears to that eye?' He tried the experiment with drawings of cubes, &c., and found that when one eye was made to look at each drawing the two images blended into one which appeared to stand out in relief. Photography supplies more accurate representations of views from two points of view than the artist's eye and hand can supply; and if a view be taken by two lenses upon different parts of a single sensitive plate the print from the negative must be divided into two and the two pictures transposed and mounted. If this transposition be neglected the

effect is *pseudoscopic*—i.e. instead of objects standing out in relief they stand back as if their more prominent surfaces were the walls of cavities. The stereoscope is essentially an instrument in which each picture is examined by a separate lens, and the two lenses are inclined so as to shift the images towards one another and thus to ensure or to facilitate the blending of the two images into one, besides which the lenses act as magnifying glasses. The two lenses must be equal. This may be ensured by using instead of whole lenses two halves of a single lens, the straight edges of which halves must be fixed parallel to one another.

Stereotyping is the method of duplicating or reproducing type pages cast in an alloy consisting largely of lead, but less hard than that used for ordinary type. The object of stereotyping is to save wear and tear to type, when the edition required is an unlimited one as regards the number of copies to be printed. Again, these same plates may be stored away and used for any reprints called for later on. Electrotyping (q.v.), which American printers usually prefer, is a better and more durable method, but slower and more expensive to produce.

Stereotyping was first invented by a goldsmith named William Ged, of Edinburgh, about 1725. Later on, early in the 19th century, Earl Stanhope made some further experiments with some success. Ged employed fine plaster for making the moulds, and this was diluted with water until it became creamy yet sufficiently liquid to be poured over the face of the type page, which had been previously brushed over with oil, so that the mould when dried could be easily lifted from the type surface without breaking. In releasing the cast from the mould the matrix was usually broken and of no further service. This method was generally in use until about the middle of last century, when it was superseded by the system of papier-mâché moulds, brought from the Continent, a much quicker and less expensive means of stereotyping. If the actual printing results were not quite so good, the advantage was that with care several casts could be made from the same moulds, and these could be put aside and brought into use on any future occasion to replace the first casts when worn.

The moulds employed consist of layers of a thin and special kind of tissue paper, with a thick middle sheet of softish paper which gives bulk. All the sheets are then separately pasted together with a special preparation, of which flour is the basis, with a small proportion of china clay, size, glue, or gum, which varies according to the fancy of the moulder, who pastes a final sheet of brown or other strong paper on the back to give strength to the whole. This complete substance for making the moulds is technically called 'flong,' a corruption of the French term *flan*. When finished, they are kept moist and flat under a light pressure until required. In making the mould, the type surface is usually brushed over with French chalk, so that the mould may be readily lifted when it is sufficiently dry. This flong, as it is called, is then laid on the pages to be moulded, and a damp sheet of linen is placed over it to protect the flong in beating. This is performed with a large and heavy long-handled brush until a fairly deep and even impression is made, which forms the matrix or mould. Then the type forme, with the mould still in position, is placed in the hot casting-box so that it is carefully dried and may be lifted and handled with safety. The mould is again placed in the casting-box and surrounded on three sides with brass gauges, and the fourth side left open for the hot metal to be poured in at the mouth of the casting-box. These brass gauges are usually one-sixth of an inch thick, which

regulates the thickness of the plate to be cast. As soon as the metal has cooled the lid of the box is unscrewed and the plate released from the mould. The surplus metal at the 'pour-end' of the cast is cut off and the back of the plate planed so as to give an even impression, and finished with a bevel in order that the clips may hold it fast to the blocks on which the plate is eventually mounted for printing, so as to bring it up to the requisite height of ordinary type.

Although the hand-beating of moulds is a tedious and laborious process it is still employed for the better class of book-production, hence the somewhat full description now given. The plaster method of stereotyping was generally discarded many years ago, but there was for some time a lingering demand for it in certain work, for it gave good deep plates and was more satisfactory, particularly for type music. Electrotyping has now superseded plaster stereotyping.

In order to keep pace with mechanical type-setting, and especially with machine rotary printing, various improvements have been invented for expediting moulding and stereotyping. But these apply perhaps more particularly to newspaper and magazine work, or books of long runs which are stereotyped and printed on rotary machines. Many new flongs, mostly used dry, and various moulding presses, both flat and rotary, have been introduced with the idea of expediting and cheapening production, and a brief reference to some of these will be useful to the reader.

The *Autoplate* is one that has been adopted by most newspaper houses. It is made in three sizes—the Senior, Junior, and the Pony, all of which are most useful supplements to the printing plant engaged on that class of work. It is of American origin and has been in operation for some years. It is largely automatic in its action and needs little supervision. Any number of duplicate plates of pages can be turned out in a very short space of time. The flong used is dry, and the mould itself is not beaten by hand but impressed with either a steel roller on the mangle principle or a flat press. This mould is placed in the casting machine, which is of vertical design and curved in the casting-box to the required shape of the printing cylinder on which it is to be fixed. This machine contains a cooling apparatus so that plates may be handled at once, and also a boring arch, tail cutter, and trimmer, so that the plates are delivered in a finished condition. A hand lever controls the closing and opening of the casting-box, and the action of a pedal performs the necessary finishing processes and releases the plate from the mould.

Another variation in stereotyping for newspaper work which has been introduced in even more recent times is that of the *Winkler*, which is said to be of continental origin. Its chief features are much on the same lines as the *Autoplate*, but the makers claim for it that it is very speedy in producing the curved finished plates, bored, trimmed, and bevelled ready for fastening on the cylinder of the rotary printing machines. The moulding is performed by a special kind of flat press, with a drying apparatus attached to it.

The *Ludlow* is a small and ingenious apparatus usually employed for the composing and stereotyping of various headings and displayed lines in advertisements, or work of a miscellaneous character. These lines are set up singly from matrices in a special composing-stick and then conveyed to the adjoining casting machine, which produces stereotypes cast type-high in single lines. This is a most useful auxiliary to the larger kinds of type-composing machine, and also for printers still employing the old system of hand-set composi-

tion. See also Vol. VIII., under PRINTING, in this Encyclopedia.

BIBLIOGRAPHY.—For special works on this subject the reader is referred to the following: Fred. J. F. Wilson, *Stereotyping and Electrotyping*; R. F. Salade, *Handbook of Stereotyping and Electrotyping*; Raithby, Lawrence, & Co. Ltd., *Practical Notes on Stereotyping and Electrotyping*; C. S. Partridge, *Stereotyping*; Legros and Grant, *Typographical Printing Surfaces*.

Sterility, barrenness in regard to reproduction of the species, is a term applied both to plants and animals, and may be due to external conditions, functional disorder, organic defects, or, in human beings, the results of surgical treatment. See FLOWER (*Fertilisation*), REPRODUCTION, EMBRYOLOGY, SEX, HYBRID, PUBERTY, &c. Impotency renders a marriage void; sterility in no way invalidates the marriage tie. As is well known, it frequently happens that children are born to parents who have been childless for many years.—Sterilisation for punitive purposes, for the benefit of the persons operated on, or for purely eugenic reasons, has been adopted from 1907 onwards by many American states, in the case of habitual criminals, inmates of reformatories, feeble-minded and other defective persons; but the results have not answered expectations.

Sterlet. See STURGEON.

Sterling, originally a substantive, 'a coin of true weight,' as applied at first to the English silver penny, then to all current coin. The word may be the late O.E. *steorling* ('coin with a star'), some of the early pennies bearing the imprint of a star. In the French form *esterlin* it is said to occur in the charter of a Norman abbey perhaps about the end of the 11th century. The suggestion that the name is derived from the Hanse merchants or *Easterlings* is now generally discredited. The adjective is now used of all the money of the United Kingdom and for gold and silver plate bearing the mark of assay, and has long been a synonym for pure and genuine.

Sterling, a city of Illinois, on Rock River (here crossed by two bridges, one of iron, 1100 feet long), 109 miles W. of Chicago by rail. A large dam supplies water-power to most of the fifty factories, which produce farming implements, barbed wire, pumps, windmills, wagons, paper, flour, &c.; and there are five foundries. Pop. 8000.

Sterling, JOHN, was born at Kames Castle in Bute, 20th July 1806, where his father, Captain Edward Sterling (1773–1847), was then making trial of farming. Ill-success drove him to Llanbethian, near Cowbridge, Glamorganshire, in 1809, thence to Paris, and finally to London, where he became one of the chief oracles of the *Times*. Of his seven children, John and an elder brother alone lived to grow up. John was educated at private schools, at sixteen went to Glasgow University, and at nineteen entered Trinity College, Cambridge, where he had Julius Hare as his tutor. Impulsive, quick-witted, 'able to argue with four or five at once,' he was recognised as the most brilliant member of the famous debating society—the Union—members of which were Maurice, John Kemble, Spedding, Venables, Charles Buller, and Richard M. Milnes. After a year Sterling followed Maurice to Trinity Hall, but left Cambridge without a degree in 1827. He first thought of law, but soon became busy on the *Athenæum*, which had not yet begun to flourish. A Liberal in thought and in politics, he came under the influence of Coleridge, and formed a fast friendship with General Torrijos, chief of a group of Spanish exiles. Indeed his own uncertain health and his becoming at the hour of parting engaged to Miss Barton

alone prevented his sailing on that crazy expedition which came to its inevitable close in the execution of Torrijos and Sterling's cousin Boyd at Málaga—a tragedy which haunted Sterling with a lasting horror. He married in November 1830, but soon after fell dangerously ill, and spent fifteen months in the island of St Vincent, returning in August 1832. In June of next year he met Hare at Bonn, and partly through his influence took orders, and served with characteristic zeal as Hare's curate at Hurstmonceaux for eight months. His health again giving way, he resigned, and though he sometimes for some time after, as Carlyle tells us, took duty for a friend in London, he never advanced to priest's orders; indeed, the divergence between his opinions and the church's soon widened beyond even the Coleridgean capability of accommodation. Carlyle first met him in February 1835, and his friendship with Maurice was knit still faster by the latter's marriage to Sterling's sister-in-law. He wrote for *Blackwood* and Mill's review—the *Westminster*, busied himself with projects for tragedies, one of which, *Strafford*, saw the light for a little in 1843, and wrote poems, one of which, *The Election*, was published in 1841. In August 1838 he formed the club first called the Anonymous, then the Sterling Club, among whose members were Carlyle, Allan Cunningham, G. C. Lewis, Malden, Mill, Milnes, Spedding, Tennyson, Thirlwall, W. H. Thompson, and Venables. His winters were spent abroad at Bordeaux, Madeira, or in Italy, in the vain hope of staving off his inevitable doom. In England he lived in turn at Clifton, Falmouth, and Ventnor, where he died, 18th September 1844.

Julius Hare edited Sterling's *Essays and Tales* (2 vols. 1848) with a memoir, which seemed to Carlyle so incomplete, as dwelling too exclusively on his ecclesiastical side—a brief accident in his career—that he himself determined to write his life, to give a faithful picture of his friend. The result was a masterpiece of biography which will keep the name of John Sterling from ever being forgotten.

Stern, DANIEL. See AGOULT.

Sternberg, a town of Czechoslovakia, 12 miles by rail N. of Olmütz, with cotton and linen manufactures. Pop. 13,000.

Sterne, LAURENCE, one of the greatest of English humorists, was born at Clonmel in Ireland, on the 24th of November 1713. His father, Roger Sterne, at that time an ensign in the 34th or Chudleigh's regiment of foot, was the grandson of an archbishop of York who had played an active part as a Cavalier ecclesiastic in the troubles of the previous century. Of his mother we know only that she was the daughter of a 'noted sutler' of the name of Nuttle, and the widow of a soldier, probably a comrade of her second husband. To Roger Sterne she bore seven children, of whom, however, but three survived the period of infancy. The family, continually recruited by births and reduced by deaths, accompanied their parents in the ceaseless wanderings necessitated by the father's military duties; and it was not till Laurence was eleven years old that it was found possible, or at least convenient, to give him any systematic education. He was then sent to Halifax grammar-school, where he remained for over seven years, and whence he was by the assistance of his kinsman, Simon Sterne of Elvington, sent to Jesus College, Cambridge. Here he obtained a sizarship, and in 1736, after taking his B.A. degree, he quitted Cambridge for York, where his father's brother, Dr Jacques Sterne, held, together with a goodly number of ecclesiastical offices, the archdeaconry of the diocese. Through this uncle's influence Laurence, who had been ordained three months after taking

his degree, and who took priest's orders in 1738, was presented to the living of Sutton-on-the-Forest, and then or immediately afterwards appointed a prebendary of York.

Three years later, in 1741, he married Miss Elizabeth Lumley, by whom he had two daughters. The first, born in 1745, scarcely survived its birth; the second was born and baptised 1st December 1747, and was the Lydia to whom he was all his life tenderly attached, and who published an edition of his Letters after his death. Of his life in his Yorkshire parish during the next nineteen years little or nothing is known, except that at some time, probably near the end of this period, a quarrel took place between him and his uncle, because (to quote the former's account of it) 'I would not write party-paragraphs in the newspapers; though he was a party man I was not, and detested such dirty work, thinking it beneath me.' Between 1743 and 1750 Sterne published a poem and two sermons. But in 1759 he struck a newer and truer vein in his *Political Romance*, better known as the *History of a Warm Watch Coat*, an allegorical skit representing Sterne's contribution to a quarrel which had arisen among the clergy and officials of York Cathedral. It seems to have been very effective, for Sterne had to be persuaded to withdraw the book from circulation. Copies of the 1759 edition are very rare. It was reprinted, considerably mutilated, ten years later, and until recently this reprint was generally taken for the first edition. In 1759 he wrote the first two volumes of the work which was destined to make him famous, *The Life and Opinions of Tristram Shandy*. They appear to have been published at York towards the end of 1759, but all the first editions extant bear the date 1760, and the books were not advertised for sale in London till January 1760. The success of the new venture was immediate and signal, and Sterne at once became a 'lion' of the fashionable world. The first edition of the book was exhausted in three months. In April Dodsley brought out a second, and this was shortly afterwards followed somewhat incongruously by a volume of the *Sermons* of the 'Rev. Mr Yorick.' By the end of the year vols. iii. and iv. of *Tristram Shandy*, for which Dodsley had given £380 in advance, were already in the press, and in January 1761 they made their appearance to receive from the town as heartily amused a welcome as their two predecessors.

Meanwhile Sterne, who had in the previous year been presented by one of his new friends of rank, Lord Fauconberg, to the living of Coxwold, had transferred his residence to the parsonage of that place, which was thenceforth to be his home; and throughout the greater part of 1761 he was busy there upon the fifth and sixth volumes of his novel. They were published in December, and three weeks later Sterne, whose health, never robust, was already beginning to fail, left England for France, where he was received with high honours by the literary society of the time, and where he prolonged his stay until the summer of 1764. In January 1765 vols. vii. and viii. of *Tristram Shandy* were given to the world, and met with a more favourable reception than the two preceding volumes, the public interest in which had slightly flagged. They were followed by the publication of a second series of *Sermons* of a far more unclerical character than their predecessors, and, indeed, abounding in quaint touches of their author's peculiar humour. The autumn and winter of 1765 were spent in a tour through France and Italy, which supplied the material of the work to which, in the former of those countries, he still owes his fame. The summer of the following year saw him at work again at Coxwold on the ninth and last

volume of *Tristram Shandy*, which appeared in January 1767. For three months he carried on a passionate flirtation with Mrs Elizabeth Draper—Eliza he called her—the wife of a Bombay government official. She left for India in April, but Sterne remained under the spell of the attachment, and wrote during the summer months what has been called his 'Journal to Eliza,' a kind of diary of vain longings after Mrs Draper's company. The rest of that year was occupied in the preparation of the first two volumes of *A Sentimental Journey through France and Italy*, and in the last days of February 1768 they were published. Their author's health, however, was now completely wrecked; the pulmonary malady from which he had long suffered advanced with rapid strides; and, attacked by influenza and pleurisy in the early days of March, he breathed his last in his London lodgings on the 18th of that month, his funeral taking place four days after at the Bayswater burying-ground of the parish of St George's, Hanover Square.

There have been few writers of any age or country who have displayed such mastery over every form of humour, from the lowest to the highest, as was exercised from his very first entrance into the field of authorship by this Yorkshire clergyman who never published a line till the age of forty, and who had somehow qualified himself for immediate and enthusiastic reception in the world of letters by a twenty-years' sojourn in a country parsonage. Yet, on the other hand, the imperfections of his art, and that in point not only of execution, but also of artistic conception and spirit, it is impossible to overlook. The wild eccentricity of his manner and arrangement, though it is of course a deliberate and, as a rule, it must be admitted, a highly successful bid for the laughter of the reader, was also to some extent the convenient cloak of a singularly slipshod literary style. His indecencies, if less gross than those of Swift or Rabelais, are to some by reason of their pruriency far more offensive. His passages of pathos, sometimes genuine and deeply moving, too often take the form of an artificial and overstrained sentimentalism, and degenerate from the affecting into the affected. His literary conscience had more than the laxity of his time, and he was unscrupulous in his unacknowledged borrowings from the writings of other men. Nevertheless he is, and deserves to be, a classic of English prose fiction. The extravagant Rabelaisian drollery that revels through the pages of *Tristram Shandy*, the marvellous keenness of eye, the inimitable delicacy of touch to which we owe the exquisite vignettes of the *Sentimental Journey*, might not of themselves have secured that place for Sterne; but it is for ever secured to him in right of that combination of subjective and personal with objective and dramatic humour in which perhaps he has never been excelled by any one save the creator of Falstaff. In Mr Shandy and his wife, in Corporal Trim, in Yorick, and above all in that masterpiece of truthful, subtle, tenderly humorous portraiture, 'My Uncle Toby,' Sterne has created imperishable types of character, and made their immortality his own.

Sterne's widow and daughter made about £400 by publishing three additional volumes of *Sermons* in 1769. In 1775 appeared the *Letters from Yorick to Eliza*, being an edition of ten letters from Sterne to Mrs Draper, and an edition of 115 letters (3 vols.) with an autobiographical memoir, by his daughter Lydia (Mrs Meddle), who subjected the letters to a curious system of mutilation in passages referring to her mother or to Mrs Draper. Complete editions of Sterne's works appeared in 1780 (10 vols.), 1873 (4 vols.), 1894 (6 vols.), and 1904 (12 vols.), the last, by W. L. Cross, including the previously unpublished 'Journal to Eliza.' The *Political Romance* (ed. W. L. Cross) was reprinted in 1914. As regards Sterne's

life-story, his own works are to a considerable extent autobiographical. But see also Ferriar's *Illustrations of Sterne* (1812; new ed. 1898); and *Lives* by P. Fitzgerald (1864; new ed. 1896), H. D. Traill (1882), W. Sichel (1910), Lewis Melville (1911); W. L. Cross, *The Life and Times of Laurence Sterne* (1909; new ed., containing the hitherto unpublished 'Letter-book,' 1925). The story of Mrs Draper is dealt with in *Sterne's Eliza*, by A. Wright and W. L. Slater (1922).

Sternhold, THOMAS, one of the authors of the English version of psalms formerly attached to the Book of Common Prayer, was born about 1500 at Awre, near Blakeney in Gloucestershire; according to Fuller and Wood, in Hampshire. He was Groom of the Robes to Henry VIII. and Edward VI., and died in August 1549. The first edition (undated) contains only nineteen psalms; the second (1549), thirty-seven. A third edition, by Whitechurch (1551), contains seven more by J. H. [John Hopkins], probably also a native of Awre, who died as rector of Great Walsingham, Suffolk, in 1570; and the complete psalms appeared in 1562, and for nearly two centuries after formed almost the whole hymnody of the Church of England. When the rival version of Tate and Brady appeared (1696) it came to be known distinctively as the 'Old Version.' Of the complete psalter of 1562, forty psalms bear the name of Sternhold, and sixty that of Hopkins. The rest were the work of William Whittingham (d. 1579), husband of Calvin's sister and Dean of Durham; Thomas Norton; William Kethe, most probably author of Psalm c. (not, however, printed here till 1565, though already in Daye's Psalter, 1560-61, and the Anglo-Genevan, 1561); J. Pullain; J. Marekant; and Archdeacon Wisdome of Ely (d. 1568). Sternhold and Hopkins' psalms are very faithful, but somewhat coarse and homely in phraseology. As Fuller well said, its authors' 'piety was better than their poetry, and they had drunk more of Jordan than of Helicon.' See Dr Julian's magistral *Dict. of Hymnology* (1892; new ed. 1907).

Sternum. See SKELETON, RIBS, BIRD.

Sternutatories. See SNEEZING.

Stesichorus, greatest of the old Dorian lyrists, and as such called the 'lyric Homer,' was born at Himera in Sicily about 630 B.C., and died in Catania in 556. He dealt largely with epic subjects in his lyrical measures, such as the sieges of Troy and of Thebes, and was said to have been struck blind for slandering Helen. Only some thirty short fragments of his works remain, to be found in Schneidewin's *Delectus* and Bergk's *Poetæ Lyrici*.

Stethoscope (Gr. *stethos*, 'the chest,' and *skopeō*, 'I look into'), an instrument invented by Laennec (q.v.) for examining the sounds of the chest. Its simplest form will be best understood by the figure, which represents the section reduced to half the natural diameter, or one-eighth of the actual size. The upper part is the chest end, the lower the ear-piece. The latter is often made in a separate piece, for the sake of greater portability. The main object of the stethoscope being to circumscribe and localise the sounds which it transmits, the chest end should be small, in order to determine the exact seat of the greatest intensity of sound. To ascertain this, the instrument should be moved right and left, up and down, till its end is on the exact spot from which the abnormal sound for which we are searching



Stethoscope.

—or, it may be, the absence of sound—proceeds. It may be made of wood, metal, or celluloid; it is usually made hollow as represented in the figure, but this is not necessary, as the sound is well conducted by the stem itself. But besides these rigid instruments flexible ones are largely used, particularly the *binaural* stethoscopes, which have an ear-piece for each of the examiner's ears. In these the ear-pieces and chest-piece are united by hollow tubes of india-rubber, felt, &c., whose mobility permits of much more ready adaptation to different parts and different positions of the patient's chest. The various sounds heard through the stethoscope are very important in the recognition of many diseases of the heart and lungs.

Stettin, the capital of the Prussian province of Pomerania, and one of the busiest ports on the southern side of the Baltic, stands on both banks of the Oder, 30 miles from the Baltic and 60 miles by rail (120 by river and canal) N.E. of Berlin. The more important of the public buildings are the Gothic church of St Peter (founded 1124), the large church of St James (14th century), the old royal palace (1575), two ornamental arches, a hospital, town-house, theatre, &c. The strong fortifications were only removed in 1874; since then the ground on which they stood has been rapidly built over, so that Stettin now forms one large town with Bredow, Grabow, and Zülchow. The population rose from 76,154 in 1871 to 116,139 in 1890 and—with the suburbs—to 210,272 in 1900, and was 250,603 in 1925. Stettin is the seat of considerable industrial activity, chiefly in connection with shipbuilding, cement, sugar, paper, spirits, soap and candles, matches, clothing, oil-refining, chicory, chemicals, flour, sewing-machines, bricks, machinery. The river from Stettin to the Haff was deepened to 24 feet in the early years of the 20th century. Swinemünde serves as an outer port. Stettin imports principally petroleum and other oils, rye, coffee, herrings, chemicals, groceries, cotton, seeds, iron, cement, timber, coal, oats, spirits, wool, hides. The exports embrace sugar, chemicals, metals, coal, cereals, spirits, seeds, timber, cement, and herrings. By the Treaty of Versailles Czechoslovakia obtained the right to use certain wharves of Stettin harbour. A free haven was opened in 1898, on the east side of the Oder. A ship canal is projected, to give direct communication with Berlin. Stettin was the seat of a princely dynasty, 1107 to 1637; was occupied by Sweden, 1648-1720; by the French, 1806-13.

Steuart, SIR JAMES DENHAM, Scottish economist, was born at Edinburgh, 21st October 1712, and educated at Edinburgh University. He was admitted to the Faculty of Advocates in 1735, but spent several years in travel on the continent, returning to Edinburgh in 1740. He had met the exiled Stewarts at Rome, and, in 1745, having offered his services to Prince Charles Edward, he was sent on a mission to the court of France. After the prince's defeat, Steuart was expressly forbidden to return to Scotland, and remained till 1763 in proscription on the continent. He wrote several treatises abroad, but it was in London in 1767 that his chief work appeared, namely, the *Inquiry into the Principles of Political Economy*. This book, an 'essay on the science of domestic policy,' covered a wide field—population, agriculture, trade, industry, money, public credit, taxes, &c.—but its mercantilist attitude rendered it of little practical importance in an age that was tending to the more liberal ideas which found expression nine years later in the *Wealth of Nations*. Yet as a systematic exposition the book is perhaps not quite worthy of the complete neglect accorded it by Adam Smith in the later and greater work. Subsequent

works of his were *Considerations on the Interest of the County of Lanark* (1769) and *The Principles of Money applied to the Present State of the Coin of Bengal* (1772). By the death of an uncle, Steuart in 1773 came into possession of the estate of Westshield, and took the name Denham. He died at Edinburgh, 28th November 1780, and was buried at Cambusnethan, and a memorial was erected to him at Westminster. Steuart's works, with a memoir, six volumes in all, were published in 1805 by his son.

Steuben, **FREDERIC WILLIAM AUGUSTUS**, **BARON**, a general of the American revolutionary army, was born at Magdeburg, 15th November 1730, and at fourteen served as a volunteer under his father at the siege of Prague. By 1754 he had risen to the rank of adjutant-general, and in 1762 he was attached to the staff of Frederick the Great. While on a visit to Paris in 1777 he was induced by Count St Germain to go to America. He arrived at Portsmouth, New Hampshire, at the end of 1777, and offered his services to congress and to General Washington, by whom they were joyfully accepted; and he joined the army, then in the most deplorable condition, at Valley Forge. He was appointed inspector-general, prepared a manual of tactics for the army, remodelled its organisation, and improved its discipline. He sat on the court-martial on Major André. In 1780 he received a command in Virginia, and he took part, as major-general, in the siege of Yorktown. As generous in character as he was capable as an officer, he spent his whole fortune in clothing his men, and gave his last dollar to his soldiers. Congress made tardy reparation, and in 1790 voted him an annuity of 2400 dollars, and a township of land near Utica, New York. There he died in his log-cottage, 28th November 1794. See Sparks's *American Biography*, and a Life by Friedrich Kapp (New York, 1860).

Steubenville, capital of Jefferson county, Ohio, on the Ohio River, 68 miles below Pittsburgh (by railway 43), with blast-furnaces, rolling-mills, machine and railway shops, and manufactories of iron, steel, tin, pottery, paper, glass, &c. There are bituminous coal-mines near by, and natural gas is plentiful. Fort Steuben was built here in 1787. Pop. (1920) 28,508.

Stevenage, a town of Hertfordshire, 4 miles S.E. of Hitchin by rail, with an old parish church and a grammar-school (1558). Straw-plait is manufactured. Pop. 5000.

Stevens, **ALFRED**, decorative artist and sculptor, was born at Blandford in Dorset, the son of a country painter, in January (baptised on 28th) 1818. When he was helping his father his talent attracted the attention of certain gentlemen, who in 1833 sent him to Italy. There he remained nearly nine years studying painting, though part of the time he assisted Thorwaldsen, the sculptor, in his studio. Three years after his return home Stevens was appointed (1845) teacher of architectural drawing in the School of Design, Somerset House, London; but he held the position only three years. During the next ten years or so from that date he was busily engaged in designing and decorating, in which he displayed the highest genius and taste. He designed in all sorts of materials and for many different purposes—in silver, bronze, iron, marble, and for furniture, churches, porcelain, mantelpieces. From 1856 he laboured at the great achievement of his life, and one of the finest pieces of modelling in England in the 19th century, the monument of Wellington for St Paul's Cathedral; but owing to the greatness of his conception and plan and the inadequacy of means, it was not completed at his death, 1st May 1875. Not till 1892 was it removed from the side chapel; but in 1912 it was at last completed

(by Mr Tweed) according to Stevens's unfinished model. See **SCULPTURE**; and books on him by Armstrong (1883) and Stannus, *Alfred Stevens and his Work* (1892).

Stevens, **THADDEUS**, an American statesman, was born in Vermont in 1792, graduated at Dartmouth in 1814, was admitted to the Maryland bar, and in 1816 settled as a lawyer in Pennsylvania, where he sat in the legislature for some years. He was a Whig member of congress from 1849 to 1853, and a leader of the Republicans in the House from 1859 till his death, 11th August 1868. He was foremost in all measures for emancipating the negroes, and was chairman of the committee on reconstruction whose bill divided the southern states for a time into five military districts. In February 1868 he proposed the impeachment of President Johnson, was one of the committee which drew up the articles, and chairman of the board of managers appointed to conduct the trial.

Stevenson, **ROBERT**, a Scottish engineer, was born at Glasgow, 8th June 1772. His father died during his infancy; and his mother having (1786) married Thomas Smith, the first engineer of the Lighthouse Board, young Stevenson was led to devote himself to the study of engineering, in which his progress was so rapid that in 1791 he was entrusted by Smith with the erection of a lighthouse on Little Cumbrae. In 1796 he succeeded his step-father as engineer and inspector of lighthouses; and during his forty-seven years' tenure of that office he planned and constructed no fewer than twenty-three lighthouses round the Scottish coasts, employing the catoptric system of illumination, and his valuable invention of 'intermittent' and 'flashing' lights. The most remarkable of these erections was that on the Bell Rock (q.v.). In 1814 Stevenson was accompanied in his tour of inspection by Sir Walter Scott. Stevenson was also in great request as a consulting engineer in the matter of roads, bridges, harbours, canals, and railways, introduced many improvements in their construction, and occasionally co-operated with Rennie, Telford, and others. He died in Edinburgh, July 12, 1850. Stevenson left four volumes of professional printed reports, a large work on the Bell Rock Lighthouse, some articles in the *Encyclopædia Britannica* and in the *Edinburgh Encyclopædia*. See the Life (Edin. 1878) by his son, David Stevenson, C.E. (1815-86).

Stevenson, **ROBERT LOUIS BALFOUR**, novelist, essayist, and miscellaneous writer, was born at Edinburgh, 13th November 1850. Stevenson took great pains in tracing his genealogical descent, hoping to prove himself a Celt, but could find nothing definite before 1665, when James Stevenson, a farmer of Nether Carswell in the parish of Neilston, near Glasgow, married a certain Jean Keir. There was romance enough in the subsequent family history, and celebrity too, for Stevenson's father Thomas Stevenson and his grandfather Robert Stevenson (q.v.) were famous lighthouse engineers. His mother was Margaret Isabella Balfour, of the old Scottish family of the Balfours of Pilrig, youngest daughter of the Rev. Lewis Balfour, parish minister of Colinton, near Edinburgh. From her he inherited the delicacy which made him a chronic invalid throughout his life. His academic education was desultory, unmarked by brilliance, and sadly interrupted by ill-health. He attended various private schools and, for some eighteen months, Edinburgh Academy; then, with the intention of following the family profession, he proceeded to Edinburgh University to study engineering (1867-71). There he came in contact with Fleeming Jenkin, professor of engineering, and made what proved to be a valuable acquaintance; and

there he attained a little fame as the president of the Speculative Society; but of far greater worth than engineering knowledge to the future author of *Kidnapped* were the visits to the lighthouses of the Scottish coast, which familiarised him with Highland manners, and with the sea and sea-folk of the north. In fact, in 1871, although he had recently won a medal for a paper on lighthouse apparatus, he definitely abandoned engineering and began to read law, being admitted an advocate at the Scottish bar in 1875. But the law had little attraction for him. He had long since dabbled in authorship, and, even as a boy, his two interests had been literature and the curious study of human life in all its aspects. *The Pentland Rising*, a pamphlet, appeared anonymously from his pen in 1866, while he had also written some verse and several articles to the short-lived *Edinburgh University Magazine*, of which he was joint-editor. All the while Stevenson was an industrious student of human nature, an eager devourer and assimilator of all sorts of imaginative and historical literature, and, as he called himself, 'a sedulous ape' of the writers upon whom he had an ambition of forming his style—Montaigne, Hazlitt, Lamb, and others. From 1873 onwards numerous articles by him appeared in periodicals—the *Portfolio*, *Fortnightly Review*, *Cornhill*, *London*, &c.—and his literary talent was appreciated by the discerning. The winter of 1873-74 was spent on the French Riviera, with some benefit to his health, and about this time his work and travels brought him into contact with numerous friends who were to exercise no small influence on his future activities. Of these friends the chief were Sidney Colvin, Leslie Stephen, and W. E. Henley. In 1875, conducted thither by his artist-cousin R. A. M. Stevenson, he found his way to Fontainebleau, and for three years he paid intermittent visits to the cosmopolitan artists' colony at Barbizon. It was there in 1876 that he met a Californian lady, Mrs Osbourne, whom he afterwards married, and who was his critic and collaborator in much of his work thereafter. In 1876 he made with Sir Walter Simpson a canoe journey from Antwerp to Pontoise, the record of which, *An Inland Voyage* (1878), was his first published work. It was more or less indifferently received, but the author did not relax. In the *Cornhill* for January 1878 appeared one of the best of his earlier stories, *Will o' the Mill*, but the *New Arabian Nights*, a fantastic serial in the *London* (1878), under Henley's editorship, was less successful. There was, however, in spite of continued coolness on the part of most critics, distinct promise in his *Travels with a Donkey through the Cevennes* (1879), the journal of tour in France in the preceding autumn. At the end of 1878 Mrs Osbourne left France and returned to California. Stevenson, restless as ever, determined to follow, and follow he did in 1879 by emigrant ship and emigrant train, under the worst possible conditions for a man of his physique. In Monterey and San Francisco his fortunes came to a low ebb, and starvation, exhaustion, disease, and poverty hung around him. But his spirit refused to be daunted, and he continued writing, parts of the *Amateur Emigrant* and *A Vendetta of the West* belonging to this period. The following year (1880) he married Mrs Osbourne, who had obtained a divorce from her husband, and the couple spent a holiday at the old mining-station at Silverado, the diary of this sojourn forming the basis of the later *Silverado Squatters* (1883). They returned to Scotland in 1880, but Stevenson's health, now permanently impaired, necessitated visits of recuperation to the Highlands of Scotland, to Davos in Switzerland, and Hyères in Provence. The volume and excellence of the work he produced under these circum-

stances during the next few years are amazing. Evidently his laborious apprenticeship was now bearing fruit. *Virginibus Puerisque*, a collection of essays, which had appeared in the *Cornhill* a few years previously, was published in 1881, and next year another collection, *Familiar Studies of Men and Books*—containing his essays on Charles of Orleans, Pepys, Burns, Villon, &c.—gave the author a reputation as a fine and subtle critic. But much more important for his popularity was *Treasure Island*, the first of his romances, which, though diffidently received as a serial in *Young Folks* (1881-82), appeared very successfully in book form in 1883. It was followed by the *Black Arrow*, another serial of less enduring merit. From 1884 to 1887, following upon an illness of exceptional severity, Stevenson stayed at Bournemouth. In 1885 he published the *Child's Garden of Verses*, which he had had on hand for some years, and the somewhat singular and rococo *Prince Otto*. The former stands almost by itself as an imaginative realisation of the make-believe and dramatising imagination habitual to childhood. About the same time he wrote a number of magazine stories, and collaborated with Henley (as he had done in 1879 in the writing of a play called *Deacon Brodie*) in the fabrication of three plays, *Beau Austin*, *Admiral Guinea*, and *Macaire*, none of them being of great account. It then fell to Stevenson first to puzzle then to captivate the reading public by what he called his 'shilling-shocker,' *The Strange Case of Dr Jekyll and Mr Hyde*, a psychological story that gained immense popularity. He sealed his success with *Kidnapped*, a Highland tale contributed serially to *Young Folks* in the summer of 1886. A book on Welling-ton he abandoned, but his memoir on Fleeming Jenkin, who died in 1885, is a piece of good biography. In 1887 appeared three collections: one of verse, *Underwoods*; one of prose, *Memories and Portraits*, in which the interest is largely autobiographical; and a collected volume of stories entitled *The Merry Men*. His father died in May 1887, and his own health was so far from improving that there was every inducement to leave home. Accordingly he went to spend the winter in the dry air of the Adirondack Mountains at Lake Saranac, and never again returned to Europe. In America his fame had preceded him, and, not now the friendless immigrant of 1879, he was besieged by American editors. For *Scribner's Magazine* he wrote a series containing some of his noblest essays, appearing later in *Across the Plains* (1892), and a serial romance, the *Master of Ballantrae* (1888-89). Meanwhile had begun the memorable voyage in the Southern Pacific, one of his cherished dreams. After two years' wanderings he bought a piece of land in Samoa, and made this spot, which he called Vailima, his home for the rest of his days. In Samoa Stevenson cut a romantic figure. To the natives he was the Great White Chief, or 'Tusitala, the teller of tales.' He bestowed much attention on local politics, and in 1892 wrote the *Footnote to History* on the subject. His other writings during these years were numerous and of unequal merit. The *Letters* which he contracted to write for a New York newspaper syndicate proved a burden to him, but his tales of South Sea life—the *Island Nights' Entertainments* collection (1893) and the *Ebb Tide* (1894)—contain some really good work. *St Ives*, however, an unfinished story of the adventures of a French prisoner of war, shows weakening powers. *The Wrecker*, written, as had been the *Ebb Tide*, in conjunction with his stepson and published serially in *Scribner's* (1891-92), provides mixed fare, containing much that is excellent and much that is ineffective. *Catriona* (1893) falls below the level of *Kidnapped*, to which it is a sequel; but in the unfinished *Weir of Hermiston*, a tale of 18th-century

Scotland, Stevenson blended all that life had taught him with the best of his own genius and left his finest story of all. Mention may be made of a volume of *Ballads* (1891), and the posthumously-printed family biography, *A Family of Engineers*; also of the 'Edinburgh Edition' (28 vols.) of his works, undertaken by some of his friends (1894-98). He died suddenly on 3d December 1894, and was buried by his own desire on the top of a mountain behind Vailima.

At his death Stevenson was the most conspicuous personality in English letters, and had secured from all classes of readers an exceptional wealth of personal affection. In trying to analyse the charm which attends his memory, it is difficult, even superfluous, to separate the man and his books. For among those romances which, it may be said, have established his fame, the romance of his own life-story is as great as any. It is more than a story of adventure; it is one of determination, will-power, devotion to an ideal. Only a man with such a spirit could have come by that style of superb grace and precision, as near perfection as it seems possible to get, the result of ceaseless perseverance, though rarely betraying the fact. Coupled with this was his story-telling instinct (one of the rarest literary qualities), unsurpassed within the limits which his nature had assigned to him. Above all, it must be said, was he the master-portrayer of the romance of boyhood and adolescence, and, going still farther back, of the feelings and inner life of childhood. In verse Stevenson has been styled a brilliant amateur. At times the brilliance is well-marked, yet often his verses, always clever, seem to fall short of the one thing needful in poetry.

The *Vailima Letters* to Sir Sidney Colvin were published in 1895, and the *Letters*, edited by Sir Sidney Colvin (1899), were supplemented by a *Life* by Graham Balfour (2 vols. 1901). See also Henry James, in *Partial Portraits* (1888), Andrew Lang in *Essays in Little* (1890), and books by Raleigh (1895), Cornford, Watt, Swinerton (1914); Miss R. Masson's *Life* (1924) and *I can Remember Robert Louis Stevenson* (1922, new ed. 1925), edited by her; J. A. Stewart's *Life* (2 vols. 1924); and a bibliography by Colonel Prideaux (1918).

Stevens Point, Wisconsin, 150 miles NW. of Milwaukee, is a railway junction and a centre of a lumbering and farming district; pop. 11,000.

Stevenson, an Ayrshire town, $\frac{2}{3}$ mile inland, and 28 miles SW. of Glasgow. Near it are collieries, ironworks, chemical-works, and Nobel's explosives factory.

Stevinus, SIMON, mathematician and physicist, was born at Bruges in 1548, held offices under Prince Maurice of Orange, and died in 1620.

Steward, LORD HIGH, anciently the first officer of the crown in England (Lat. *dapifer*, *senescallus*), whose important functions were soon conferred on the Justiciar. The dignity, thenceforward honorary, was long hereditary in the successive houses of Leicester, but was finally absorbed into the royal dignity by Henry IV. Since that time there has been no permanent Lord Steward, but the office is temporarily revived when occasion requires, a Lord Steward being appointed under the Great Seal *pro hac vice* at a coronation or the trial of a peer. When the proceedings are at an end the Lord Steward terminates his commission by breaking his wand of office.

The Steward or High Steward of Scotland was not only chief of the household, but collected and managed the crown revenues, and took the first place in the army next to the king in battle. The office was conferred by David I. on Walter Fitzalan, the founder of the royal house of Stewart (q.v.). The accession of Robert, the seventh High

Steward, to the throne as Robert II. merged the seneschalship in the crown; but the estates of the stewards afterwards became the appanage of the king's eldest son, and by act of the Scottish parliament of 1469 the titles of Prince and High Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles were vested in the eldest son and heir-apparent of the crown of Scotland for ever. 'Great Steward of Scotland' has thus become one of the titles of the Prince of Wales.

The *Lord Steward of the Household*, in England, was originally designated the Lord Great Master of the Household. He is the head of the ancient court called the *Board of Green Cloth* (q.v.), and as such has the control and selection of all the officers and servants of the household, except those belonging to the Chapel, the Chamber, and the Stable, and also appoints the royal tradesmen. He is always sworn a member of the Privy-council, and has precedence of all peers of his own degree. He has no formal grant of office, but receives his charge from the sovereign in person, and holds his appointment during pleasure. Until 1924 his tenure of office depended upon the political party to which he belonged, but it is now non-political. The salary of the office is £2000.

Stewart, HOUSE OF. The Breton Alan Fitz-flaald (died c. 1114) got from Henry I. the lands and castle of Oswestry in Shropshire. His elder son, William Fitzalan (c. 1105-60), remaining in England, became the ancestor of the Earls of Arundel, from whom, through an heiress (1556), that earldom has passed to the Dukes of Norfolk. The second son, Walter (died 1177), coming to Scotland in the service of David I., had large possessions conferred on him in Renfrewshire, Teviotdale, Lauderdale, &c., along with the dignity of Steward of Scotland, which became hereditary in his family, and gave his descendants the surname of Stewart, by some branches modified to Steuart or the French form Stuart. The Fess Checquy (q.v.), adopted as the arms of the Stewarts, is emblematical of the chequer of the Steward's board. The connection between the Stewarts and the Fitzalans was shown by Chalmers to have been well known and acknowledged so late as 1336, when Richard Fitzalan, Earl of Arundel, for 1000 marks surrendered to Edward III. his 'hereditary right' to the Stewardship of Scotland, which was supposed to have reverted to him through the forfeiture of the Scottish line.

For seven generations the Stewardship descended without a break from father to son. Walter, the grandson of the first Steward, held in addition the office of Justiciary of Scotland, and was one of the ambassadors sent in 1239 to fetch Marie de Couci, second wife of Alexander II. His third son, Walter, called Balloch, by his marriage with the daughter of Maurice, Earl of Menteith, got that earldom, which, by his great-granddaughter, Margaret, was conveyed to Robert Stewart, Duke of Albany, son of Robert II. Alexander, fourth Steward (1214-83), was regent of Scotland in Alexander III.'s minority; he commanded at the battle of Largs (q.v.) in 1263, and, invading the Isle of Man, annexed it to the Scottish crown. From his second son's marriage with the heiress of Bonkyl sprang the Stewarts of Darnley, Lenox, and Aubigné. James, the fifth Steward (1243-1309), was one of the six regents of Scotland after the death of Alexander III. Walter, the sixth Steward (1293-1326), occupies a conspicuous place among Bruce's companions-in-arms. He did good service at Bannockburn, and four years later successfully defended Berwick against Edward II. in person. His marriage in 1315 with Marjory, Bruce's daughter, eventually brought the crown of Scot-

land to his family—‘It cam with ane lass,’ in James V.’s well-known words. His son by Marjory, Robert, seventh Steward (1316–90), on the death of David II. in 1371 ascended the throne as Robert II. He was twice married; first, in 1349, to Elizabeth, daughter of Sir Adam Mure of Rowallan, and secondly, in 1355, to Euphemia, Countess of Moray, daughter of Hugh, Earl of Ross. Elizabeth Mure was related to him within the prohibited degrees, so in 1347 he had obtained a papal dispensation (only discovered in the Vatican in 1789) for the marriage, legitimising those children who had already been born. Hence, in later times, the descendants of this first marriage came to be branded with the suspicion of illegitimacy, while those of the second union would boast their preferable claim to the throne. His third son, Robert (c. 1349–1420), was in 1398 created Duke of Albany; the fourth, Alexander, who in 1374 got the earldom of Buchan on the forfeiture of the Comyns, is infamous in history as the ‘Wolf of Badenoch.’

Between 1371 and 1714 (343 years) fourteen Stewarts sat upon the Scottish, and six of these also on the English, throne. A race unhappy as few, they were Robert II. (1316–90); Robert III. (c. 1340–1406), who died of grief, his elder son murdered, his second an English captive; James I. (1394–1437), for eighteen years a prisoner, afterwards murdered; James II. (1430–60), killed at the siege of Roxburgh; James III. (1451–88), murdered, with his son in rebellion against him; James IV. (1473–1513), slain at Flodden—his much-loved mistress, Margaret Drummond, was poisoned; James V. (1512–42), who died broken-hearted by the rout of Solway Moss; Mary (1542–87), beheaded at Fotheringhay, thrice a widow, and for twenty years a captive; James VI. and I. (1566–1625); Charles I. (1600–49), beheaded; Charles II. (1630–85), for fourteen years an exile; James VII. and II. (1633–1701), for twelve years of his youth an exile, and again for the last twelve of his old age; and Mary (1662–94) and Anne (1665–1714), his daughters, who supplanted him, and both died childless. Thus five of the fourteen met with a violent death; two died of grief; and eight succeeded as minors. All the above receive separate articles; but here may be noticed the son and the grandsons of James VII. and II.

By his second queen, Mary of Modena, James had one son, JAMES FRANCIS EDWARD, born at St James’s Palace on 10th June 1688. Forty-two privy-councillors, ladies of rank, &c. (more than half of them Protestants) were present in the bed-chamber; but the warming-pan fiction fastened on him the nickname of Pretender. Six months later he was conveyed by his fugitive mother to St Germain, where his boyhood was passed, and where, on his father’s death in 1701, he was proclaimed his successor. In an attempt, in March 1708, to make a descent upon Scotland, the young ‘Chevalier de St George,’ as he was styled by his adherents, showed some gallantry, but was not suffered to land; and after his return he served with the French in the Low Countries, at Malplaquet charging twelve times, and in the last charge receiving a sword-thrust in the arm. But in Mar’s ill-conducted rebellion (see JACOBITES) he showed himself heavy, spiritless, even tearful, when, too late in the day, he landed at Peterhead (22d December 1715), and sneaked away six weeks afterwards from Montrose. France was now closed to him by the treaty of Utrecht, and almost all the rest of his faineant, prayerful life was passed at Rome, where he died on 1st January 1766. In 1719 he had married the beautiful and high-spirited Princess Clementina Sobieski (1702–35) who bore

him two sons, but was much irritated by his preference for the titular Countess of Inverness.

See books on him by Martin Haile (1907) and Alice Shield (1907).

His elder son, CHARLES EDWARD LOUIS PHILIP CASIMIR, known variously as the ‘Young Pretender,’ the ‘Young Chevalier,’ and ‘Bonny Prince Charlie,’ was born at Rome on 31st December 1720. His education was irregular, but from childhood he raised the hopes of the Jacobites by the promise of a bright and chivalrous nature. He first saw service at the siege of Gaeta (1734); fought bravely at Dettingen (1743); and next year repaired to France, to head Marshal Saxe’s projected invasion of England. But the squadron which was to have convoyed the transports with 15,000 troops to Kent fled before the British fleet; the transports themselves were scattered by a tempest; and for a year and a half Charles was kept hanging on in France, until at last, sailing from Nantes, he landed with seven followers at Eriska in the Hebrides on 2d August 1745, and on the 19th raised his father’s standard in Glenfinnan. The clansmen flocked in; on 17th September Edinburgh surrendered, though the castle still held out; and Charles held court at Holyrood, the palace of his ancestors. There followed the victory over Sir John Cope at Prestonpans (q.v.), the march upon London with 6500 men, the fatal turning at Derby (6th December), the victory over Hawley at Falkirk (17th January 1746), the crushing defeat by the Duke of Cumberland at Culloden (16th April), and Charles’s five months’ hidings and wanderings, with £30,000 set on his head, in the Hebrides and the western mainland, till on 20th September he got shipping from Moidart to Brittany. The peace of Aix-la-Chapelle (1748) caused his forcible expulsion from France, and thereafter he lived successively at Avignon, Liège, Basel, Florence, and Rome. He seems to have paid two or three secret visits to London between 1750 and 1760; in 1766 succeeded to his father’s empty titles; in 1772 married the ill-fated Countess of Albany (q.v.); and for forty years a miserable drunkard, died at Rome, 31st January 1788. By his Scottish mistress, Clementina Walkenshaw, he left a natural daughter, Charlotte (1753–89), whom he had created Duchess of Albany. He was buried at Frascati, but translated to St Peter’s.

See also COPE (SIR JOHN), CULLODEN, and MACDONALD (FLORA); Ewald’s *Life of Prince Charles Edward* (1875), and A. Lang’s (1900 and 1903).

His brother, HENRY BENEDICT MARIA CLEMENT, Duke of York, Cardinal, and Bishop of Frascati, was born at Rome, 5th March 1725. After the failure of the ‘45, when he had hastened to Dunkirk to support Prince Charles Edward, he resolved to take orders, and in 1747 received a cardinal’s hat from Benedict XIV. Clement XIII. consecrated him Bishop of Corinth *in partibus*, and subsequently appointed him to the suburban see of Frascati, where he took up his residence. He enjoyed, through the favour of the French court, the revenues of two rich abbeys, as well as a Spanish pension; and the liberal charity with which he dispensed his income endeared him to his flock. On his brother’s death in 1788 he caused a medal to be struck, bearing the Latin legend, ‘Henry IX., king of England, by the grace of God, but not by the will of men.’ The French Revolution stripped him of his fortune, but in 1796 he sold his family jewels to relieve the necessities of Pius VI. In 1798 the French plundered his villa, and he had to flee for his life to Venice. He returned in 1801 on the restoration of the papal authority, George III. having meanwhile in 1800 granted him a pension of £4000. This last, perhaps, best, of the Stuarts died at the age of eighty-two on 13th July 1807. The crown-jewels, carried off

from England by James II., were bequeathed by him to George IV., then Prince of Wales, who in 1819 caused Canova to erect a monument in St Peter's to 'James III., Charles III., and Henry IX.'

See H. M. Vaughan, *The Last of the Royal Stuarts* (1906).

Next to the exiled Stuarts in representation of the royal house as heir-of-line came the descendants of Henrietta (q.v.), Charles I.'s youngest daughter, who in 1661 was married to Philip, Duke of Orleans. From this marriage sprang Anne-Mary (1669-1728), who married Victor Amadeus, Duke of Savoy (q.v.) and king of Sardinia; their son, Charles Emmanuel III. (1701-73), king of Sardinia; his son, Victor Amadeus III. (1726-96), king of Sardinia; his son, Victor Emmanuel I. (1759-1824), king of Sardinia; his daughter, Mary (1792-1840), who married Francis, Duke of Modena; their son, Ferdinand (1821-49), who married Elizabeth of Austria; and their daughter, Maria Teresa (born 1849), who in 1868 married Prince Ludwig of Bavaria (1845-1921; king 1913-18), and whom, as 'Mary III. and IV., the 'Legitimist Jacobites' of 1891 put forward as the 'representative of the Royal House of these realms.' Rupert, her son, was born at Munich on 18th May 1869, and is ninth in descent from Charles I.

The branch of the family which the Act of Settlement (1701) called to the throne on the death of Queen Anne were the descendants of the Electress Sophia of Hanover, granddaughter of James VI. and I. by her mother, the Princess Elizabeth (q.v.), Electress Palatine and Queen of Bohemia. By that act not only were the above-mentioned descendants of Charles I.'s daughter, Henrietta of Orleans, excluded, but also the Roman Catholic descendants of the Princess Elizabeth's sons. King George V. is twenty-fourth in descent from Walter Fitzalan, eighteenth from Robert II., and tenth from James VI. and I.

Before proceeding to glance at the cadets of the House of Stewart we may notice here ARABELLA STUART, who, born in 1575, was the daughter of the Earl of Lenox, Darnley's younger brother, so a great-great-granddaughter of Henry VII., a third cousin to Queen Elizabeth, and a first cousin to James VI. and I. She lost her father at two, her mother at six, and was brought up by her maternal grandmother, the imperious Bess of Hardwick. At the age of twenty-seven, shortly before Elizabeth's death, she was suspected of having a lover in the boy William Seymour, who had Tudor blood in his veins; but on James's accession she was restored to favour, only, however, to contract a secret marriage in 1610 with him. Both were imprisoned, and both escaped—Seymour successfully to Ostend, she unsuccessfully in man's attire, for she was retaken in the Straits of Dover. She died, insane, in the Tower of London, 25th September 1615.

See Lives by Elizabeth Cooper (2 vols. 1866), Mary E. Bradley (2 vols. 1889), B. C. Hardy (1913), Lefuse (1913).

The cadets of the house may be divided into four classes: (1) descendants of Robert II.; (2) descendants of natural sons of his descendants; (3) descendants of natural sons of Stewart kings; and (4) legitimate branches of the Stewarts before their accession to the throne. To the first belong the Stuarts of Castle-Stewart, descended from Robert, Duke of Albany, Robert II.'s third son, through the Lords Avondale and Ochiltree. They received the titles of Lord Stuart of Castle-Stewart in the peerage of Ireland (1619), Viscount Castle-Stewart (1793), and Earl (1800). To the second class belong the Stuart Earls of Traquair (1633-1861), descended from a natural son of James Stewart, Earl of Buchan. To the third class belong the Regent Moray (q.v.), the Marquis of

Bute, and the Shaw-Stewarts; and to the fourth belong the Earls of Galloway (from a brother of the fifth High Stewart), the Lords Blantyre, the Stewarts of Fort-Stewart, and the Stewarts of Grandtully (from the fourth High Stewart; the last baronet died in 1890).

See, besides works cited at JACOBITES, under the different Stewart sovereigns, and in Marshall's *Genealogist's Guide* (new ed. 1903), Stewart genealogies, &c., by Symson (1712), Hay of Drumboote (1722), Duncan Stewart (1739), Noble (1795), Andrew Stuart of Castle-milk (1798), A. G. Stuart (for Castle-Stewart branch, 1854), Sir W. Fraser (for Grandtully branch, 1868), W. A. Lindsay (1888); William Townend, *History of the Descendants of the Stuarts* (1858); the Marchesa Campana de Cavelli, *Les Derniers Stuarts à Saint-Germain en Laye* (2 vols. 1871); Percy M. Thornton, *The Stuart Dynasty* (1890); Gibb and Skelton, *The Royal House of Stuart* (1890), illustrating the Stuart exhibition (1888); Hewison, *Bute in the Olden Time* (1894-95); J. J. Foster, *The Stuarts in Art* (2 vols. 1902).

Stewart, ALEXANDER TURNEY, millionaire, was born of Scottish stock at Lisburn, near Belfast, in 1803, emigrated to New York in 1823, and two years later opened his first dry-goods store in Broadway, with a rent of \$250; his retail store built in 1862 cost nearly \$2,750,000. His charities were numerous and bountiful; yet at his death, 10th April 1876, he left some \$40,000,000, which there were no blood relatives to share. See RESURRECTIONISTS, and GARDEN CITY.

Stewart, BALFOUR, LL.D., F.R.S., physicist, was born at Edinburgh, November 1, 1828. He studied at both St Andrews and Edinburgh universities, but in 1846 entered on a commercial career. Seven years later he forsook business, returned from Australia to Edinburgh, and became assistant to Professor Forbes. In 1859 he was appointed director of the Kew Observatory, and in 1870 professor of Physics at Owens College, Manchester. He died, December 19, 1887, near Drogheda, Ireland. He made his first reputation by his work on Radiant Heat (1858), by which he established the equality of the emissive and absorptive powers of bodies. He is rightly regarded as one of the founders of the method of spectrum-analysis, of which the complete theory was given by Kirchhoff a little later (see HEAT and SPECTRUM). In connection with his work on radiant heat the experiments (in conjunction with Professor Tait) on the heating of a rotating disc in vacuo (1865-78) should be mentioned, as should also his remarks on the effect of relative motion on radiation. His other labours were chiefly meteorological, his name being specially associated with such subjects as the relation between sun-spots and temperature and magnetic changes, terrestrial magnetism, and the daily ranges of the meteorological elements. Particularly valuable are his numerous papers on terrestrial magnetism. As a writer of text-books on physics he earned a high reputation, the *Treatise on Heat* (1866), the *Elements of Physics* (1870), and the *Conservation of Energy* (1873), all running into numerous editions, as was also the case with *The Unseen Universe, or Physical Speculations on a Future State*, a book published conjointly by Stewart and Professor Tait in 1875.

Stewart, SIR CHARLES. See CASTLEREAGH.

Stewart, DUGALD, philosopher, was born in Edinburgh on the 22d November 1753, and was the son of Matthew Stewart (q.v.). He entered the High School in his eighth year, and remained till his thirteenth. His subsequent course at the university extended from 1765 to 1769. In the departments of study where his own career afterwards lay he was fortunate to find pro-

fessors of ability and distinction, the moral philosophy chair being occupied by Adam Ferguson. While Stewart gave his highest promise in these subjects he also made great attainments in mathematics and natural philosophy, and likewise in classics. In 1771 he went to study at Glasgow, partly with a view to one of the Snell scholarships at Balliol College, Oxford, and partly to attend the lectures of Dr Reid. It was while there that he wrote an essay on Dreaming, which was his first effort in mental philosophy, and contained the germs of many of his subsequent speculations. He lived in the same house with Archibald Alison, the author of the *Essay on Taste*, and the two became intimate friends through life. He was at Glasgow only one session. In 1772, in his nineteenth year, he was called upon by his father, whose health was failing, to teach the mathematical classes in the university of Edinburgh; in 1775 he was elected joint-professor, and acted in that capacity till 1785. In 1778 Adam Ferguson was absent from his post on a political mission to America, and Stewart taught the moral philosophy class in addition to his mathematical classes. The lectures that he gave on this occasion were wholly his own, and were delivered from notes, as was his practice in after years. On the resignation of Ferguson in 1785 he was appointed professor of moral philosophy, and continued in the active duties of the class for twenty-five years. His lectures were greatly admired and numerous attended. He went over a wide compass of subjects: psychology, or the science of mind proper, metaphysics, logic, ethics, natural theology, the principles of taste, politics, and last of all, political economy, which, from the year 1800, he treated in a separate course. In 1792 appeared his first volume of the *Elements of the Philosophy of the Human Mind*, and in 1793 he published his *Outlines of Moral Philosophy*. He read before the Royal Society of Edinburgh in 1793 his *Account of the Life and Writings of Adam Smith*; in 1796 the *Account of the Life and Writings of Principal Robertson*; and in 1802 the *Account of the Life and Writings of Dr Reid*. In 1805 he took a prominent part in the 'Leslie controversy,' and wrote a pamphlet maintaining Sir John Leslie's claims to the chair of mathematics and defending him from theological aspersions. In 1806, on the accession of the Whig party to power, he received a sinecure office worth £300 a year. The death of his second son in 1809 gave a blow to his health, otherwise indifferent, and he was unable to lecture during part of the following session; Dr Thomas Brown, at his request, acting as his substitute. The following year Brown was appointed conjoint professor, and taught the class till his death in 1820. From 1809 Stewart lived at Kinneil House, near Bo'ness, which the Duke of Hamilton had placed at his service. In 1810 he published his *Philosophical Essays*; in 1814 the second volume of the *Elements*; in 1815 the first part, and in 1821 the second part, of the *Dissertation on the History of Ethical Philosophy*; in 1827 the third volume of the *Elements*; and in 1828, a few weeks before his death, the *Philosophy of the Active and Moral Powers*. On the death of Brown Stewart exerted himself to secure the appointment of Sir William Hamilton to the chair, but the influence used with the town-council in behalf of John Wilson ('Christopher North') was overpowering. Stewart resigned his conjoint professorship on the 20th June 1820; he died 11th June 1828.

The philosophy of Stewart was the following up of the reaction commenced by Reid against the sceptical results that Berkeley and Hume drew from the principles of Locke (see SCOTTISH PHILOSOPHY). Hence arose the principles of common

sense of Reid, in which Stewart for the most part acquiesced. Stewart also followed and improved upon Reid in the systematic exposition of all the powers of the mind which rendered mental philosophy for the first time a subject of study, independent of metaphysical, logical, and ethical applications; although he also followed it out in all these directions with his usual perspicacity and felicity of exposition. His contributions to the philosophy of taste, in the *Philosophical Essays*, are among the best parts of his writings. Although Stewart was not one of the most original thinkers in his department, yet, by the force of his teaching and the compass of his writings, he did much to diffuse an interest in the speculations connected with the human mind. Amongst notable men who studied under Stewart were Lords Jeffrey and Cockburn, Sir Walter Scott, Lord Brougham, Francis Horner, Sir James Mackintosh, James Mill, Lord Palmerston, and Earl Russell.

His works (11 vols. 1854-58) were edited by Sir W. Hamilton, whose work was completed and the biography added by Professor Veitch.

Stewart, MATTHEW, was born in 1717 at Rothesay in Bute. He studied first at the university of Glasgow, where he was a favourite pupil of Robert Simson, and in 1742-43, when he was a student of divinity in the university of Edinburgh, attended Maclaurin's lectures on fluxions. For a short period he was minister of Roseneath, and in 1747 was elected Maclaurin's successor. He had in the previous year published his *General Theorems of considerable use in the higher parts of Mathematics*. In 1761 he published *Tracts Physical and Mathematical*, and in 1763 his *Propositiones Geometricæ more veterum demonstratæ*. In 1772 he ceased to lecture in the university, and he died on 23d January 1785. The lifelong friendship which existed between him and Simson was unusually cordial, and it is highly probable that the bent of Stewart's mind towards the ancient geometry and his comparative indifference to the modern analysis were due to the example of his master. A biographical account of Stewart by Professor John Playfair will be found in the first vol. of the *Transactions of the Roy. Soc. of Edinburgh* (1788).

Stewarton, a town of Ayrshire, on Annick Water, 5½ miles N. by W. of Kilmarnock. Its specialty is the Scotch bonnet manufacture; but it also carries on carpet-weaving, spindle-making, &c. Pop. 4000.

Stewartry, the name which was given in Scotland to a district governed by a steward, an officer appointed by the king with jurisdiction over crownlands, and powers similar to those of a lord of regality. While the civil jurisdiction of a steward was equivalent to that of a sheriff, his criminal jurisdiction was much more extensive. The only remaining trace of this jurisdiction exists in the term Stewartry, which in place of county is applied to the district of Kirkcudbright (q.v.; and see GALLOWAY).

Stewing, in Cookery, a very economical way of preparing meat and fruits for food. It differs from boiling in this respect, that only a small quantity of water is used, and the heat applied is so gentle as only to simmer it. The more slowly the ebullition is carried on the better. As the small quantity of water is retained as gravy, nothing is lost. Meat prepared in this way is tender and savoury, but, owing partly to the richness of the gravy, is not very digestible. See COOKERY, DIGESTION.

Steyer, a town of Upper Austria, at the confluence of the Steyer and Enns, 36 miles by rail S. by E. of Linz, is the chief seat of the iron and steel manufactures of Austria, turning out firearms, cutlery, files, nails, chains, &c.,

and also manufacturing paper, leather, beer. Pop. 20,000.

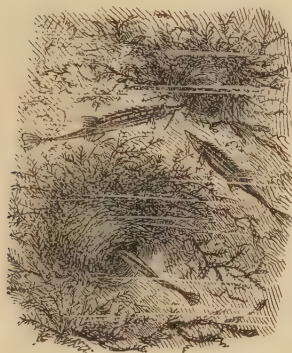
Steyn, MARTINUS THEUNIS (1857–1916), born at Winburg in the Orange Free State, studied at Grey College, Bloemfontein, and the Inner Temple, London, practised as a barrister in Bloemfontein, was State Attorney of the Orange Free State (1888), and a judge. In 1896 he was elected president of the Orange Free State, which under his administration entered the war of 1899–1902 on the side of the Transvaal. He promoted the Union of 1910, but was subsequently lukewarm.

Steyning, a town of Sussex, 1 mile W. of the river Adur and $4\frac{1}{2}$ miles N. of Shoreham. Till 1832 it returned two members.

Sticking-plaster. See PLASTERS.

Stickleback (*Gasterosteus*), a genus of Acanthopteron fishes having the dorsal fin replaced by strong spines which vary in number in the different species. The sticklebacks are small and the male

is brightly coloured, the brightness increasing at sexual maturity. They are widely distributed throughout northern and temperate regions. One of the European species, the Fifteen-spined Stickleback (*G. spinachia*), is marine; the other two—the Ten-spined Stickleback (*G. pungitius*) and the Three-spined Stickleback (*G. aculeatus*)—occur in fresh or brackish water.



Sticklebacks and Nests.

Much interest

attaches to the sticklebacks on account of the high degree of parental care exhibited by the male. At the spawning season he constructs a nest of grass and stems of plants firmly cemented together by mucous threads secreted from the kidneys. The nest is barrel-shaped, and has at first one aperture. The work of building ended, the eager male, now resplendent in his wedding-robes, sets forth in search of a mate, whom he coaxes to his nest. After she has quitted it, making a second aperture, he enters, fertilises the eggs, and immediately resumes his quest, bringing home another and another mate until the nest is filled with eggs. These eggs he guards with jealous vigilance, freeing them from parasites, and attacking every enemy that comes within reach, even though it be a fish many times larger than himself. With the hatching of the ova his labours become for a time more arduous than ever, for the tiny, active sticklebacks must be guarded until they are big enough and strong enough to fend for themselves.

Stieler, ADOLF, editor of the well-known *Atlas* (Gotha, 1817–23; 75 plates, enlarged in succeeding editions to 108), was born at Gotha on 26th February 1775, and died at the same place on 13th March 1836, having spent his life in the public service of the duchy. A *School Atlas* and a *Map of Germany* (in 25 sheets) by him were also very popular.

Stier, RUDOLF EWALD, German theologian, was born at Fraustadt, 17th March 1800, studied at Jena, Halle, and Berlin, and had already laboured as pastor at Frankleben near Merseburg and Wichlinghausen in the Wupperthal when he was appointed in 1850 superintendent at Schkeuditz, and in 1859 at Eisleben, where he died, 16th December 1862. Stier was a man of fervent and somewhat

mystical piety, and as an exegete he shows absolute faith in the inspiration and infallibility of his text; but he has no other dogmatisms, and his books are full of observations always ingenious and edifying, if sometimes prolix and far-fetched.

Among his works the most popular have been *The Words of the Lord Jesus* (Eng. trans. 8 vols. 1855–58), *Words of a Risen Saviour* (trans. 1859), *Words of the Angels* (1862), and *Words of the Apostles* (trans. 1869). See the Life by his sons (Wittenberg, 1868).

Stiff Neck. See NECK.

Stifter, ADALBERT, German prose-writer, was born at Oberplan in the Böhmerwald, 23d October 1805, and studied at Vienna. After a tutorship in the Metternich family he became in 1849 a school-inspector at Linz, and died 28th January 1868. His fame rests mainly on the beauty of his prose and his feeling for nature in *Studien* (1844–50) and *Bunte Steine* (1852); but Hermann Bahr declares *Der Nachsommer* (1857) to be ‘our Austrian *Wilhelm Meister*,’ and *Witiko* (1864–67) the only work of its kind since *I Promessi Sposi*.

Stigand, Archbishop of Canterbury, enjoyed great favour with Edward the Confessor, who made him his chaplain, then (1044) Bishop of Elmham or of the East Angles. Eight years later the bishop mediated successfully in the interests of peace between the king and Earl Godwin, and was rewarded with the archbishopric of Canterbury, which had been abandoned by Archbishop Robert. But his appointment was generally looked upon as uncanonical, and was still so regarded even after Stigand received the pallium from Pope Benedict X., Benedict’s own election being held to be illegal. On the death of Harold, Stigand gave his vote for Edgar Atheling to be king, and for this reason, and because he was a firm friend of the House of Godwin, William the Conqueror distrusted him, and induced the pope to send a commission of cardinals, who deprived him of his dignities and sentenced him to perpetual imprisonment. But Stigand died shortly afterwards at Winchester; it is said he was starved to death, though whether voluntarily or under compulsion is uncertain.

Stigma. See FLOWER.

Stigmara, the root of *Sigillaria* (q.v.) and other trees.

Stigmatisation (Lat. *stigmatizatio*, ‘a puncturing,’ from Gr. *stigma*, ‘a puncture’), the name applied by Roman Catholic writers to the supposed miraculous impression on certain individuals of the ‘stigmata,’ or marks of the wounds which our Lord suffered during the course of His Passion. St Paul says of himself, ‘I bear in my body the marks of the Lord Jesus’ (Gal. vi. 15), but his bold metaphor is most likely taken from the notion of soldiers branding on their bodies their general’s name. In the early days many Christians branded the name of Christ on their foreheads, and various voluntary mutilations for Christ’s sake were practised by enthusiasts. The stigmata comprise not only the wounds of the hands and feet, and that of the side, received in the crucifixion, but also those impressed by the crown of thorns and by the scourging. The impression of the stigmata is by those who believe in its reality regarded as a mark of the signal favour of our Lord, manifested to believers specially devoted to the contemplation of His Passion. The most remarkable example of stigmatisation is that said to have occurred in 1224 to Francis of Assisi, on the mountain of Alverno. Being absorbed in rapturous contemplation of the Passion of Christ, he saw a seraph with six shining wings, blazing with fire, and having between his wings the figure of a man crucified,

descend from heaven and approach him, so as to be almost in contact. After a time the vision disappeared, leaving the soul of Francis filled with reverence and awe. And now he became aware that in hands, feet, and side he had received externally the marks of crucifixion. These mysterious marks continued during the two years until his death, and are claimed to have been seen by many eye-witnesses, including Pope Alexander IV.

The Dominicans openly disputed the fact, but at length made the same claim for Catharine of Sienna, whose stigmata were explained as at her own request made invisible to others. The Franciscans appealed to Sixtus IV., and that pope, himself a Franciscan, forbade representations of St Catharine to be made with the stigmata. Still the fact is recorded in the breviary office, and Benedict XIII. granted the Dominicans a special feast in commemoration of it. Many others, especially women, are claimed to have received all or some of the stigmata. The last to be canonised (1831) for this reason was Veronica Giuliani, who is said to have received in 1694 first the marks of the crown of thorns, and afterwards those of the crucifixion. More recent cases are those of Anna Katherina Emmerich (1774-1824), who became a nun at Agnetenberg; 'L'Estatica' Maria von Mörl of Caldaro (1839); Louise Lateau (1850-83, in 1868), whose stigmata were stated to bleed every Friday; and Mrs Girling (1827-86, about Christmas 1864), of the New Forest Shaker community. Dr Imbert in 1894 enumerated 321 persons, of whom but 41 were men, as having received the stigmata, and of these 80 lived before the 17th century. Apart altogether from the question of the value of the evidence offered, we may reasonably conclude that some kind of stigmatisation is a pathological condition of occasional occurrence, but from this to the assertion that it is a special sign of divine favour is a wide and an unwarrantable leap.

Stilbite. See ZEOLITE.

Stilfserjoch. See STELVIO.

Stilicho, a famous Roman general, the mainstay of the western empire after the death of Theodosius the Great, is said to have been a Vandal, and was born about 359. Through his courage and ability he rose rapidly in rank, was sent as ambassador to Persia in 384, and soon after his return rewarded with the hand of Serena, niece of Theodosius. His rise caused a jealousy that soon grew to rankling hatred in the heart of Rufinus, the ambitious minister of Theodosius. In 394 Stilicho departed for Rome in charge of the youthful Honorius, who had been committed to his care, placed him on the throne of the western empire, and administered in his name the affairs of state. On the death of Theodosius (end of 394) Rufinus, the guardian of Arcadius, instigated Alaric to invade Greece while Stilicho was engaged in chastising the invaders of the Roman territories on the Rhine and in Gaul. Returning, he at once set out for Constantinople and destroyed Rufinus, then marched against Alaric, blocked him up in the Peloponnesus, but through over-confidence permitted him to escape across the isthmus with his captives and booty. In 398 his daughter Maria became the wife of Honorius. His old opponent, Alaric, after several inroads upon the eastern provinces of the western empire, now invaded Northern Italy, but was signally defeated at Pollentia (403) and Verona by Stilicho, who had hurriedly called in the Roman legions from Rhetia, Gaul, Germany, and even Britain. Stilicho's ambition now led him to attempt the introduction of his own family to the imperial succession—a state-

ment disbelieved by Gibbon, who considers it merely as an invention of the crafty Olympius—by the marriage of his son with the heir-presumptive Placidia, the daughter of Theodosius, and to attain this end he made overtures of alliance to Alaric, which were gladly accepted. But the dreadful inroad of Radagaisus (406) at the head of more than 200,000 (some say 400,000) barbarians, who ravaged the whole country as far as Florence, compelled the great general of the West to shelve for a time his ambitious schemes. With a small but chosen army of veterans, aided by a body of Huns under Uldin (father of Attila), and of Visigoths under Sarus, he so harassed the invaders that they were forced to give him battle. They were soon completely routed; Radagaisus was put to death, and his followers sold as slaves. Stilicho now returned to his own ambitious schemes, established enmity between Rome and Byzantium by seizing on eastern Illyricum and inducing Alaric to transfer his allegiance to Honorius. But Honorius, who had been prejudiced against Stilicho by one of his officers, Olympius, refused to take eastern Illyricum from the Byzantine empire; and subsequently by an artful harangue he so influenced the soldiers of the army of Gaul that they rose *en masse* against the partisans of Stilicho. Stilicho himself was at Bologna; and on the news of the revolt, his most zealous friends urged immediate action against Olympius and the Pavian rebels; but for the first time in his life vacillation seized the soldier. He was soon forced to flee to Ravenna, where he was murdered, 23d August 408. Thus perished the last of the series of distinguished aliens, who, as emperors, warriors, or politicians, had propped up the Roman empire for 150 years, with a stern and resolute zeal equal to that of the early Romans themselves. Three months after his death Alaric and his Visigoths were at the gates of Rome.

Still is an apparatus for Distillation (q.v.). It consists essentially of a vessel in which the liquid to be distilled is placed, the vapour being conducted by means of a *head* or *neck* to the condenser or worm, where it is cooled by water or other means, and again forms liquid. The still itself varies greatly according to the purpose for which it is used. It is made of copper, iron, earthenware, or glass, and is heated by naked flame or steam-heat. The steam may either be applied on the outside by means of a *jacket* or inside by the use of a *coil*. A *vacuum still* is one in which a partial vacuum is constantly maintained by means of an air-pump, distillation under such circumstances being more rapid and at a lower temperature. See also RETORT.

Stillborn. See OBSTETRICS, ABORTION, and FÆTUS.

Stillicidium. See EAVESDRIP, SERVITUDE.

Stillingfleet, EDWARD, a learned English divine, was born at Cranborne in Dorsetshire on 17th April 1635. There and at Ringwood he received his early education, at thirteen entered St John's College, Cambridge, where he took his degree in 1652, and the year after obtained a fellowship. For some years after leaving college he was occupied as a private family tutor; and in 1657 he was presented to the rectory of Sutton in Bedfordshire. In 1659 appeared his *Irenicum*, or the *Divine Right of Particular Forms of Church Government examined*, a noble catholic-spirited attempt to find a mean as a basis of union for the divided church. His views savoured somewhat more of latitudinarianism than could be pleasant to the High Church party, and indeed Stillingfleet himself afterwards thought fit to modify them. His *Origines Sacræ*, or the *Truth and Divine*

Authority of the Scriptures (1662), a creditable contribution to the Apologetics of the day, was followed by his *Rational Account of the Grounds of the Protestant Religion* (1664), a defence of the Church of England from the charge of schism in its separation from that of Rome. These works were received with great favour, and quickly led to rich preferment. In 1665 the Earl of Southampton presented him to the rectory of St Andrews, Holborn; he was also appointed preacher at the Rolls Chapel, and shortly after lecturer at the Temple, and Chaplain in Ordinary to Charles II. In 1670 he became Canon Residentiary, in 1678 Dean, of St Paul's. In the Court of Ecclesiastical Commission instituted by James II. Stillingfleet declined to act; and after the Revolution of 1688 he was raised to the bishopric of Worcester. He died at Westminster on 27th March 1699, and was buried in Worcester Cathedral. So handsome in person as to have been popularly called 'the beauty of holiness,' he had, Burnet tells us, a reserved and haughty temper. But he was courteous and temperate in debate, and he had the rare merit for a theologian of being capable of appreciating the courtesy of an opponent. Thus, in the controversy that grew out of his *Mischiefs of Separation* (1680), he candidly confessed himself overcome by the answer of John Howe, who, he said, wrote 'more like a gentleman than a divine, without any mixture of rancour.' Other works were his *Origines Britannicæ, or Antiquities of the British Churches* (1685), and a defence of the doctrine of the Trinity (1697). His collected works, with Life by Dr Richard Bentley, were published in 1710 (6 vols. folio); a supplementary volume of *Miscellanies*, edited by his son, in 1735. See Tulloch's *Rational Theology in the Seventeenth Century* (vol. ii. 1872). —His grandson, BENJAMIN STILLINGFLEET (1702–1771), amongst other things a dilettante and botanist, wrote *Thoughts concerning Happiness* (under the pseudonym Irenæus Krantzovius, 1738), *Essay on Conversation, Miscellaneous Tracts relating to Natural History, Husbandry, and Physick* (a translation from Linnæus), with an original preface on *Grasses* (1759), *Principles and Power of Harmony* (1771), and several dramas; he left in preparation a *General History of Husbandry*. His Life and Select Works were published by W. Coxe in 1811. See BLUE-STOCKING.

Stillingia. See EUPHORBIACEÆ, TALLOW-TREE.

Stillwater, capital of Washington county, Minnesota, on the navigable St Croix River (which here expands into a narrow lake), 18 miles by rail N.E. of St Paul. It has a large lumber trade, and contains sawmills, a foundry, flour-mills, and a state prison. Pop. 8000.

Stilt (*Himantopus*), a widely distributed genus of wading-birds belonging to the Snipe family (Scolopacidae). They have long slender bills and very long wings and legs, the length of the legs being almost equal to that of the body. The Black-winged Stilt (*H. candidus*) has been occasionally met with in Britain, but is only a rare summer visitor, though it breeds in Holland and southern Europe. The prevailing colours of plumage among the stilts are black and white, but a pure black species inhabits New Zealand.

Stilton, a village in the north of Huntingdonshire, 6 miles SW. of Peterborough. It gives name to the well-known cheese, manufactured elsewhere, but once much sold at Stilton.

Stilts, poles with steps or supports at a sufficient distance from the lower end to allow a man standing on the steps to walk clear of the ground and with longer strides. Useful in all marshy lands, they were in old days specially serviceable in the

French Landes (q.v.), where the shepherds practically spent the whole day on stilts. Elsewhere they serve for crossing streams (as the upper Tweed and Clyde), for a (somewhat dangerous) pastime for boys, and for displays of acrobatic skill. At Namur one of the diversions of the carnival was a tournament between bodies of men mounted on stilts.

Stimulants are agents which increase the activity of the vital functions generally, or of one system or organ. Their action is usually understood as being transient and rapid, but is not necessarily so. They are most commonly employed to act on the nervous and circulatory systems, but hepatic, renal, and gastric stimulants are also common terms in medicine. Popularly only those which act on the nervous and circulatory systems are well known, and include alcohol in the form of wines and spirits, sal-volatile, smelling-salts and other preparations of ammonia, besides ether, camphor, various preparations of lavender, peppermint and other essential oils, ginger, &c. Cold and electricity also act as stimulants. They are useful in fainting, nervousness, shock, hysteria, and similar conditions. See the articles on ALCOHOL, ELECTRICITY (MEDICAL), &c.

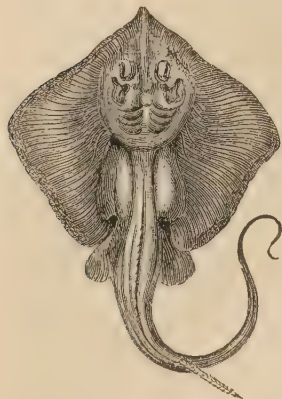
Sting-fish. See WEEVER.

Stinging-animals. In many different ways animals have the power of stinging. To begin with the minutest, the trichocysts of the slipper-animalcule (Paramecium) are often regarded as weapons, though they are more probably mooring-threads. Most Cœlenterates, such as jelly-fish and Portuguese-man-of-war, have Stinging-cells (q.v.). The surprising occurrence of stinging-cells in some Nudibranchs has been proved to be due to a diet of Cœlenterates. The stings of ants, bees, and wasps and some other Hymenoptera are abdominal structures, probably homologous with appendages, and they are associated with a poison-secreting gland. The poison of spiders is lodged in the chelicerae or first pair of oral appendages. The sting of the scorpion consists of a double poison-gland lodged in the sharply pointed segment or 'telson' which lies behind the anus at the end of the tail. The sting-rays (*Trygon*) have no special poison-glands, but it is probable that the inflammation which follows their wounds is due either to the mucus alone or to that plus micro-organisms introduced therewith. In the case of the weevers, both the British species (*Trachinus draco* and *T. vipera*) have special poison-glands in connection with spines, and their wounds are only too well known to fishermen. Finally, the stinging powers of the venomous snakes are due to the modification of one of the salivary glands on each side as a poison-gland and to the adaptation of the teeth as fangs. In the poisonous Mexican lizard *Heloderma* an approach to a similar specialisation occurs. See also POISON.

Stinging-cells, or CNIDOBLASTS, are characteristic of all Cœlentera except Ctenophores. To them the jelly-fish, Portuguese-man-of-war, sea-anemones, and the like owe their power of stinging. They serve to benumb or kill or grapple the small animals on which most of the Cœlenterates feed. Each stinging-cell contains a long coiled lasso or nematocyst bathed in poisonous fluid; at the base of the cavity in which the lasso lies there is a little living matter and a nucleus; projecting from the surface there is often a small trigger-like peak. When the cell is stimulated, in some cases at least by nervous impulse from adjacent nerve-cells, the lasso, which is many times the length of the cell, is rapidly everted. After this has taken place the cell dies. In many cases the cnidoblasts are grouped in little 'batteries.' See CœLENTERATA, HYDRA.

Stinging Plants. See COWHAGE, LOASACEÆ, NETTLE, NETTLE-TREE, URTICACEÆ.

Sting-ray (*Trygon*), a genus of cartilaginous fishes, of the Ray (q.v.) order and family Trygonidæ. The long tail bears dorsally a long



Sting-ray (*Trygon pastinaca*). *T. sephen* and *T. wurnak*, attain a large

size. Only one species occurs in the British seas, *T. pastinaca*, popularly known as the Fire-flaire. The spine of the sting-ray is used by the savages of the South Sea Islands as a point to their spears.

Stinkpot. See ASPHYXIANTS.

Stinkstone, or SWINESTONE, a kind of marble or limestone remarkable for the fetid urinous odour which it emits when rubbed. It contains a little sulphur.

Stink-trap. See SEWERAGE.

Stink-wood (*Ocotea bullata*), a very valuable South African tree of the family Lauraceæ, remarkable for the strong disagreeable smell of its wood, which, however, is hard, very durable, takes an excellent polish, and resembles walnut. It is used for wagons, furniture, panelling, &c.

Stint. See SANDPIPER.

Stipa. See FEATHER-GRASS.

Stipend is the provision made for the support of the parochial ministers of the Church of Scotland. The Church of Scotland has from its inception been organised on a territorial basis, and its endowments, so far as coming from public sources, are almost entirely appropriated to the individual parishes. In the old parishes the stipend was paid out of the tithes or teinds of the parish (see TEINDS), and the ministers of these parishes had a right to have competent stipends awarded to them by the Court of Teinds out of the teinds of their respective parishes in so far as these were adequate. The teinds of *quoad sacra* parishes are included in those of the parishes out of which they were carved, and thus the areas of the *quoad sacra* parishes contribute from their teinds to the stipends of the original, not of the *quoad sacra*, parishes. Stipends were, as a general rule, awarded out of teinds, not in money, but in grain measured by chalders. The money value of the stipend therefore varied in amount from year to year owing to the variations of the fiars prices struck annually in each county, which rose and fell with the price of grain (see FIARS). When the existing stipend of a minister was deemed insufficient, the Court of Teinds, provided there remained any surplus or free teind in the parish, might award out of it such augmentation of stipend as was considered suitable. But no augmentation could be applied

for within twenty years after the last augmentation.

The Report, dated 4th April 1923, of the Departmental Commission appointed by the Secretary for Scotland to inquire into the tenure and endowment of the Church of Scotland contains a statement of the sources out of which stipends—so far as these (a) accrued from public sources, or (b) were drawn from voluntary sources but administered under acts of parliament—were payable at the date of the report. (1) There were 880 old parishes in which the stipends were payable out of teinds. These included a certain number of parishes—known as Exchequer livings—the stipends of which were augmented by grants, payable out of the Consolidated Fund, under the Acts 50 Geo. III. chap. 84, and 5 Geo. IV. chap. 72, which were passed for the purpose of supplementing small stipends. By the later of these acts a parish minister, who had neither manse nor glebe, and whose income was less than £200 per annum, was entitled to an allowance making up his stipend to a sum not exceeding that amount. The annual sum provided under these acts was applied at the sight of the Court of Teinds on reports by the teind clerk. The sum of £12,000 is chargeable annually on the Consolidated Fund in respect of these grants to Exchequer livings. (2) There were 42 parliamentary charges, provided under the Act 5 Geo. IV. chap. 90, in each of which a stipend of £120 is payable out of the Consolidated Fund. (3) There were 46 town churches, the stipends of whose ministers were payable by burghs out of special funds held by burghs. (4) There were about 500 *quoad sacra* parishes whose endowments were derived from voluntary sources, but were administered under decrees of the Court of Teinds in accordance with the New Parishes (Scotland) Act, 1844 (7 and 8 Vict. chap. 44).

The Church of Scotland (Property and Endowments) Act, 1925 (15 and 16 Geo. V. chap. 33), which came into force on 28th May 1925, has introduced important changes affecting stipends. Under the act every stipend which in any way or to any extent depended upon fluctuations in the price of grain—referred to in the act as 'virtual stipend'—is to be converted, at the standard of value defined in the act, into a stipend payable only in money. The method provided in the general case for effecting this conversion is that the standard value in money of virtual stipend for each county shall be determined by adding to the former county average value of the different kinds of virtual in which such stipends are localised an increase of 5 per cent. per annum of that average value—the former county average value of any kind of virtual being deemed for this purpose to be the average value of that kind of virtual for that county for the fifty years 1873 to 1922. It is, however, enacted that, in the application of this provision to a particular parish, regard is to be had to special circumstances affecting the calculation of value of stipend in that parish. The value in money of any virtual stipend, as the same may be determined under these statutory provisions, along with the value of any money stipend, is the 'standard value' of that stipend. The substitution of the new permanent or standard value of virtual stipend for the former fluctuating value of such stipend is termed the 'standardisation' of the stipend. It is enacted that the date of standardisation of a stipend is to be the term of Martinmas which shall first occur not less than six months after the date when the benefice becomes actually vacant, or is deemed to become vacant (a) by 'election,' that is, by the minister, who at the date of the act is entitled to a virtual stipend, electing that the stipend shall be standardised, and intimating his election

in writing to the heritors, to the clerk of the presbytery, and to the General Trustees of the Church, or (b) by 'notification,' that is, by the General Trustees intimating in writing to the minister of any parish, who is entitled to victual stipend, to the clerk of the presbytery, and to the heritors that the victual stipend is to be standardised. The standardised stipend, on and from the date of standardisation, vests *de die in diem* in the minister entitled thereto—any interest which, under the previous law and practice, had vested in the minister at that date or in the widow or other representatives of a deceased minister being safeguarded. The act provides that the standardised stipend is, as from the date of standardisation, payable by the heritors to the General Trustees half-yearly at Whitsunday and Martinmas; but this provision ceases to operate so soon as the amount of the standardised stipend as shown by the Teind Roll—a roll prepared by the clerk of teinds—is constituted a real burden on the lands of the heritors, or has been redeemed or extinguished. The former law relating to augmentations of stipend ceased, as from the date of the act, to have effect. Under the act, however, the minister or General Trustees may—subject to certain time conditions based on the previous law and practice—apply to the Lord Ordinary to find whether there are surplus teinds available for an augmentation; but no such application can be made after the expiry of eleven years from the passing of the act. If, on such application, it be found that there are surplus teinds available, the stipend is to be augmented according to a scale set out in sect. 10 (3) of the act. An augmentation under this section of the act comes in place of all future rights of augmentation, and is final. Neither the widow nor any other representative of any minister admitted after the passing of the act to any benefice is to be entitled to ann (see ANNATES). The annual payments out of the Consolidated Fund to or on behalf of the Church are thenceforth to be paid by the Treasury to the General Trustees, with certain powers for redemption. These annual payments include—in addition to the sum of £12,000 in respect of the grants to Exchequer livings (*supra*) and the sum of £5040 on account of stipends in parliamentary charges (*supra*)—a sum of £2000 for itinerant preachers and a sum of £1100 towards the expenses of the General Assembly.

Stipendiaries. See MERCENARIES.

Stipendiary Magistrates. See BOROUGH.

Stirling, the county town of Stirlingshire, stands on the south bank of the winding Forth, 36 miles NW. of Edinburgh and 29 NNE. of Glasgow. Like Edinburgh, to which in its main features it bears a striking resemblance, it no doubt owes its origin to the strong natural fortress of its Castle Hill, which rises gradually from the east to a height of 420 feet above the sea or 340 feet above the plain, and fronts the west with a steep precipitous wall of basaltic rock. The Castle, which commands magnificent views of the Grampians, the Ochils, and the 'Links of Forth,' dates from immemorial antiquity, though few, if any, of the existing buildings are earlier than the days of the Stewart sovereigns, who often kept court here. These include the Douglas room (where the Earl of Douglas was stabbed by James II., 1452), James III.'s parliament-hall (now a barrack-room), James V.'s palace, and James VI.'s chapel. Stirling has many other objects of interest, as Argyll's Lodging (1630, since 1799 a military hospital); ruined Mar's Work (c. 1570); the church of the Holy Cross, or Holy Rood, the parish church of Stirling (in 1656 divided into two); the statue of Bruce (1877); the new cemetery, with statues of

Reformers and Covenanters; Cowane's Hospital or the Guildhall (1637); the King's Knot and King's Park; the Mote or Heading Hill; the old four-arch bridge (c. 1400—the 'key of the Highlands'); Robert Stevenson's new bridge (1832); and the Smith Institute (1874), with picture-gallery and museum, where now is preserved the 'Stirling Jug' (1497), the standard of the old Scots pint. Other modern edifices are the County Buildings (1875), the public hall (1883), the High School (1855–89), and the Municipal Buildings (1918). In the neighbourhood are Bannockburn (q.v.); the ruins of Cambuskenneth Abbey, founded by David I. in 1147 for Augustinian monks, and the burial-place of James III.; and the Abbey Craig (362 feet), crowned by the Wallace Monument (1861–69), a tower 220 feet high. Stirling has manufactures of carpets, agricultural implements, &c. A royal burgh as early as 1119, it unites with Falkirk and Grangemouth (by the act of 1918) to return one member to parliament. Pop. (1851) 12,837; (1881) 16,013; (1921) 21,345. Stirling (formerly *Stryvelyne* or *Estrivelin*, and also *Snowdown*) has a wealth of historic memories—the death of Alexander I. and William the Lion; Wallace's victory of Stirling Bridge (1297); the great siege of the castle by Edward I. (1304); the birth of James III.; the coronation of Queen Mary; the baptism and coronation of James VI.; the slaughter of the Regent Lennox (1571); the birth of Prince Henry (1594); the capture of the castle by Monk (1651); and its unsuccessful siege by the Jacobites (1746).

Stirling, JAMES HUTCHISON, the most eminent of later Scottish philosophers, was born at Glasgow, 22d June 1820, took the course in both arts and medicine at Glasgow University, and practised a short time as a physician in South Wales. He next went to Germany, and gave himself devotedly for some years to the study of philosophy. The publication of his masterly and epoch-making work, *The Secret of Hegel: being the Hegelian System in Origin, Principle, Form, and Matter* (1865; 2d ed. 1898), opened up an unknown world to readers, and gave a powerful impulse to the study of philosophy generally. This work, as full of individuality as learning, was followed in 1881 by a *Complete Text-book to Kant*, comprising a translation and reproduction of the *Critique of Pure Reason*, with a commentary and biographical sketch. These two works stand together in the most intimate relation, for, according to Stirling, from Kant's antecedent system Hegel's philosophy itself was but 'a development into full and final shape.' At the same time Dr Stirling brought Kantian speculation into line with English thought by demonstrating that the central problem of the critical philosophy was a question that had been already propounded, if not answered, by Hume. Stirling received the degree of LL.D. from Edinburgh in 1867, and was elected a foreign member of the Philosophical Society of Berlin in 1871. He delivered the first course of Gifford Lectures at Edinburgh, and these were published in 1890, the whole forming a vigorous if somewhat discursive work, in which natural theology is considered in its relation to the history of philosophy, and investigated mainly from the point of view of reason and the principles involved in the Theistic inference. Of the famous three proofs—the Teleological, the Cosmological, and the Ontological—he deals mainly with the first. 'Begin with which we may, and let them be separated from each other as they may be in time, the three, after all, do constitute together but the three undulations of a single wave, which wave is but a natural rise and ascent to God, on the part of man's own thought, with man's own experience and consciousness as

the object before him.' Other works of Dr Stirling's are *Sir William Hamilton: being the Philosophy of Perception* (1865), an assault on Hamilton's doctrine of perception more serious still than Mill's; an excellent translation of Schwegler's *History of Philosophy* (1867); *Jerrold, Tennyson, and Macaulay, &c.* (1868); *As Regards Protoplasm* (1869; complete ed. 1872), an answer to Huxley's *Essay on the Physical Basis of Life*; *Lectures on the Philosophy of Law* (1873), together with an incisive attack on Whewell and Robertson Smith for their statements anent Hegel's relations to Newton and the calculus; *Burns in Drama* (1878); *Darwinianism: Workmen and Work* (a criticism of the three Darwins, 1894); besides lectures on Materialism, Philosophy in the Poets, &c., and the article on Kant in *Chambers's Encyclopædia*. He died 19th March 1909. See Life by his daughter (1912).

Stirling, WILLIAM ALEXANDER, EARL OF, minor dramatic poet, a contemporary and dear friend of Drummond of Hawthornden, was born at Menstrie House near Alloa, most probably about 1567—hardly so late as 1580, the usual date formerly given. He studied at Glasgow and Leyden, travelled through France, Spain, and Italy with Archibald, seventh earl of Argyll, and began his career as a poet by publishing at Edinburgh, in 1603, his tragedy of *Darius*, quickly followed by *Aurora*, a collection of sonnets (Lond. 1604), *Cræsus* (together with *Darius*, 1604), the *Alexandrian Tragedy* (1605), and *Julius Cæsar* (1607). These were collected as *The Monarchicke Tragedies* in 1607. He was knighted by 1609; in July 1613 was attached to the household of Prince Charles, as before he had been to Prince Henry's; in 1614 was made Master of Requests for Scotland, publishing the same year the first part of his great poem of *Doomesday* (second part, 1637), which extends to 11,000 verses, and which himself even allows in the dedication to be of 'too melancholic a nature for young minds.' He received in 1621 the grant of 'Nova Scotia'—a vast tract of Canada and the northern part of the modern United States—his charter being renewed in 1625; and in 1631 he received the patent of sole printer for thirty-one years of King James's version of the Psalms, a work to which he had contributed greatly, but which proved an utter failure. In 1626 he was made Secretary of State for Scotland, which office he held till his death, despite his unpopularity. Baillie writes of him as 'extreamly hated of all the country, for his alleged bribery, urging of his psalms, and the books for them.' In 1627 he was made Keeper of the Signet, a Commissioner of Exchequer in 1628, and one of the Extraordinary Judges of the Court of Session in 1631. The French pushed their conquests in America, and Alexander's grant of lands thereby became useless. He was promised £10,000 compensation, but the money was never paid. In 1630 he was created Lord Alexander of Tullibody and Viscount Stirling. In 1633, at the crowning of Charles in Holyrood, he was made Earl of Stirling and Viscount Canada, in 1639 also Earl of Dovon, but he sank into insolvency, and died in London, 12th September 1640. His body was embalmed and buried at Stirling a few months later. The title died out with the fifth earl in 1739. His tragedies are not dramatic, but their quatrains are gracefully written, albeit the quantities are monstrous—witness Ixion, Nicānor, Orion, and Eumēnes. The *Parænesis* to Prince Henry is perhaps his finest work; the songs, sonnets, elegies, and madrigals forming the *Aurora* are sadly marred by conceits, yet show rich fancy and ingenuity, though scarce even a Scotsman can claim for them that they sparkle still the right Promethean

fire. These amatory poems the author did not include in his collected *Recreations with the Muses* (folio, 1637).

His works were edited, with elaborate essays, by Kastner and Charlton (vol. i. 1921). See also the Rev. Charles Rogers, *Memorials of the Earl of Stirling and the House of Alexander* (2 vols. 1877) and his edition of the *Earl of Stirling's Register of Royal Letters* (1615-35).

Stirling-Maxwell. See MAXWELL.

Stirlingshire, a midland county of Scotland, forming part of the border-land between Highlands and Lowlands, is bounded by Perth, Clackmannan, Linlithgow, Lanark, and Dumbarton shires. With a maximum length and breadth of 46 and 22 miles, it has an area of 451 sq. m., or 288,842 acres, of which 3000 are foreshore and 8000 water. The Forth traces much of the northern and all the north-eastern boundary; on the western lies Loch Lomond; and other lakes and streams belonging partly or wholly to Stirlingshire are Lochs Katrine and Arklet, and the Avon, Carron, Bannock, Endrick, and Blane. Ben Lomond, in the north-west, attains 3192 feet; and lesser elevations are the Gargunnoch Hills (1591 feet), Kilsyth Hills (1393), Campsie Fells (1894), and Finty Hills (1676). A considerable part of Stirlingshire is occupied by the rich carse of Stirling and Falkirk, once covered with unproductive peat-moss. About 40 per cent. of the whole area of the county is in cultivation. Coal and ironstone are largely mined; and there are the great ironworks of Carron and Falkirk, besides manufactures of woollens, cotton, chemicals, &c. The chief towns are Stirling, Falkirk, Kilsyth, Denny, and Grangemouth. With Clackmannanshire, the county returns two members to parliament. Pop. (1801) 50,825; (1841) 82,057; (1881) 112,443; (1921) 161,726. In Stirlingshire were fought the battles of Stirling Bridge, 1297; Falkirk, 1298; Bannockburn, 1314; Sauchieburn, 1488; Kilsyth, 1645; and Falkirk, 1746. See Nimmo's *History of Stirlingshire* (3d ed. 1880).

Stirner, MAX, was the pseudonym by which Kaspar Schmidt (1806-56) became known as a representative of 'individualist anarchism.' A predecessor of Bakunin, he taught that might is right, morality the weapon of tyrants and the fetter of fools, and egoism the standard. Born in Bayreuth, he studied at Berlin, and taught in a girls' school there. *The Ego and his Own* was translated in 1912.

Stitch in the side is the popular and expressive name applied to sharp pains felt in various parts of the side. It seems that these may be due to various causes; thus, they may be associated with pleurisy where there is no effusion, or with a stretching of the not uncommon adhesions between two pleural surfaces, or simply with local spasms of the respiratory muscles, as when a person takes violent exercise after a full meal, or perhaps even with a slight twisting of part of the intestine. When the stitch is but slight it is often removed by stooping, hence the popular remedy is to make a cross upon the foot.

Stitchwort. See CHICKWEED.

Stiver (Dutch *stuiver*), a coin of Holland, equivalent to a penny sterling, being the $\frac{1}{20}$ th of a guilder or gulden. See FLORIN.

Stoat. See ERMINE.

Stobæus, JOANNES, a native of Stobi in Macedonia, who compiled for his son Septimius, about 500 A.D., an anthology in four books from as many as 500 Greek poets and prose-writers. It has preserved for us fragments from many works now lost, and is especially rich in quotations from

the Greek dramatists. Originally forming one whole, the work in course of time became divided into two divisions, each of two books: *Eclogæ Physicæ et Ethicæ* (ed. Gaisford, 1850; Meineke, 1860-64), and *Anthologion or Florilegium* (Wachsmuth, 1884), containing the precepts on political and ethical subjects (ed. Gaisford, 1822-25; Meineke, 1856-57).

Stock, or STOCK GILLYFLOWER (*Matthiola*), a genus of Cruciferae, with cylindrical or compressed pods, and a stigma consisting of two upright appressed plates, the outer side of which often rises into a knob or horn. The species are herbaceous, annual or perennial, or half-shrubby, natives of the countries around the Mediterranean Sea, most of them thickly clothed with white or grayish stellate hairs; the flowers in racemes, and generally beautiful and fragrant. Some of the species have long been much cultivated, and many fine varieties have been produced by cultivation. *M. incana*, a very rare and even doubtful native of England, is probably the parent of the greater number of the cultivated kinds. The sandy shores of Wales and of Cornwall produce a species, *M. sinuata*, the large purple flowers of which are fragrant only at night—a characteristic also of several other species. Stocks are always raised by gardeners from seed, which even the double kinds often produce, a multiplication of the petals having taken place without loss of the parts of fructification. Of the seedlings, however, some produce double and others single flowers, so that only some gratify the cultivator. The hoary-leaved stocks are generally treated as biennials, although, in reality, they may almost be reckoned perennial; and it is not desirable that they should flower in the first year, as the plants become stronger when they remain without flowering till the second year, and produce richer racemes of flowers. The smooth-leaved stocks are treated as annuals. The beautiful little annual called Virginian Stock does not belong to this genus, although it is of the same family. Its habit is indeed very different. It is *Malcolmia maritima*, and, notwithstanding its popular name, is a native of the shores of the Mediterranean. It has become one of the most favourite British flowers, almost rivalling mignonette, and is all the more esteemed because it grows well in garden-plots exposed to the smoke of towns.

Stockbridge, a little market-town of Hampshire, on the Anton or Test, 8 miles W. by S. of Andover. Till 1832 it returned two members to parliament: Steele at one time was its representative. It has a well-known racecourse and training stables.

Stock-exchange. The London Stock-exchange as a corporate body only dates from the commencement of the 19th century. Prior to the establishment of the Stock-exchange in 1801 transactions in the funds were conducted in a very slipshod manner by groups of individuals, who till about 1698 used the old Royal Exchange in London as a meeting-place, and then for a century made one of the network of alleys in Cornhill their headquarters, congregating in Change Alley both in the open air and in the Jonathan and Garraway coffee-houses. Dealings in Government funds were also conducted in the Rotunda Room in the Bank of England. The founders of the Stock-exchange acquired premises in Capel Court, facing the eastern side of the Bank of England. The original capital subscribed for providing the accommodation was 400 shares of £50 paid. Nothing further was required for upwards of half a century in the way of capital. Subsequently considerable expenditure, especially since 1870, raised the total share capital

to £500,000 in 20,000 shares, £25 paid up per share, and there remain unredeemed £307,900 in 3 per cent. debentures of £450,000 originally created in 1899-1900. In the early days of stock-dealing transactions were almost entirely in the different forms of British Government funds, lottery bonds, and floating debt; but Change Alley, just as Capel Court in the 19th century, had wild fits of gambling in company schemes, of which the most memorable, the South Sea Scheme (q.v.), culminated in 1720.

At the time the first stone of the Stock-exchange building was laid in 1801 the total national debt of Great Britain was some £550,000,000, and the Stock-exchange list, published bi-weekly, comprised only six securities, chiefly British Government stocks. Foreign governments first came to the English market as borrowers in 1816 to 1825, and the bonds of various European and American states, Russian, Portuguese, Neapolitan, Danish, Greek, Colombian, Mexican, Buenos Aires, Chilean, Peruvian, &c., came to be dealt in. There were also transactions in a few canal, insurance, and industrial companies, including shares of the Gaslight and Coke Company. Numerous banking corporations were established immediately after 1833. The introduction of railways in the United Kingdom and on the Continent in the period from 1840 to 1846 added largely to the business of the Stock-exchange. The gold discoveries of 1848-50 brought about the formation of a crowd of British, colonial, and foreign mining schemes. The introduction of joint-stock companies after the Act of 1862, the growth of foreign government debts, and the introduction of Indian and colonial borrowings, municipal loans, gas, water, shipping, telegraph, tramway, rubber, oil, manufacturing, &c., undertakings, as well as a great number of colonial and foreign railroad, &c., securities, have added enormously to the amount of securities dealt in. In 1911 the official daily Stock-exchange 'List' comprised some 5200 securities. At the end of March 1924 the 'official' list of quoted and further unquoted securities aggregated probably between 12,000 and 13,000 different items. The official list now comprises twenty large pages of names of securities.

Outside London there are the provincial establishments—Manchester, Liverpool, Leeds, Birmingham, Bristol, Glasgow, Edinburgh, Dublin, Belfast; and other important centres of the United Kingdom have their stock-exchanges administered by committees, all having rules and regulations much on the same lines as those of the great London establishment. On the Continent every important city has its stock-exchange or *Bourse*. New York, Philadelphia, Baltimore, Chicago, San Francisco, and other important American cities have their stock-exchanges; and there are *Bolsas* in South American cities. Transactions in public funds and securities of joint-stock companies are also conducted in leading Indian and colonial cities.

The control of affairs of the London Stock-exchange is vested in two separate bodies:

- I. The trustees and managers—who must *ipso facto* be members—who represent the proprietors of the building, and are elected by the shareholders.
- II. The committee for general purposes—thirty in number are elected annually, in March, by the members.

The second body is responsible for the framing and observance of the rules, the maintenance of discipline, the granting of quotations, dates of settlements, investigation of disputes, whether between members themselves or members and the public, the admission of members and clerks, &c. The committee has powers to censure, suspend, or

expel any members for infraction of the rules or dishonourable conduct.

There have in times past been disputes between the two governing bodies, but a new scheme provided that each new member must also be a shareholder. Such regulation will automatically in time blend the two administrations into one. The proprietors, at 1st January 1876, numbered 268; at 24th March 1926 there were 2523 proprietors.

At the time when the London Stock-exchange was opened in 1802 there were 551 members and 99 clerks. In 1904 the roll of members included upwards of 3800 names, and there was an army of house clerks. In 1926 the members numbered 3858, and there were 1884 non-member clerks—authorised to deal for their employers and unauthorised, all with right of entry to the exchange buildings.

Members have to declare whether they act as brokers or jobbers, and subsequently may notify the committee of intention to change over from the one to the other.

The *broker* transacts business as between members of the Stock-exchange and the public, obtaining his commission from the clients who employ him. He deals in all securities, at rates of commission fixed by the committee, and published in the Rules and Regulations (Appendix xxxix. of the Rules).

The *jobber* or *dealer* confines his attention to some special group of securities and generally offers to buy at one price or sell at a higher price. The margin between the buying and selling prices he may quote to any broker or fellow jobber varies according to the nature of the security, the extent of competition, the state of the market, &c.

Official schedules of the names of firms and individuals who are brokers are obtainable by the public free of charge from the Stock-exchange secretary, and one is posted up for public information in the Bank of England. A list is now embodied in the *Stock Exchange Official Intelligence*. No such schedule is issued to the public as to the names of 'jobbers' or 'dealers,' but information can be obtained, as each year the committee issues a full list of the firms and individuals of the Stock-exchange, setting out the date of admission, addresses—office and private—bankers, telephone numbers, &c.

In 1821 each applicant for membership was required to provide two existing members as sureties for the sum of £250 each, who were held liable in their suretyship for two years. Various alterations have since been made.

At the present time an individual seeking membership, if he has not for a period of four years served as clerk in the Stock-exchange, is required to obtain nomination of a deceased or retired member, has to obtain the suretyship of *three members* responsible for £500 each for four years, has to purchase three Stock-exchange shares and pay an entrance fee of 600 guineas, and the annual subscription current at time of his application. At present such subscription is 100 guineas. Such annual payments and the annual subscriptions have in course of years gradually increased.

For any applicant who has served as an authorised or unauthorised clerk to a member or firm for a period of four years the conditions are not so onerous as for an inexperienced applicant. The trained man of four years' experience has to acquire a nomination and one Stock-exchange share. He has to find two sureties for £300 each for four years. His entrance fee is 300 guineas, and the present annual subscription is 50 guineas. Each year the committee grants a certain number of free nominations to clerks who have been in the 'House' for four years, and would-be members of this class can enter their names on a waiting list. Their entrance fee is also 300 guineas.

Registered and Bearer Securities.—Stock-exchange securities are of two characters, inscribed or registered, and to bearer. In home government funds and several colonial and municipal 'inscribed' issues the names of stockholders are registered (*inscribed*) in books kept at the Bank of England, or other banking agents of the government or corporation. When such stock is sold the vendor or his attorney must attend the bank and sign the transfer in the books. Where stock in a railroad or other company that registers the name of the stockholder is sold by the *registered* proprietor a deed of transfer, subject to stamp-duty, has to be executed, and this deed, with the relative stock or share certificate, is passed to the purchaser, who directly or through his agent lodges them with the company for registration into his own name. Securities to *bearer* are those the title to which passes by mere delivery, and the interest or dividends are paid periodically by means of coupons.

Settlements.—The great bulk of stock-exchange transactions in Great Britain are purchases or sales for what is termed the *settlement*, which is bi-monthly. Important exceptions, however, are all descriptions of British and colonial securities, dealings in which have, since the reopening of the Stock-exchange after the Great War, been for *cash* only. In dealing in *registered securities* it is necessary for the purchaser or seller to furnish the broker entrusted with the business with full particulars. A purchaser should give his full name, address, and occupation. A seller is required to forward to the broker the certificate of title. Where the transaction is in *securities to bearer* the vendor simply has to hand the securities to his broker, and the transaction is in all respects similar to the exchange of a bank-note for cash.

In cases of new issues of companies, dealings are only permitted after sanction has been granted by the committee.

Although the London Stock-exchange is not, as generally is the case on the Continent, in any way controlled by the Government and has not a monopoly, till recent years it practically secured the whole of the *bona fide* business of buying and selling British Government securities. But since the Great War period creation of vast Government loans and great increase in all manner of new capital issues, the banking companies have in many cases induced their clients to give buying and selling orders to their managers throughout the country, and though the orders are effected through the Stock-exchange, the banks, also most lawyers, who give orders for clients, receive half the stock-brokers' commission charge.

Members of the Stock-exchange voluntarily place themselves under the most stringent rules and regulations, and the slightest irregularity is visited with prompt pains and penalties. There is no appeal from decisions that may be made by the committee, and no legal action may be instituted by one member against another except with the consent of the committee.

Immediately prior to the war declaration, August 1914, the hitherto unprecedented step was taken—31st July—of compulsory closing of the Stock-exchange at the request of the Government, and projects for the minimising of effect on the world of finance were considered. An outcome of these deliberations was the fixing of minimum prices below which transactions were not permitted and the granting of a moratorium—the duration eventually decided as till a year after conclusion of peace—in respect of all transactions which had not been consummated at the time.

In January 1915 the Stock-exchange was, with the consent of Government, reopened, but the conditions of dealing which had been mutually agreed

upon by the Treasury officials and the Stock-exchange Committee were so restricted that free markets were non-existent and dealings could be effected for cash only. Obviously every precaution had to be taken to preclude the chance of enemy-held securities being marketed in the United Kingdom *vis à vis* neutral countries, and all transactions had to be accompanied by a declaration of British ownership.

With the termination of the war restrictions were gradually removed, and all bargains unsettled at the outbreak of war were finally adjusted in August 1922. Shortly after that date all war-time restrictions and declarations were removed. One exception of importance was that dealings in all British, Indian, and Colonial Government securities could be effected for cash only.

Prior to the war, by telegraph and telephone, an enormous amount of *arbitrage* business had been transacted between international exchanges, especially between New York, Paris, and London. Closely observant dealers, finding a security could be bought cheaper in New York than in London, purchased in New York and sold the stock in London. Such arbitrage business was conducted between the exchanges of all the world. The outbreak of war put a stop to all arbitrage London dealings with the Continent and America, and the aftermath of upheaval and demoralisation of foreign currencies has reduced arbitrage business to a minimum.

Bulls, Bears, Contango, Backwardation, Corners, Options.—A very large proportion of the business done in the stock-markets prior to the war was speculation in *time bargains*. A purchaser who imagines that some special security is likely to rise in price buys for the settlement, in the hope of being able to sell at a profit before the date for payment falls due. If a change in price the way he expects is delayed, he renews the transaction from settlement to settlement. It may be the case that a fall in price is expected, and an operator sells in the hope of being able to buy back at a lower price. The purchaser for a higher quotation is in stock-exchange parlance called a *bull*. The seller who anticipates a fall in prices is termed a *bear*. If there is a preponderance of bull speculation high terms are asked for the loan of money on the security of stock, termed a rate of *contango*, which may be expressed as so much per share or per cent. on the nominal hundred pounds of capital, or it may be a rate per cent. upon the actual amount of money to be borrowed. If many persons have formed an adverse opinion as to the course of the market, and there is what is termed an oversold state of the account, it frequently happens that those *bears* who have sold what they do not possess are called upon by real purchasers of stock, shares, or bonds to provide a bonus, termed *backwardation*, to pay the holder of the security for the trouble and risk attendant on lending it to the seller. Sometimes a long-continued speculation for the fall is attended with very high backwardation charges, and not infrequently violent fluctuations in the price of the security. Combinations to resist the adverse effect of sales by speculators for the fall are sometimes entered into in face of really adverse circumstances. A powerful group with command of money finding that 'bear' operations in a security of which the floating amount is small have been entered into to an excessively imprudent extent, buy all the stock that is offered, and call upon those who have sold what they do not possess to deliver it. This results in what is called a *corner*, and the operators who have sold have to pay whatever price the operators who have bought like to ask. *Corners* have been very frequent on the New York and Chicago Stock also Produce exchanges. It is many years ago since

any 'corner' of magnitude has been attempted on the London Exchange.

Much speculation in stock-exchange securities is conducted on what is known as *option* business. Options can be of threefold character—the payment of a sum for the right to purchase or to sell at a future date at an agreed price, or the right to sell only, or again the right to buy only. These options are termed respectively (1) the *put and call*, (2) the *put*, (3) the *call*. In America the double option of *put and call* is termed a *straddle*. This option business enables any operator to enter into speculative engagements with a known maximum of possible loss.

It should be mentioned that in 1878 a Royal Commission investigated and reported on the subject of the regulations and procedure of the Stock-exchange to consider *inter alia* the granting of a charter. The reports in full with evidence were published as a Government blue-book. It virtually commended the rules and regulations as they were being carried out by the committee of the Stock-exchange. At recurring intervals since then the 'charter' question has been revived, but so far nothing in this direction has been accomplished.

See Francis, *Chronicles of the Stock Exchange* (1849); G. R. Gibson, *The Stock Exchanges of London and New York* (1889); *Stock Exchange Official Intelligence*, issued annually under the sanction of the London Stock-exchange Committee, also the *Stock Exchange Year-book*, by T. Skinner; besides works by Crump (1875), Giffen (1877), Ellis (1879), Duguid (5th ed. 1926), Hartley Withers (1910), Poley (1911), Hirst (1911); on the law and usages of the Stock-exchange, works by Paterson, Royle, Melsheimer, Lawrence, Stuttgart, Bagehot's *Lombard Street* (10th ed. 1892), Schwabe and Branson (1905), J. Burn (1909), Bewes (1910), Parkinson's *ABC of Stocks and Shares* (1925), and American works by Lewis, Biddle, Dos Passos, and Cook; also the article *BROKER*.

Stock-fish, a commercial name of salted and dried cod and other fish of the same family, particularly the Ling, Hake, and Torsk.

Stockholm, the capital of the kingdom of Sweden, stands on several islands and the adjacent mainland, between a bay of the Baltic and Lake Mälär, in a situation that is accounted one of the most picturesque in Europe. The nucleus of Stockholm is an island in mid-channel called 'the Town'; on it stand the imposing royal palace (1697-1754); the principal church (St Nicholas), in which the kings are crowned; the House of the Nobles (1648-70), in which that class held its periodical meetings; the ministries of the kingdom; and the principal wharf, a magnificent granite quay, fronting east. Immediately west of the central island lies the Knights' Island (*Riddarholm*), containing the old Franciscan church (restored 1914-22), in which all the later sovereigns of Sweden have been buried. To the north of these two islands lie the handsomely built districts of Normalm and Östermalm, separated from them by a narrow channel, in which is an islet with the Houses of Parliament. The principal buildings and institutions in Normalm and Östermalm are the National Museum (1850-65), with extremely valuable collections of prehistoric antiquities, coins, paintings, sculptures; the principal theatres; the Academy of the Fine Arts (1735); the barracks; the Hop Garden, a magnificent park, with the Royal Library (1870-76; a large collection), and with the statue (1885) of Linnæus; the Academy of Sciences (1739), with natural history collections; the Museum of Northern Antiquities (1873); the Observatory; the Nobel Library; and technological, medical, *slöjd*, and other schools. Ship Island (*Skeppsholm*), immediately east of 'the Town' island, is the headquarters of the Swedish navy, and is built over with marine workshops, ship-

building yards, &c., and is connected with a smaller island on the south-east, that is crowned with a citadel. Beyond these again, and farther to the east, lies the beautiful island of *Djurgården*, once a hunting-ground of Gustavus Vasa. Situated there are the Northern Museum (1907), the Biological Museum, and a great open-air park and museum (*Skansen*). Immediately south of 'the Town' island is the extensive district of Södermalm, the houses of which climb up the steep slopes that rise from the water's edge. The new municipal buildings (1923) and the law-courts (1915), masterpieces of modern Swedish architecture, stand on the island of Kungsholmen. Handsome bridges connect the central islands with the northern and southern districts; besides buses and tramways, the principal means of communication are quick little steamboats, some of which extend their journeys to the beautiful islands in Lake Mälär on the west, and eastward towards the Baltic Sea (40 miles distant). Besides the institutions already mentioned Stockholm is the home of the Swedish Academy (1786), Academies of Agriculture (1811), Music (1771), and the Military Sciences (1771), a naval school, a school of navigation, of pharmacy, &c. There is considerable industry in the making of sugar, tobacco, silks and ribbons, candles, linen, cotton, and leather, and there are large iron-foundries and machine-shops. Although Gothenburg is the chief port of Sweden, Stockholm, which ranks next, is the principal port of the east coast, and serves a vast hinterland. Usually free from ice on its seaward side all the year round, it has ample docking facilities, including six ship-yards with dry and floating docks, &c. A free-port area was established in 1919 and greatly extended in 1925. The most important imports are grain and flour, textile manufactures, raw textile material and yarn, colonial wares, and coal, while chief among the exports are timber (wrought and unwrought), iron and steel, metal goods, wood-pulp, paper and paper manufactures, and tar. Although Stockholm was founded by Birger Jarl about 1255, it was not made the capital of Sweden until comparatively modern times. It has grown rapidly: pop. (1800) 75,500; (1850) 93,000; (1870) 136,000; (1925) 438,896. The principal events in the history of the city have been the sieges by Queen Margaret of Denmark (1389), the battles in the vicinity against the Danes towards the end of the 15th century, the capture of the place by Christian II. of Denmark in 1520, the Blood Bath he executed amongst the principal men of the country in what was then the Great Market, and the liberation of the city by the Swedish patriot Gustavus Vasa in 1523.

Stockings. See **HOSIERY**.

Stockmar, CHRISTIAN FRIEDRICH, BARON, diplomatist, was born of Swedish descent at Coburg, 22d August 1787, studied medicine, and after some service with the army was appointed physician to Prince Leopold of Coburg, ere long to become his secretary and most influential adviser on all questions personal and political. As such he came to England with Leopold when he became the husband of the Princess Charlotte; and he gave Leopold valuable support in the negotiations that issued in making him king of Belgium. He had been ennobled in 1821, and was made a baron in 1831. Leaving Leopold's service in 1834, he became the mentor of Prince Albert of Coburg, and was the trusted friend of the young queen of England and her husband, living sometimes in England and sometimes in Coburg. As representative of Coburg in 1848 at the Diet, he supported Prussia's claim to the headship of the German nation. He died at Coburg, 9th July 1863.

See his *Denkwürdigkeiten*, edited by his son (Eng. trans. *Notabilia*, 2 vols. 1872); Juste, *Le Baron Stockmar* (Brussels, 1873); Sir Theodore Martin's *Life of the Prince Consort*; the *Greville Memoirs*; and for a less favourable view, the *Memoirs of King Leopold's morganatic wife*, Caroline von Bauer (Eng. trans. 1884).

Stockport, a parliamentary, municipal, and county borough of East Cheshire, 6 miles SSE. of Manchester and 37 E. of Liverpool. It is built on the slopes of a narrow gorge, where the Tame and the Goyt unite to form the Mersey, which is spanned by the viaduct (1840) of the London and North-Western Railway, 111 feet high and 625 yards long, as well as by several bridges. St Mary's Church was rebuilt in 1817, with the exception of its 14th-century chancel; and Stockport has also a market-hall (1851-61), mechanics' institute (1862), free library (1875), fine technical school (1890), huge Union Sunday school (1806), grammar-school (1487; rebuilt 1832), infirmary (1832), the Vernon Park (1858), containing a museum, and, in St Peter's Square, a statue (1886) of Richard Cobden, who represented the borough from 1841 to 1847. Stockport was the site of a Roman station, and afterwards of a Norman castle, held till 1327 by the Earls of Chester, and taken by Prince Rupert in 1644, soon after which it was demolished by the parliament. In 1745 Prince Charles Edward passed through Stockport, which Bishop Pococke six years later describes as having 'a little manufacture of the Manchester linen, some woollen and ribands, and two silk-mills like those of Derby.' Since then it has grown to be a most important seat of the cotton industry, in spite of the machinery disturbances (1810-20), the strike of 1828-29, when the military were called out, and many persons wounded, the 'Plug Riots' (1840), and the cotton-famine (1861-64). Felt hats are also manufactured, and there are iron and brass foundries, engine and machine shops, breweries, &c. Stockport was constituted a parliamentary borough (returning two members) in 1832, a municipal borough in 1835, and a county borough in 1888. Pop. (1851) 53,835; (1881) 59,553; (1901) 78,871; (1911) 119,870; (1921) 123,315.

Stocks, an apparatus of wood much used in former times in England for the punishment of petty offenders. The culprit was placed on a bench, with his ankles fastened in holes under a movable board, and allowed to remain there for an hour or two. The period of their first introduction is uncertain, but in the second Statute of Labourers, 25 Edw. III., 1350, provision is made for applying the stocks to unruly artificers; and in 1376 the Commons prayed Edward III. that stocks should be established in every village. Each parish had in later times its stocks, often close to the churchyard; and, though the last in London (St Clement Danes, Strand) were removed in 1826, many may still be seen in the country. Indeed the punishment was used so late as 1858 at Colchester, 1863 at Tavistock, and 1865 at Rugby. Combined with the stocks was often a whipping-post for the flagellation of vagrants.

Stocks. See **NATIONAL DEBT**, and **STOCK-EXCHANGE**.

Stockton, capital of San Joaquin county, California, on a navigable creek connected with the San Joaquin River, 103 miles by railway E. by N. of San Francisco. It contains a convent and the state lunatic asylum, and manufactures ironware, paper, woollens, flour, soap, carriages, farm implements, &c. Pop. 40,000.

Stockton, FRANCIS RICHARD, who was born at Philadelphia 5th April 1834, and died 19th April 1902, was engraver and journalist, and became assistant-editor of *St Nicholas*. He first attracted notice by

his fantastic stories for children, which fill several volumes; but he is best known by all classes of readers as author of *Rudder Grange* (1879). Later works are *The Late Mrs Null*, *The Casting Away of Mrs Lecks and Mrs Aleskine*, and *The Dusanter*, *The Hundredth Man*, *The Schooner Merry Chanter* (1890), *The Squirrel Inn* (1891), *Pomona's Travels* (1894), *The Shadrach* (1895), *The Buccaneers and Pirates of our Coasts* (1898), and *Captain Chap* (1898).

Stockton-on-Tees, a borough and seaport of Durham, on the north side of the Tees, 11 miles from its mouth and 11 ENE. of Darlington, 4 WSW. of Middlesbrough, and 236 NNW. of London. A new town, South Stockton, incorporated in 1892 as Thornaby-on-Tees (population 20,000), has sprung up in Yorkshire south of the river, the two being connected by an iron bridge of three arches (1887), which superseded a five-arch stone bridge of 1771, and cost over £80,000. The town has seven churches, a Roman Catholic chapel (1842-70) by the elder Pugin, a town-hall, borough-hall (1852), an exchange, two theatres, large recreation grounds, and an extensive park presented by Sir Robert Ropner, Bart. The Stockton Races, of some mark in the sporting world, are held here annually in August. Shipbuilding, chiefly in iron and steel, is carried on to a great extent; and blast-furnaces, foundries, engine-works, and extensive potteries and ironworks are in operation. Sailcloth, ropes, linen, and diapers were at one time the staple industry of the town, but their manufacture has been discontinued; there are breweries. The exports are chiefly iron and steel manufactured, ferro-manganese, pig-iron, chemical manures, grain; the imports iron and steel manufactured and raw, spelter, sand and loam, chemical manures, cement, iron-ore, provisions and grain. The Stockton and Darlington Railway, the first to commence passenger traffic, was opened for the double purpose of the conveyance of passengers and goods, 27th September 1825. At Stockton the Tees is navigable for vessels of large tonnage; the navigation of the river has been much improved, and great facilities for an extensive trade provided. Pop. municipal borough (1891) 49,708; (1921) 64,150; of parliamentary borough, including Thornaby (1921) 83,981. Stockton suffered severely from the incursions of the Scots in the early part of the 14th century, but even at that time it enjoyed considerable trade. Its moated castle was taken for the Parliament in 1644, and 'slighted and dismantled' in 1652, almost the last vestige being removed in 1865. At the Restoration it had only 120 houses, mostly built of clay. Since 1867 it sends one member to parliament. Ritson, Sheraton, and Walker (the inventor of friction matches) were natives.

Stoddard, RICHARD HENRY, American poet, was born at Hingham, Massachusetts, in July 1825, attended schools in New York, and then worked in an iron-foundry for some years, meanwhile reading widely, especially in poetry. In 1849 he produced a small volume of poems, only to suppress it afterwards; but 1852 saw the birth of a sturdier collection. From 1853 to 1870 he served in the New York custom-house, in 1870-73 was clerk to General McClellan, and till his death in May 1903 did much reviewing and literary criticism. His poems include *Songs in Summer* (1857), *The King's Bell* (1862), *The Book of the East* (1867), and *Lion's Cub* (1891).

Stoicism, a school of ancient philosophy, strongly opposed to Epicureanism in its views of human life and duty. The Stoical system dates from the end of the 4th century B.C.; though commonly said to have been derived from the system of the Cynics, it is noteworthy that few of its

founders or early apostles were born in Greece; it is the joint produce of Hellas and the Orient, and it was in Rome rather than in Greece that it most profoundly influenced civilisation.

The founder of the system was Zeno, from Cittium in Cyprus (340-260 B.C.), who derived his first impulse from Crates the Cynic. He opened his school in a colonnade called the *Stoa Poikilē* ('Painted Porch') at Athens, which was adorned with pictures of the Trojan war, Marathon, and the Amazons by Polygnotus; hence the name of the sect. Zeno had for his disciple Cleanthes, from Assos in the Troad (300-220), whose *Hymn to Jupiter* is the only fragment of any length that has come down to us from the early Stoics—a poem setting forth the unity of God, his omnipotence, and his moral government. Chrysippus, from Soli in Cilicia (280-207), followed Cleanthes, and in his voluminous writings both defended and modified the Stoical creed. Antiquity gave by far the most important position to Chrysippus; 'Without Chrysippus there had been no Porch,' recent German criticism has done much to discover how much of the system is due to each. And Pearson sums up his elaborate investigation as follows: 'The result of our investigation has been to show conclusively that all those doctrines which are most characteristic of the true essence of Stoicism were contributed by Zeno and Cleanthes. To Zeno belong the establishment of the logical criterion, the adaptation of Heraclitean physics, and the introduction of all the leading ethical tenets. Cleanthes revolutionised the study of physics by the theory of tension and the development of pantheism, and by applying his materialistic views to logic and ethics brought into strong light the mutual interdependence of the three branches. The task of Chrysippus was to preserve rather than to originate, to reconcile inconsistencies, to remove superfluous outgrowths, and to maintain an unbroken line of defence against his adversaries.' These three represent the first period of the system. The second period (200-50) embraces its general promulgation, and its introduction to the Romans. Chrysippus was succeeded by Zeno of Sidon, and Diogenes of Babylon; then followed Antipater of Tarsus, who taught Panætius of Rhodes, who, again, taught Posidonius of Apamea, in Syria. Posidonius was acquainted with Marius and Pompey, and taught Cicero; but the moral treatise of Cicero, *De Officiis*, is derived from a work of Panætius. The third period of Stoicism is Roman. In this period we have Cato the Younger, who invited to his house the philosopher Athenodorus; and, under the Empire, the three Stoic philosophers whose writings have come down to us—Seneca, Epictetus, and the Emperor Marcus Aurelius. Stoicism prevailed widely in the Roman world, although not to the exclusion of Epicurean views.

The leading Stoical doctrines are given in certain phrases or expressions, as 'life according to nature,' the ideal 'wise man,' 'apathy,' or equanimity of mind, the power of the 'will,' the worship of 'duty,' the constant 'advance' in virtue, &c. But the system will be best considered under four heads—the Theology; the Psychology; the theory of the Good; and the scheme of Virtue.

(1) The Stoics held that the universe is governed by one good and wise God. According to Epictetus, God is the father of men; Marcus Aurelius exults in the beautiful arrangement of all things. They did not admit that the Deity intermeddled in the smaller details of life; they allowed that omens and oracles might be accepted as signs of the foreordained arrangement of God. They held this foreordination even to the length of fatalism, and made the same replies as have been given in

modern times to the difficulty of reconciling it with Free-will. God is the author of all things except wickedness; the very nature of good supposes its contrast evil, and the two are inseparable, like light and dark; in the enormous extent of the universe some things must be neglected; when evil happens to the good, it is not as a punishment, but as connected with a different dispensation; parts of the world may be presided over by evil demons; what we call evil may not be evil. Like most other ancient schools, the Stoics held God to be corporeal like man; body is the only substance; nothing incorporeal could act on what is corporeal; the first cause of all, God or Zeus, is the primeval fire, emanating from which is the soul of man in the form of a warm ether. Their theory of the universe may in fact be described as a materialistic pantheism. It is for human beings to recognise the universe as governed by universal law, and not only to raise their minds to the comprehension of it, but to enter into the views of the Creator, who must regard all interests equally; man should be, as it were, in league with Him, merge self in the universal order, think only of that and its welfare. By this elevation of view we are necessarily raised far above the consideration of the petty events befalling ourselves. The grand effort of human reason is thus to rise to the abstraction or totality of entire nature. The Stoics held the theory of the *absorption* of the individual soul at death into the divine essence; but, on the other hand, their doctrine of advance and aspiration is what has in all times been the main natural argument for the immortality of the soul. For the most part they kept themselves undecided as to immortality, giving it as an alternative, but reasoning as to our conduct on either supposition, and submitting to the pleasure of God in this as in all other things. In arguing for the existence of divine power and government they employed what has been called the argument from design.

(2) As to the constitution of the mind, they held that men have bodies like animals, but reason or intelligence like the gods. Animals have instinctive principles of action; man alone has a rational, intelligent soul. According to Marcus Aurelius, we come into contact with Deity by our intellectual part, and our highest life is thus the divine life. But the most important Stoical doctrine respecting the nature of man is the recognition of reason as a superior power or faculty that subordinates all the rest—the governing intelligence. This, however, is not a mere intellectual principle, but an active force, uniting intellect and will. The bodily sensibilities are opposed to this higher reason and will, which, however, is strong enough to control them. Another way of expressing the same view was the power of the mind over the body, which was dwelt upon by Epictetus in the most exaggerated form. (The assertion of a doctrine so obviously contrary to the fact as that sickness may affect the body without enfeebling the mind could only end in practical failure, or else in contradiction.) In Seneca we find something very closely approaching to the Christian doctrine of the corruption of human nature. The littleness of humanity was a favourite theme of Marcus Aurelius, and naturally followed from the Stoical mode of contemplating the universe at large. The doctrine called the freedom of will may be said to have originated with the Stoics, although with them it was chiefly a rhetorical mode of expressing the dignity of the wise man, and his power of rising superior to circumstances. To prepare the way for the Stoical precepts Epictetus distinguished between things in our power and things not in our power. The things in our power are our opinions and notions about objects, and all our affections, desires, and aversions; the things not

in our power are our bodies, wealth, honour, rank, authority, &c. Wealth and high rank may not be in our power, but we have the power to form an *idea* of these—viz. that they are unimportant, whence the want of them will not grieve us. A still more pointed application is to death, whose force is entirely in the idea.

(3) The Good was not by the Stoics identified with happiness. Happiness is not necessary, and may be dispensed with, and pain is no evil. Pains are in a sense an evil, but, by a proper discipline, may be triumphed over. They disallowed the direct and ostensible pursuit of pleasure as an end (the point of view of Epicurus), but allured their followers partly by promising them the victory over pain, and partly by the lofty enjoyments that grew out of their plan of life. Pain of every kind, whether from the casualties of existence or from the severity of the Stoical virtues, was to be met by a discipline of endurance. Great stress was laid on the instability of pleasure, and the constant liability to accidents; whence we should always be anticipating and adapting ourselves to the worst that could happen, so as never to be in a state where anything could ruffle the mind. Much might still be made of the worst circumstances—poverty, banishment, public odium, sickness, old age. Such a discipline was peculiarly suited to the unsettled condition of the world at the time, when any man, besides the ordinary evils of life, might in a moment be sent into exile, or sold into slavery. Moreover, it is a discipline adapted to a certain class of dispositions existing in all ages—men who prefer above all things ‘equanimity’ of mind, and would rather dispense with great occasional pleasures than risk their state of habitual composure. Next to the discipline of endurance we must rank the complacent sentiment of pride, which the Stoic might justly feel in his conquest of himself. It was usual to bestow the most extravagant laudation on the ‘wise man,’ and every Stoic could take this home to the extent that he considered himself as approaching that great ideal. The last and most elevated form of Stoical happiness was the satisfaction of contemplating the universe and God. The work of Marcus Aurelius is full of studies of nature in the devout spirit of ‘passing from nature to nature’s God;’ he is never weary of expressing his thorough contentment with the course of natural events, and his sense of the beauties and fitness of everything. Old age has its grace, and death is the becoming termination. This high strain of exulting contemplation reconciled him to that complete submission to whatever might befall which was the essential feature of the ‘life according to nature.’

(4) The Stoical theory of virtue is implicated in their ideas of the good. The fountain of all virtue is manifestly the life according to nature, as being the life of subordination of self to more general interests—to family, country, mankind, the whole universe. The Stoics were the first to preach what is called ‘Cosmopolitanism;’ for although, in their reference to the good of the whole, they confounded together sentient life and inanimate objects—rocks, plants, &c., solicitude for which was misspent labour—yet they were thus enabled to reach the conception of the universal brotherhood of mankind, and could not but include in their regards the brute creation. They said, ‘There is no difference between Greeks and Barbarians; the world is our city.’ Seneca urges kindness to slaves, for ‘are they not men like ourselves, breathing the same air, living and dying like ourselves?’ The Epicureans declined, as much as possible, interference in public affairs, but the Stoical philosophers all urged men to the duties of active

citizenship. Although there had been many good and noble men among the pagans, yet positive beneficence had not been preached as a virtue before the Stoics. They adopted the four cardinal virtues (wisdom, or the knowledge of good and evil; justice; fortitude; temperance) as part of their plan of the virtuous life. Justice, as the social virtue, was placed above all the rest; but most interesting to us are the indications of the idea of beneficence. Epictetus is earnest in his exhortations to forgiveness of injuries. Marcus Aurelius often enforces the same virtue; he contends as strongly as Butler and Hume for the existence of a principle of pure—that is, unselfish—benevolence in the mind. There is also in the Stoical system a recognition of duties to God, and of morality as based on piety. Not only are we all brethren, but also the 'children of one Father.'

The extraordinary stress put upon human nature by the full Stoic ideal of submerging self in the larger interests of being led to various compromises. The rigid following out of the ideal issued in a series of the Paradoxes—viz. that all the actions of the wise man are equally perfect, and that, short of the standard of perfection, all faults and vices are equal; that, for example, the man that killed a cock without good reason was as guilty as he that killed his father. The idea of duty was of Stoical origin, fostered and developed by the Roman spirit and legislation. The early Stoic had two different words for the 'suitable' (*kathēkon*) and the 'right' (*katorthōma*). It was a great point with the Stoic to be conscious of 'advance,' or improvement. By self-examination he kept himself constantly acquainted with his moral state, and it was both his duty and his satisfaction to be approaching to the ideal of the perfect man. The Stoical system has largely tinted modern ages, in spite of its severity. It has always had a charm as an ideal, even when men were conscious of not realising it. The limitation of wants, the practice of contentment, the striving after equanimity, the hardening of one's self against the blows of fortune are all fundamental maxims with the moralists of later ages; and a qualified form of the subordination of self to the general welfare is an essential part of most modern theories of virtue.

The chief ancient authorities on the Stoics are the writings of Epictetus, Marcus Aurelius, and Seneca, themselves Stoic philosophers, together with notices occurring in Cicero, Plutarch, Sextus Empiricus, Diogenes Laertius, and Stobæus. See Zeller's *Stoics, Epicureans, and Sceptics* (Eng. trans. 1870); L. Alston, *Christian Stoicism in the Second Century* (1906); Edwyn Bevan, *Stoics and Sceptics* (1913) and 'Philosophy' in *The Hellenistic Age* (1924); Gilbert Murray, *Stoic Philosophy* (1915), and *Five Stages of Greek Religion* (1925); Wenley, *Stoicism and its Influence* (1925); and works cited at AURELIUS, EPICTETUS, SENECA, ZENO.

Stoke-Newington, a metropolitan borough in the north of London, wedged between Islington and Hackney, returns one member to parliament. Pop. (1921) 52,167.

Stoke-on-Trent, a city, county, and parliamentary borough of Staffordshire, the capital of the 'Potteries,' on the Trent and the Trent and Mersey Canal, an important railway centre, 15 miles SE. of Crewe, 2 E. of Newcastle-under-Lyme, and 16 N. of Stafford. It was formed in 1910 by the union of Hanley, Burslem, Tunstall, Longton, and Fenton with Stoke-upon-Trent, and was declared a city in 1925. It became a three-member parliamentary borough in 1918, the parliamentary divisions being Burslem, Hanley, and Stoke. Stoke-upon-Trent is a modern place, dating only from the last quarter of the 18th century, and has a

parish church with Wedgwood's grave, a town-hall (1835), a market-hall (1883), a free library (1878), the Minton memorial building (1858), the Harts-hill Infirmary (1868), public baths, and statues of Wedgwood, Minton, and Colin Minton Campbell. Its factories of porcelain, earthenware, encaustic tiles, and tessellated pavements are among the largest in the world; and the industries also include coal-mining, brickmaking, and the manufacture of iron, engines, machinery, &c. The Central School of Science and Technology, an institution for training in the industries of pottery and coal-mining, was opened in 1914, and extensions were commenced in 1925. There is a collection of pottery housed in the public library and museum, and a similar collection at Hanley. Other important schools of technology are the Wedgwood Institute at Burslem, the Sutherland Institute at Longton, and the Victoria Institute at Tunstall. Longton (once called Lane End) and Fenton (once called Lane Delph) are both busy centres of china and earthenware manufacture. See separate articles on HANLEY, BURSLEM, and TUNSTALL. Pop. of Stoke-on-Trent county borough (1911) 234,534; (1921) 240,440.

Stoke-Poges, a village of Buckinghamshire, 2 miles N. of Slough station. Gray's mother settled here in 1742, and he is buried in the beautiful churchyard, the scene of his *Elegy*.

Stokes, SIR GEORGE GABRIEL, mathematician and natural philosopher, was born August 13, 1819, in Skreen, County Sligo. He entered Pembroke College, Cambridge, in 1837, graduated in 1841 as senior wrangler and first Smith's prizeman, and in 1849 was appointed Lucasian professor of Mathematics. In 1852, the year after his election as a Fellow of the Royal Society, he was awarded the Rumford medal; in 1854 he became secretary, a position which he held till 1885, when he was made president for the succeeding quinquennial period. From 1886 he represented Cambridge in parliament, and in 1889 was created a baronet. His papers deal with some of the most abstruse problems of mathematical physics, and are characterised by a remarkable lucidity of treatment and an unerring sagacity of attack. In several of these, by opening new ground, he gave direction to later investigations by others. Till his death (1st February 1903) two subjects, mainly engaged his attention. On Hydrodynamics he wrote for the British Association in 1846 a valuable Report, in which his own contributions rank amongst the most important of the day. Specially may be noted his investigations on waves and on the effect of fluid friction on solids moving through fluids. Then to the theory of light he made contributions of great value, his profound paper on the dynamical theory of diffraction (1849) being amongst the most important. He first gave a satisfactory theory of fluorescence and phosphorescence, and as early as 1852 he pointed out clearly the physical basis of Spectrum-analysis (see SPECTRUM). In 1884-86 he delivered in Aberdeen the Burnett Lectures on 'Light' (3 vols. 1887), an admirable elementary treatise for non-mathematical readers. His influence in the development of the Cambridge school of mathematical physics can hardly be overestimated.

See his *Mathematical and Physical Papers* (5 vols. 1880-1905), *Memoir and Correspondence*, ed. Larmor (2 vols. 1907).

Stokes, WILLIAM (1804-77), physician, studied at Edinburgh, and in 1845 became regius professor of Medicine in Dublin University. He wrote lectures on the *Theory and Practice of Medicine* (1837), and works on the diseases of the chest and of the heart and on continued fevers.—His eldest son, WHITLEY

STOKES, born at Dublin in 1830, studied law at Trinity College, went to India in 1863, and after holding a series of important legal appointments was in 1877-82 president of the Indian law-commission and draughtsman of the present civil and criminal codes. He wrote many legal works, including *The Anglo-Indian Codes* (1887-91), and edited many Irish and other Celtic texts. LL.D., D.C.L., C.S.I., C.I.E., he died 13th April 1909.

Stoke-upon-Trent, since 1910 part of Stoke-on-Trent (q.v.).

Stolberg, CHRISTIAN, GRAF ZU, poetic writer, was born at Hamburg, 15th October 1748. Whilst a student at Göttingen he identified himself with the Göttingen poetic school (*Dichterbund*), a literary circle embracing also Bürger and Voss. After twenty-three years' public service in the duchy of Holstein he retired, and died at his seat of Windebye, near Eckernförde in Sleswick, on 18th January 1821. As a poet he was inferior in genius to his brother Friedrich Leopold, in whose books his own work was generally included. His principal productions are *Gedichte* (1779), *Gedichte aus dem Griechischen* (1782), *Schauspiele mit Chören* (1787), *Vaterländische Gedichte* (1810), and a metrical translation of Sophocles (1787).

Stolberg, FRIEDRICH LEOPOLD, GRAF ZU, younger brother of the preceding, was born at Bramstedt in Holstein on November 7, 1750. Like his brother he was one of the *Dichterbund* fraternity at Göttingen. Most of his active life was spent in the public service of Denmark. Although possessed of some degree of poetic fancy, he was on the whole a somewhat colourless writer in the style of Klopstock. Shortly after the outbreak of the French Revolution he went over to the Roman Catholic Church, and from that time a very pronounced religious and ascetic temper made itself prominent in his writings, of which the principal was *Geschichte der Religion Jesu Christi* (15 vols. 1807-18). He died on his estate of Sondermühlen, near Osnabrück, 5th December 1819. Besides the volumes of *Gedichte*, *Schauspiele*, *Vaterländische Gedichte*, issued along with his brother's works, F. L. Stolberg published translations from Æschylus, Plato, and the *Iliad*, an idyllic romance *Die Insel* (1788), and other books. See works by Menge (1863), Hennes (1876), Janssen (3d ed. 1882), Sauer (1895).

Stole (Gr. *stolē*, Lat. *stola*, 'a robe'), a narrow vestment, of the same stuff as the chasuble, worn by bishops and priests in the Latin Church during mass, in the administration of sacraments, and in certain blessings, and by deacons when they have to move the blessed sacrament. In some places it is worn while preaching. Bishops wear it over both shoulders; so also do priests, but crossed over the breast; deacons wear it over the left shoulder. It is also used in some cases as a symbol of jurisdiction, in which sense it is constantly worn by the pope, even when not officiating. In the Anglican Church the stole is worn with the same difference by priests (but not crossed) and deacons. It is usually of black silk, fringed at the ends, with sometimes crosses embroidered; but coloured stoles, according to the season, are also worn in some churches. In the Greek Church the stole proper is peculiar to deacons; among Syrian Christians it is worn by clerics of all (even minor) orders. The stole originated in the *orarium* or handkerchief, which was sometimes worn as a scarf, and which in the 6th and 7th centuries came to be recognised as a sacred vestment in the Western Church. The name stole began to be substituted by the 9th, and was the common word before the 12th century. See illustrations at CHASUBLE and COPE. *Stole-fees* are the same as surplice-fees (see SURPLICE). The

broad scarf is worn by chaplains to any member of the royal family, or to any peer or peeress, doctors in divinity, and caputular members of a collegiate church.

Stolen Goods are thus treated by English law: a *bond-fide* purchaser of such goods, who has not bought them in market overt, is bound to restore them to the true owner; but if the goods are sold in market overt, the purchaser is entitled to keep them unless the owner has duly prosecuted and convicted the thief. Market overt means the open market in towns and places where a legal market is held. In the City of London every shop is held to be a market overt, but this only applies to the City proper (see SALE). The above rule as to stolen goods does not apply to valuable securities which are stolen, if the security has been paid or discharged *bond fide* by the person liable, or if the security is a negotiable instrument and has passed to a 'holder in due course.' It is a punishable offence to offer or take rewards for the recovery of stolen property. See also THEFT.

Stolp, a town in the Prussian province of Pomerania, stands on the river Stolp, 85 miles W. by N. of Danzig, and has a castle, some old churches (the castle chapel dating from the 13th century), iron-foundries, machinery and amber manufactures, and an active trade in agricultural products, timber, fish, &c; pop. (1925) 41,826.

Stolypin, PETER ARKADIEVITCH (1865-1911), the indomitable Russian minister who repressed disorder with a high-hand, dissolved the second Duma (1907), altered the electoral law, and, in spite of the council of the empire, promulgated a measure of Polish reconstruction passed by his majority in the third Duma. He fell by the hand of an assassin.

Stomach. The Anatomy and Physiology of this organ are treated of in the article DIGESTION (q.v.); see also ABDOMEN, BIRD, FISHES, &c.; and INDIGESTION, VOMITING.

DISEASES OF THE STOMACH.—Only the more common and severe varieties of gastric disease will be treated here. The symptom that is most frequently noticed by the subject of stomach disturbance is dyspepsia, which may in some cases amount to severe pain connected with the taking of food or coming on some hours later, or which may consist simply of a feeling of weight, distension, or general discomfort about the middle of the body. Vomiting accompanies some of the severer disorders, and blood may at times be brought up in the vomit or passed in the motions of the bowels. Loss of weight is found in the more serious conditions, but if the nutrition of the body be well maintained, the disease is not likely to be of grave importance apart from the discomfort that it occasions. In the diagnosis of gastric disease, valuable information is obtained from chemical examination of a light test-meal drawn off by the stomach-tube after an hour's digestion; and in cases of alteration in shape or position of the organ, direct evidence as to its condition is given by the administration of a meal containing bismuth or other dense substance which is then subjected to examination by the X-rays.

Acute gastritis (inflammation of the stomach) is most commonly caused by errors in diet, such as indigestibility of the food, strong spirituous liquors, extremes of temperature in the food, or food in a state of decomposition. It is also one of the features in poisoning by an irritant (see POISON). In some persons it is produced by sudden changes in the weather, or even occurs periodically as so-called 'bilious attacks.' The chief symptoms of acute gastritis are pain in the stomach, varying according to the severity of the irritation from a feeling of weight to one of great agony, also head-

ache, sour eructations, vomiting first of food and later of bile-stained material, and finally there may be diarrhoea from irritation of the bowels. The treatment consists in getting rid of the irritating material either by an emetic or by a purgative according to circumstances; the administration of remedies which have a soothing effect upon the gastric mucous membrane, such as bismuth carbonate, weak alkaline fluids, and preparations of opium; the application to the surface over the stomach of mustard leaves, hot compresses, or other forms of counter-irritation; and the abstinence at first from all forms of food and afterwards for a few days from anything heavier than milk or light farinaceous foods.

Chronic gastritis (chronic catarrh) may arise after repeated attacks of the acute form or may come on gradually as the result of injudicious dietary, such as irregularity in meal times, habitual use of irritating foods or of strong forms of alcohol, or as the result of weakening disease in other organs. It may present various symptoms. In some cases it is associated with an excessively acid gastric juice, when discomfort is felt in the pit of the stomach an hour or more after food, later a burning sensation (heartburn) about the centre of the chest, and often eructation in small quantities of intensely acid food causing a raw feeling in the throat, or less commonly vomiting of the sour stomach-contents in large quantities. In other cases, especially those of long duration and those due to spirit-drinking, gastritis is associated with a poor secretion of gastric juice and small appetite, the tongue is furred, and there is occasional vomiting, especially in the morning, of food remnants with strings of mucus. In treatment, attention to the diet is the most important point. The meals must be taken regularly, and small meals at relatively frequent intervals are preferable to occasional large amounts of food. In all cases careful attention to the teeth, if these are decayed or defective, and proper chewing of the food are of great importance. Regularity of the bowels, early rising, and sufficient daily exercise in the fresh air must also be practised. In the acid form of gastritis, all condiments, even salt, should be avoided as much as possible, and the food should be simple and non-stimulating, such as eggs, fish, vegetable soups, milk puddings, and the like; meat and strong meat-soups should be avoided. In the form where appetite is poor and there is vomiting of mucus in the morning, salted food, pickles, and condiments like mustard and pepper stimulate the stomach and act beneficially; meat well-divided is also allowable. As to medicinal remedies, in the acid type of gastritis rhubarb, soda, and bismuth, combined sometimes with Dover's powder when the pain is severe, may be taken before meals; or a bitter infusion, such as that of gentian or calumba, combined with bicarbonate of soda, taken similarly before meals, often gives much relief. In the type of case with mucus and poor appetite, a better result is got usually from taking one of these bitter infusions combined with dilute hydrochloric acid immediately after each meal.

Dilatation of the stomach (gastrectasis) may either occur as a natural condition or may arise from weakness in the muscular wall or from some obstruction to the exit of the stomach-contents at the pyloric opening. Great capacity of this organ is compatible with perfect health, but when the food cannot properly escape and is retained for many hours, various forms of fermentation are apt to occur and to cause discomfort and failure of proper nutrition. In its early stage this condition is known as *atony of the stomach*, and when the condition is due to a slipping down of the whole

organ from its attachments the term *gastroptosis* is employed. However the distension may be brought about, the ultimate result is that the lowest part of the stomach descends so far beneath the outlet that natural emptying of the organ into the small intestine becomes increasingly difficult, and the stomach distends more and more under the increasing load. These cases are particularly easily recognised on X-ray examination. In the milder cases, tonic treatment, the avoidance of bulky forms of food, and the wearing of a broad, carefully-shaped abdominal belt or binder may suffice. In severer cases, where the stomach has become so much distended that complete emptying never takes place, fermentation occurs, and there is a constant feeling of heartburn and of weight beneath the ribs; vomiting of fermented material in great quantity takes place every few days, followed by a sense of relief in the symptoms; constipation is very troublesome owing to the delay in digestion; and the patient loses greatly in weight and strength. The special treatment required by these severer cases consists in washing out the stomach either at night or in the morning with the stomach-tube. In exceptionally severe cases, due, for example, to narrowing of the pyloric outlet by the scar of an old ulcer, the operation of gastro-enterostomy often affords relief from all the symptoms. This consists in uniting the lowest part of the stomach to a neighbouring loop of bowel with an opening passing from the one to the other, so that effective escape of the stomach-contents is ensured.

Ulcer of the stomach (gastric ulcer) is a frequent disease sometimes existing unsuspected for a long time on account of the mildness of its symptoms, and in other cases constituting a very formidable malady. Its frequency may be judged from the fact that post-mortem examinations show one person in every twenty or twenty-five to have either an acute ulcer or the scars of a healed ulcer dating from some previous period of life. The disease is more common in women than in men, affecting especially young women between the ages of twenty and thirty; and it is frequently associated with anaemia. The ulcer is usually small ($\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter), of round or oval form, and has a tendency to penetrate through all the coats of the stomach. It is most commonly found on the hinder wall of the stomach close to the pyloric orifice or beyond this in the duodenum. It may heal at any stage, and, if it is small, practically no trace may be left; or if it has been large, a great deal of scarring may result, which is apt to cause narrowing of the pyloric opening with consequent dilatation of the stomach. In occasional cases one of two serious complications may ensue, and the possibility of these makes the condition always dangerous: either the ulcer may erode a blood-vessel with resulting hæmorrhage into the stomach, or it may perforate into the peritoneal cavity, producing acute peritonitis of sudden onset. The symptoms of gastric ulcer, as already indicated, may be mild and indefinite, but usually there is considerable pain, especially after solid food has been taken. This pain, together with tenderness on pressure, is chiefly found in the pit of the stomach, just below the lower end of the breast-bone, but occasionally the pain is referred through to the back. Vomiting of blood either in streaks or as large quantities of material resembling coffee-grounds, or the passing of black partially-digested blood by the bowels, is a very characteristic sign. In treatment the most important principle is to give the stomach complete rest, and to administer only sufficient food to absorb the acid gastric juice. Milk, with the addition of lime-water and cream and thin starchy foods like

arrowroot, ground-rice, or cornflour, are the most suitable. In severe cases the patient remains in bed, and nourishment by the bowel is employed over two or three weeks, later small quantities of milk and cream or of white of egg in water being given by the mouth. The most serviceable medicinal remedies are large doses of bismuth carbonate, with which may be joined small doses of opium or of dilute hydrocyanic acid to relieve the pain. When hæmorrhage occurs, it is checked by sucking small lumps of ice and by such styptics as tannin, ergot, and extract of suprarenal gland. When small hæmorrhages persist in spite of treatment, the operation of gastro-enterostomy is often performed in order to prevent the passage of food over the ulcer. If perforation should occur, an immediate operation to close the opening is urgently necessary.

Cancer of the stomach occurs mostly in people over fifty years of age, and a hereditary tendency to the disease can often be traced. It usually commences near one or other of the openings of the stomach; and if it is at the pyloric opening, an obstruction is presented to the escape of food, so that dilatation of the stomach ensues with great aggravation of the patient's symptoms. Sooner or later the growth ulcerates, and bleeding then usually occurs. The symptoms at an early stage are dyspepsia, loss of weight, with pain, discomfort and vomiting after meals, and the vomit often shows the presence of blood. The diagnosis is rendered more certain when a tumour can be felt over the region of the stomach, and when chemical analysis of a test-meal reveals the absence of the natural hydrochloric acid from the gastric secretion. X-ray examination frequently affords a certain amount of help in diagnosis. In early cases an operation can sometimes be performed which completely removes the disease; and in more advanced cases the measures applicable to dilatation of the stomach, with opium and other drugs to relieve pain, and with care in the dietary, afford relief. The duration of life in a case of gastric cancer is usually from six to twelve months.

Vomiting of blood (hæmatemesis) is an important sign of disease affecting the stomach. It may be due to erosion of a large blood-vessel in the course of gastric ulcer or of cancer, but it usually occurs in these diseases by gradual oozing from the minute vessels (capillaries) over the bare surface. It frequently takes place without any apparent breach of surface when strong irritants are taken by the mouth, such as an irritant poison or an immoderate dose of strong alcohol. It also arises in the course of general diseases associated with hæmorrhage elsewhere, such as scurvy and pernicious anæmia, or it may be a vicarious form of the menstrual discharge. Occasionally, in diseases of neighbouring organs, such as the liver and the heart, varicose veins are found in the stomach, which, by their rupture, give rise to copious hæmatemesis without actual disease of the stomach. The treatment of vomiting of blood is given above under Ulcer.

Stomata, minute openings in the epidermis of leaves and tender green stems of plants, subserve the purposes of respiration, transpiration, and gas-assimilation. They are most numerous on the under surface in most leaves, on the upper side of floating leaves, but in some monocotyledons equally distributed. See **PHYSIOLOGY (VEGETABLE)**, and illustration at **LEAF**; and for the complex stomata of *Marchantia*, see **LIVERWORTS**.

Stone, a market-town of Staffordshire, on the left bank of the Trent, 7 miles NNW. of Stafford and 7 S. of Stoke-on-Trent. It has a town-hall (1869), a market-hall (1868), Alleyne's grammar-school (1558), remains of an Augustinian monas-

tery, two modern convents, and manufactures of earthenware, boots and shoes, beer, leather, &c. Pop. 6000.

Stone, a weight formerly in use throughout the northern countries in Europe, but varying in different countries, and now mostly obsolete. The British imperial stone, the only legal one, is 14 lb.; but in various parts of the country stones of other values are or have been in use, as a stone of 24 lb. for wool, 8 lb. for butcher-meat, 22 lb. for hay, 7 lb. for oatmeal in Scotland, 16 lb. for cheese, 32 lb. for hemp, and 5 lb. for glass.

Stone. See **CALCULUS**, and **LITHOTOMY**.

Stone. Under the head **BUILDING STONE**, the more important kinds of stone used for architectural purposes are noticed. The preservation and dressing of stone are also treated there, as is artificial stone. Some building-stones, such as limestone, marble, sandstone, flagstone, flint, slate, granite, basalt (green-stone), serpentine, and porphyry, are again referred to under their respective names. See under **MILL**, **OVEN**, and **WHET-STONES** for millstones, firestone (leckstone), and hones. Precious stones are discussed under **STONES (PRECIOUS)**, and such heads as **DIAMOND**, **RUBY**, **SAPPHIRE**. For the art of carving precious stones, see **CAMEO**, **GEM**. Purely ornamental stones other than gems are noticed under **ALABASTER**, **FLUOR SPAR**, **JADE**, **JASPER**, **LABRADORITE**, **LAPIS LAZULI**, **MALACHITE**, and other heads.

Stone Age, or **AGE OF STONE**, is a term used in archaeology to denote the condition of a people who, being unacquainted with the arts of working in metals, are obliged to use stone of various kinds as the material from which to manufacture cutting tools and weapons. *Stone Stage* would perhaps be a more correct expression. The word 'Age' must not be here understood to mean a fixed chronological epoch in the world's history; it merely implies the time, long or short, early or late, during which the condition specified subsisted in any region or among any population. Its duration necessarily varied with circumstances in different centres. Peoples settled in remote situations, and therefore uninfluenced by contact with higher phases of culture (as, for example, the islanders of the South Pacific, and the Eskimo of the extreme north), have in some cases remained in their Stone Age down to the 19th century; whereas the peoples of Europe, in various parts of which high civilisations developed at an early date, emerged from their Stone Age by acquiring the art of working bronze many centuries before the Christian era. That throughout all Europe man has begun with an Age of Stone is certain. We cannot be quite so sure about certain regions of the other continents, which as yet are insufficiently explored; but evidence of a primæval Age of Stone has come from Asia Minor, India, China, various parts of Africa, and also from the American continent.

The beginning of human life in Europe has been sought in Tertiary times. Pliocene and even Miocene gravels have yielded chipped flints which have been considered to be the work of a sentient being, whether fully developed man or an antecedent Homosimian form is disputed. An influential school of prehistoric archaeologists, however, deny that these *coliths*, as they are called, display any assured indication of intentional chipping, and assign their origin to one or other of various natural causes. The flints are at best so rude that it is really impossible to feel any certainty about their artificial character; nothing will ever settle this dispute but the discovery of bones of their supposed makers. Such a discovery has never yet been made.

That man occupied Europe during some at least

of the phases of the Quaternary ice age is, however, quite beyond question; recognisably artificial flint implements have been found, associated in some cases with the bones of animals then living in Europe, but now extinct. During the Ice Age, in its alternating glacial and genial intervals, man lived entirely upon the products of the chase. He was unacquainted with the arts of agriculture, as is shown by the absence of millstones and similar agricultural implements, and also by the absence of the bones of domestic animals from his habitation sites and middens; he was also ignorant of the art of weaving, as is shown in like manner by the absence of spindle-whorls and loom-weights;



Fig. 1.

a, round-pointed, tongue-shaped implement, Biddenham, near Bedford; *b*, acutely-pointed implement made from rounded nodule of flint, St Acheul, near Amiens; *c*, from Bemerton, Wilts; *d*, irregularly-ovate, sharp-rimmed instrument, Moulin Quignon, Abbeville. (From Evans's *Ancient Stone Implements of Great Britain*.)

there is, moreover, no evidence that he knew how to make pottery. During the centuries which intervened between the ice age and the beginning of the use of metal, the arts specified above were acquired step by step. The earlier stage, during which man was a hunter, is known as the *Palæolithic*, or Old Stone Age; the latter is the *Neolithic*, or New Stone Age. It is a mistake to suppose that the Neolithic age is essentially a period of polished stone, though it is not infrequently so called; the majority of Neolithic implements are chipped often as rudely as in the antecedent Palæolithic, and many of the implements of polished stone, formerly assigned to the Neolithic, are now known to belong



Fig. 2.—Carved Reindeer-horn, Laugeriebasse, Dordogne. (From Cartailhac's *La France Préhistorique*.)

to the Bronze Age. The essential distinction between the two periods lies in the differences between their respective modes of life.

The Palæolithic age was of enormous duration, although it is impossible to fix its length in terms of years. The Heidelberg jawbone, probably the earliest human relic as yet found in Europe, is by some dated to *circa* 382,000 B.C.; but dates such as this have no real meaning. For chronological purposes the Palæolithic has been divided into a series of subordinate periods, which apparently indicate chronologically successive stages of civilisation.

The division holds satisfactorily for western Europe, but it is by no means so easily applied to the remains which have been yielded by the eastern regions of the Continent. These divisions are as follows:

1. *Pre-Chellean*.—An introductory stage represented by very rude, almost amorphous implements.

2. *Chellean* (so called from the typical station of Chelles-sur-Marne, near Paris).—A period when Europe was sufficiently tropical in climate to support such animals as the hippopotamus. Man is represented by tools of flint embedded in the river-drifts. The chief tool is the *coup de poing*, or hand-axe—a nodule of flint sharpened at one end, rounded at the other for convenience of grasping in the hand.

3. *Acheulean* (named after the typical station of Saint-Acheul, near Amiens), during which the climate was growing colder; the tropical animals were giving place to the mammoth. The tools, especially the *coup de poing*, are better made than in the preceding period.

These three together constitute the *Lower Palæolithic*, and are probably to be dated in the genial period between the Riss and the Würm glaciations, the last two great advances of the Ice Age.

4. *Mousterian* or *Middle Palæolithic* (named after Le Moustier, a station on the bank of the river Vézère in the Dordogne).—A period of ungenial climate (the Würm glaciation), during which man was obliged to seek shelter in caves, many of which have yielded remains of his handiwork. In addition, we have found numerous human bones from this period, and even a few complete skeletons. These enable us to restore a being of low stature (about 5 feet), with low forehead, great ridges in the skull over the eyes, a receding chin, undeveloped mentality, but powerful limbs. The flints show considerable degeneration as compared with the preceding period.

5. *Aurignacian* (named after Aurignac, Haute-Garonne).—A more genial climate. Europe was covered with herds of wild horses, upon which the hunters fed. Tools improved; beginning of an industry in bone. Above all, beginning of the pictorial art, which is one of the most remarkable manifestations of Palæolithic activity. See ART.

6. *Solutrean* (named after Solutré, near Mâcon).—Especially characterised by extraordinary skill in chipping flint. The pictorial art for a time suffers eclipse.

7. *Magdalenian* (named from the cave of La Madeleine, Tursac, Dordogne).—In this period the bone industry and the pictorial art reach their high-water mark. The bone implements of this period consist of well-made needles, borers, harpoon-points, and a series of implements of unknown use, called by the French archaeologists *bâtons de commandement*. They are decorated with engraved figures, usually of animals; among them life-like representations of animals now either wholly or locally extinct (such as the mammoth and the reindeer) are to be recognised. They are drawn with wonderful faithfulness, freedom, and spirit. The cave-walls are also decorated with engraved and painted representations of animals and other devices. These last three stages constitute the *Upper Palæolithic*.

The upper Palæolithic culture must have been introduced into Europe by an invading race, in every way, physically and mentally, superior to the brutish Mousterians. Bones of the upper Palæolithic peoples have been found in not inconsiderable numbers.

The Palæolithic shades into the Neolithic by a series of approximations, the relationship between which is as yet very obscure. These fall

approximately in time into the period of the final oscillations of the disappearing Ice Age, which succeeded the great glaciations. The principal transitional stages are as follows:

The *Azilian*, so called from the cave known as Le Mas d'Azil in the Pyrenees; characterised by disappearance of the now extinct fauna, rather rude flint flakes, harpoons with flat shanks (not round shanks as in the Magdalenian harpoons), minute ('pygmy') flints, and pebbles decorated with painted lines, the last degeneration of the Palæolithic art. The prototype of these pebbles, which probably had some magico-religious purpose, is to be sought in the *Capsian* art of Spain, an



Fig. 3.—Lozenge-shaped (a), leaf-shaped (b), and barbed (c) arrow-heads of Flint.

industry of North African origin, and contemporary with the Magdalenian of the south of France.

The *Asturian*, a recently isolated industry, of which some stations have been found in northern Spain, distinguished by a peculiar form of rudely pointed flint implements.

The *Campignian*, which first appears in southern Scandinavia, and is traced through the midden-heaps of the Danish coast into France (it bears its name from Le Campigny, one of the type stations in that country). The Campignian civilisation is the first that has been found in Ireland; the Azilian

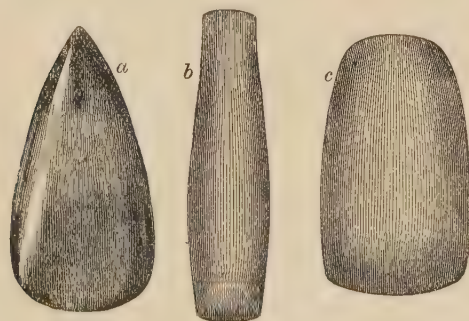


Fig. 4.—Polished Stone Axes or Celts: a, 5½ inches; b, 13 inches; c, 5 inches long.

in Scotland. The lower Palæolithic is found in the southern counties of England, the middle Palæolithic about as far north as Derby.

The Neolithic period began with the final disappearance of the ice (the Daun oscillation, dated roughly about 7000 B.C.), and continued until it was superseded by the introduction of bronze, probably about 2500 B.C. The Neolithic inhabitants of Europe were not mere nomads; they were settled on the land, which they cultivated, and upon which they reared flocks and herds. They were able to venture upon the sea, as is shown by the presence of the bones of deep-sea fishes in their midden-heaps on the sea-coasts. They lived in huts made of earth or of stones, usually circular

in form—the excavation of the sites of these huts has given much information as to their mode of life—or else, in regions such as Switzerland, which have many lakes, upon platforms of wood supported on piles driven into the lake bottoms. They possessed all the animals now domesticated, with the exception of the cat. Their tools were chipped from flint, and show a considerable variety of specialised forms—a sure sign of advance in civilisation; and as remains in the lake-dwellings show, they were equally expert in making implements of wood and of bone. The marvellous Danish daggers, which are the finest products of the flint-chippers' skill in Europe, are more probably to be assigned to the Bronze rather than to the Stone Age; the forms of these weapons appear to be suggested by bronze daggers. As was mentioned above, the polished stone axes and other implements that have been described as Neolithic cannot all be assigned to that period.

It is noteworthy that with this advance in the arts of life there went a complete extinction of the pictorial art so characteristic of the earlier period. On the other hand, there is to be seen evidence of a very highly developed social organisation. This is shown, *first*, by evidences of trade—the distribution of ornamental and precious stones far from their natural source of supply, and also of the peculiar Pressigny flints. This indicates the possibility of merchants travelling from tribe to tribe, which they could hardly have done unless there were some machinery to secure them a safe-conduct; *secondly*, by the enormous stone monuments which were erected in certain parts of Europe as burial places. These constructions are made of stones, some of which may weigh anything up to seventy tons, and could not have been manipulated at all except by a large body of men working together for a common purpose.

The method of burial in the Stone Age is most commonly by inhumation; cremation is not altogether unknown, but it is much more characteristic of the Bronze Age. The human remains show that already the population of Europe was an almost inextricable racial mixture.

See Déchelette's *Manuel d'archéologie*, vols. i., ii.; Sollas, *Ancient Hunters*; H. F. Osborn, *Men of the Old Stone Age*; J. M. Tyler, *The New Stone Age in Northern Europe*. For a short handbook on the subject, the *British Museum Guide to the Stone Age* may be recommended.

Stone-chat (*Saxicola rubicola*; see CHAT), one of the most common of the British Turdidæ, a



Fig. 5.
Danish
Flint-dagger.



Stone-chat (*Saxicola rubicola*).

pretty little bird, rather smaller than the red-breast, black on the upper parts and throat in summer; the breast of a dark reddish colour; some-

white on the sides of the neck, the wings, and the tail. It makes its nest of dry grass and moss, lined with bents, hair, and feathers, on the ground or at the foot of a low bush. It is a partial migrant in the British Isles; some migrate southwards in cold winters, and there is an influx of others from continental regions. It is somewhat local and erratic in its distribution, frequenting a place for a few seasons and then suddenly abandoning it. It feeds on insects, grubs, worms, and seeds. The name 'chat' is applied also to other members of the genus *Saxicola*, e.g. Whin-chat (q.v.).

Stone Circles, or Circles of Standing Stones (q.v.), popularly, but erroneously, called Druidical Circles in Britain, Dom-rings or Thing-steads in Scandinavia, and known as Cromlechs in France, consist of unhewn stones set up at intervals round the circumference of a circular area usually of level ground, though they are sometimes found on the slightly sloping side of a hill. The area thus marked off from the surrounding ground varies in size from less than 20 to more than 100 yards in diameter. The number of stones composing the circle also varies greatly, but as most stone circles exist now in a condition of greater or less dilapidation it is often impossible to ascertain with certainty what the original number may have been. Sometimes they are mere boulders rolled into position, at other times they are pillar-stones, evidently chosen for their length, and wedged upright by smaller stones inserted round their bases in the cavity in the subsoil prepared for their reception. Sometimes there is a single circle only, at other times one or two smaller circles are contained concentrically within the outer circle. At Callernish (q.v.) lines of stones radiate out from the circle. Occasionally the area on which the circle stands is further marked off from the surrounding ground by a trench, or by a trench and rampart of earth surrounding the whole, except where a narrow pathway gives access to the interior on the original level. In the district of Scotland between the Dee and the Spey there are numerous examples of a special variety of stone circle distinguished by the presence of a great flat block placed on edge so as to fill one of the intervals between two of the upright pillars, usually on the south-west side of the circle. Circles of small boulder stones placed close together and scarcely showing above the turf are also found in many parts of Europe, indicating that the space thus enclosed has been reserved for burial deposits in prehistoric times. But the circles composed of large stones set at considerable intervals apart are linked with the burial customs of the builders of the chambered cairns of the Stone Age. A great circle of standing stones encircled the gigantic chambered cairn of New Grange in Ireland, and the smaller cairns of Clava in Strathnairn near Inverness are similarly encircled by pillar-stones. As a rule the cairns which covered the cremation interments of the Bronze Age are smaller than those of the preceding period, and the custom of placing the burnt bones in a cavity in the soil, covered only by an inverted urn of clay, dispensed with the cairn altogether, while it retained the circle of standing stones as a visible mark or fence of the grave-ground. In a number of instances in Scotland the examination of the interior space has disclosed burials of the Bronze Age, mostly after cremation, but occasionally unburnt. The

cremated remains were deposited with cinerary urns placed either in an inverted position over the burnt bones or upright and containing the burnt bones, at the bottom of a shallow pit excavated in the subsoil. These cinerary urns exhibit the forms and ornamentation characteristic of the age of bronze. Sometimes the burials have been placed in cists of unhewn slabs of stone, covered by small cairns of loose stones, underneath the surface level; at other times the burnt bones of many burials have been found placed in shallow cavities excavated in the soil of the interior area of the circle, near the bases of the upright stones. From these circumstances it is conclusively demonstrated that the common varieties of stone circles in Scotland are circular cemeteries of Bronze-Age burials. It may be that the greater circles, like those of Stennis, Avebury, and Stonehenge, may have had a different origin and purpose, but there is no evidence more conclusive than mere conjecture for the assumption of a different purpose for the larger circles, and the great size of the circle surrounding the immense chambered cairn of New Grange shows that a great circle was associated with sepulture.

The largest of the Scottish stone circles is the Ring of Brogar in Orkney, standing on the slope of the hill overlooking the Loch of Stennis, about 4 miles N.E. of Stromness. It is surrounded by a trench 30 feet wide and about 6 feet in depth, enclosing a total area of about 2½ acres. The trench is crossed by two accesses to the enclosed area on opposite sides of the circle, each 17 feet wide. The circle of pillar-stones stands 13 feet within the trench on a circumference of 340 feet in diameter.



Ring of Brogar, Stennis, Orkney, before restoration.

The original number of pillar-stones was probably sixty, of which only thirteen were standing before the Commissioners of Works took possession and had the others re-erected in 1908; ten were prostrate, and the stumps or fragments of thirteen more were still recognisable. The stones range up to 14 feet in height. The average distance between the stones is about 17 feet. A smaller circle, the Ring of Stennis, composed of larger stones, stands about a mile to the south. Its whole interior area is raised about 3 feet above the surrounding level, and has had a circumscribing ditch, with a rampart on the inner side. Only two stones were standing before 1908. A larger one, which was prostrate, is 19 feet long and 5 feet broad. It was near this circle that the perforated stone stood, through the aperture of which it was the custom in the 18th century for young men and women of the district to plight their troth by joining hands, a promise of marriage thus made being regarded with superstitious reverence as specially binding. The largest

stone circle in England is that of Avebury (q.v.) in Wiltshire. This monument is apparently alluded to in a charter of King Athelstan, dated 939 A.D., where one of the boundaries is said to run 'from the road to Hackpen northward, up along the Stone Row, thence to the burying-places.' Stonehenge (q.v.), the most famous of British stone circles, differs from other stone circles not only in its ground-plan, but in the pillar-stones of the exterior circle and the larger ellipse surmounted by imposts, mortised on tenons in the tops of the uprights, and also by the stones being at least partially tool-dressed. In Norway and Sweden stone circles have been found to be burial-places of the Iron Age. They are usually simple circles composed of eight to thirteen stones; occasionally there are two concentric circles, the inner circle being sometimes composed of small stones set close together in a ring. Sometimes there is a single pillar-stone in the centre of the circle. As a rule they are not remarkable either for the size of the circles themselves or for the massiveness of the stones of which they are composed. Circles of standing stones are widely distributed. In Algeria megalithic circular burial-places are not uncommon, but they do not correspond in general with those of northern Europe, being rarely composed of pillar-stones. Circles of pillar-stones, apparently of comparatively recent origin, have been found in northern India, and megalithic circles are stated to have been occasionally met with east of the Jordan, and in northern Arabia.

See Ferguson's *Rude Stone Monuments* (Lond. 1872); Anderson's *Scotland in Pagan Times* (Edin. 1886); *Plans and Photographs of Stonehenge*, by Sir Henry James (1867); T. E. Peet, *Rough Stone Monuments* (1912).

Stone-coal. See ANTHRACITE.

Stone-crop. See SEDUM.

Stone-fly (*Perla*), a genus of insects typical of the order Plecoptera. The hind-wings are broader than the fore-wings, and folded at the inner edge. The body is elongated, narrow, and flattened; the wings fold close to the body, which generally bears two terminal bristles. The larvæ are aquatic, and much resemble the perfect insect, except in the absence of wings. A number of species—e.g. *P. bicaudata*—are common in Britain, and are well known to anglers as an attractive lure for fishes.

Stone-fruit. See FRUIT.

Stoneham, a town of Massachusetts, 9 miles N. of Boston, with large boot and shoe factories. Pop. 8000.

Stonehaven (locally *Stanehive*), a seaport and (since 1607) the county town of Kincardineshire, 16 miles SSW. of Aberdeen, is situated on a rocky bay at the mouth of Carron Water, which divides it into an Old and New Town. The harbour, formed since 1826, can admit only small vessels; but Stonehaven has very considerable herring and haddock fisheries. It was constituted a police-borough in 1889. Pop. (1841) 3012; (1901) 4577; (1921) 4856. See DUNNOTAR.

Stonehenge, a circular group of gigantic standing stones on Salisbury Plain, about 2 miles from Amesbury in Wiltshire, situated in the midst of an extensive group of prehistoric barrows of the Bronze Age. The circle of stones, which is about 100 feet in diameter, occupies the central portion of an area of about 300 feet in diameter, enclosed within an earthen rampart and ditch. It consists of two concentric circles enclosing two horse-shoes, both open at the north-east end. The exterior circle, which is composed of pillar-stones of Tertiary sandstone, locally called 'gray-wethers' or 'sarsens',

set up at pretty regular intervals of about 4 feet apart, has been surmounted by a continuous line of imposts closely fitted to each other at the extremities, and having mortise-holes in their under sides, which receive tenons on the tops of the pillar-stones. The pillar-stones show generally about 13 feet of height above the ground, and the imposts are about 10 feet long, 3½ feet wide, and 2 feet 8 inches deep. Of this circle sixteen pillar-stones and five imposts retain their original position. These stones were found lying about the plain, the remains of a cap of sandstone that had almost vanished. They were transported ready-dressed. About 9 feet within the exterior circle are the remains of a second circle of smaller blocks of rock, locally known as 'blue stones.' They are irregular in shape and height, and do not seem to have supported imposts, but few now remain standing, and their number and respective positions cannot be accurately determined. It seems to be ascertained that these stones (dolerites and rhyolites) must have been brought from Pembrokehire, and dressed at Stonehenge. Within this inner circle, and separated from it by about the same distance, is an incomplete ellipse, nearly of horse-shoe form, with the open end facing the north-east, formed of five trilithons or groups of two immense pillar-stones supporting an impost. The central trilithon facing the open end of the ellipse was the largest, the pillar-stones being about 23 feet in height above ground, and the added height of the impost making the whole height of the trilithon nearly 28 feet. The other four, which stood facing each other, two and two on opposite sides of the ellipse, are somewhat smaller. Only two of the five are now perfect; the central one wants the impost, which fell in 1620, one of the pillars lies broken on the great stone, popularly called 'the altar stone'; the other, which leaned over, supported by one of the smaller stones in front of it, was set upright in 1901. Of the two trilithons on the west side of the ellipse, the one next the open end has only one pillar-stone standing, the other has fallen inwards with the impost, and both are broken; the other trilithon fell outwards in 1797, but the three stones, though prostrate, are still entire. The trilithons of the ellipse are of the same Tertiary sandstone as the pillar-stones and imposts of the exterior circle. They are partially tool-dressed. Within this ellipse is a smaller ellipse of the same form, but composed, like the second circle, of irregularly-shaped 'blue-stones' without imposts, varying from 6 to 8 feet in height, and set at intervals of about 5 to 6 feet. Within the whole, backed by the great trilithon, lies the so-called altar-stone of micaceous sandstone, supposed like the 'blue-stones' to come from Pembrokehire. Outside the circle, but within the earthwork, are two unworked sarsens, to north-west and south-east, while to north-east stands a third, the Friar's Heel, outside the earthwork, on the axis of the whole. In line with it on the edge of the ditch lies a stone fancifully named 'the slaughter-stone.' From Stonehenge a straight earthwork or avenue runs for a quarter of a mile.

On 31st December 1900 one of the stones of the outer circle was blown down; and the proprietor, Sir E. Antrobus, in concert with several archaeological societies, had the whole enclosed, and the question of preservation and restoration placed in the hands of engineering experts. The Office of Works and the Society of Antiquaries undertook the securing of stones that were in danger. Stonehenge was sold in 1915 to Mr C. H. E. Chubb, who gave it to the nation in 1918.

Stonehenge is first chronicled by Henry of Huntingdon in the 12th century as one of the four wonders of England. Geoffrey of Monmouth says it was erected by Aurelius Ambrosius, in com-

memoration of the British nobles slain by Hengist; that Aurelius himself was buried in it; and that Constantine, in the 6th century, was buried 'close by Uther Pendragon, within the structure of stones which was set up with wonderful art not far from Salisbury, and called in the English tongue Stonehenge.' Camden copied a drawing of it, which shows its outer circle much more complete than at present. Inigo Jones, in 1620, laments the disappearance of stones that were standing when he measured it. Stukely deplores the loss of the fallen stones carried away to make bridges, mill-dams, and the like. Aubrey mentions a large stone carried away within his remembrance to make a bridge. His plan shows a number of depressions

(1895), Lady Antrobus (1901), Sir N. Lockyer (1906), E. H. Stone (1924); a small guide by F. Stevens (revised 1924); and *The Antiquaries' Journal* (1924).

Stonehenge, the pseudonym of JOHN HENRY WALSH (1810-88), a native of Hackney, a surgeon at Worcester, and from 1857 editor of *The Field*, author and editor of works on dogs and sport.

Stonehouse, EAST, is now part of Plymouth (q.v.).

Stone River. See MURFREESBOROUGH.

Stones, PRECIOUS, is a vague term, as certain substances take rank in the list and disappear with the fluctuations of fashion; and the same name is

often given to several substances which may have a superficial similarity, although they really belong to distinct mineral species. Further, in point of beauty and rarity, the mineral substances used for ornament so merge into the common and abundant that there is no possible dividing line between precious and common stones. Among the substances used ornamentally, however, there are a few which from all times have occupied a foremost place and have been universally prized as precious stones. In such a rank and position may be placed the diamond, the ruby, the sapphire, the oriental amethyst, and the emerald. These, on account of their rare properties—their lustre, their play of light, their brilliance of colour, their great hardness and consequent durability, and especially be-



Stonehenge.

(Reproduced by permission of the Controller of H.M. Stationery Office, from *Stonehenge To-day and Yesterday*, by F. Stevens.)

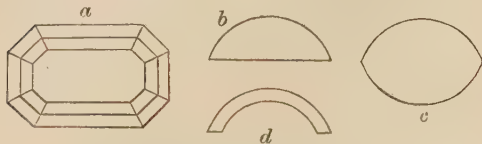
within the circular earthwork. These have been located by Col. Hawley and Mr Newall, who found two rings of holes in the chalk, many of them containing charred human and other bones. These holes (with some exceptions) seem to have held stones, which had been removed before they were turned to use for burials. Various excavations at Stonehenge have brought to light flint flakes, stone hammers and mauls, chips from the dressed stones, fragments of rude pottery similar to the urns found in the neighbouring barrows, bones of oxen and portions of stags' horns used as picks to make holes in the chalk to receive the stones. The only evidence that the builders of Stonehenge knew the use of metals is a small stain of carbonate of copper on one of the stones. The inference has been drawn that the monument dates from very late in the Neolithic or the beginning of the Bronze Age, perhaps about 1700 B.C. Most archaeologists look upon it as an exceptional development from the ordinary type of Stone Circles (q.v.), used as burial-places by the late Stone and early Bronze Age people of Britain, though some regard its exceptional development as due rather to a religious influence than to the mere idea of the common commemoration of simple burial. Many seek an astronomical meaning. At the summer solstice an observer within the monument would see the sun rise very nearly in line with the slaughter-stone and the Friar's Heel. The other undressed stones might mark the position of sunset at the summer solstice and sunrise at the winter solstice. But these directions are only approximate; and to get a plausible date it is necessary to abandon them for an arbitrary line. Sir Norman Lockyer used Sidbury Hill. Whatever its origin, it is the grandest megalithic monument in Britain. See books by Long (1876), Gidley (1877), E. Barclay

cause of their extreme rarity, have always been the most esteemed of jewel stones. In the second rank, as well-established precious stones of minor value, may be included the spinel or balas ruby, the Brazilian topaz (the oriental topaz is a yellow sapphire), the varieties of garnet, the turquoise, the tourmaline, the aquamarine or pale emerald, the chrysoberyl or cat's eye, the zircon or jargoon, the opal, and the varieties of quartz, such as rock-crystal, agate, amethyst, cairngorm or Scotch topaz, chalcedony, jasper, onyx, sardonyx, &c. Among other beautiful and valuable stones much appreciated for ornamental purposes, but scarcely to be classed as precious stones, there may be included lapis lazuli, crocidolite, labradorite, moon-stone, aventurine, and malachite. To the list of precious stones there should be added two substances of animal origin—pearls and red coral—and perhaps also amber, a comparatively rare and valuable fossil resin. The various substances here enumerated are dealt with, for the most part, under their own proper names.

For the development of the sparkle, lustre, and glow of colour of most precious stones it is essential that they should undergo the process of cutting and polishing. When lustre and sparkle are the principal qualities to be revealed, as in the case of the diamond, the surface is most favourably cut into numerous plane facets as either brilliant or rose cut stones (see DIAMOND, figs. 1 and 3). When colour is the more important quality of the stone it may, if plane surfaces are wanted, be step or table cut (a in fig.). Such stones also, and translucent and opaque stones, may be cut *en cabochon*—i.e. with curved or rounded surfaces. The varieties of cabochon cutting are single cabochon (b), or high plano-convex double cabochon (c), and double convex and hollow cabochon (d),

the latter being much used for large garnets, which so cut are called carbuncles.

One of the most important qualities of a precious stone is its hardness, as upon that properly depends



its power of resisting wear and of keeping the brilliance of its polished surface. It is a property of great constancy, moreover, and in many cases affords a ready means of determining the nature of a stone under examination. Of all known substances diamond is the hardest, and representing it, according to Mohs's scale, by 10, the following is the relative hardness of several of the more important of the precious stones: Diamond, 10·0; sapphire, 9·0; ruby, 8·8; chrysoberyl, 8·5; spinel, 8·0; topaz, 8·0; aquamarine, 8·0; emerald, 7·8; zircon, 7·8; tourmaline, 7·5; amethyst, 7·0; moonstone, 6·3; turquoise, 6·0; opal, 6·0.

Artificial Precious Stones.—Numerous attempts have been made by eminent investigators to produce artificial precious stones by means of intense heat and pressure and by electrical action; but hitherto these efforts have failed of practical success. In an important memoir published by Sainte Claire Deville and Caron in 1858 (*Comptes Rendus*, vol. xli.) they describe various processes by which they obtained small crystals of corundum, ruby, sapphire, &c. By the action of the vapours of fluoride of aluminium and boracic acid on one another, they obtained crystals which, in hardness and in optical properties, resembled natural corundum. When a little fluoride of chromium was added a similar process yielded violet-red rubies; with rather more fluoride of chromium blue sapphires were yielded; and with still more green corundum was obtained. A mixture of equal equivalents of the fluorides of aluminium and glucinum, when similarly acted on by boracic acid, yielded minute crystals of chrysoberyl. The action of fluoride of silicon on zirconia yields small crystals of zircon, and by the action of silica on a mixture of the fluorides of aluminium and glucinum hexagonal plates of extreme hardness were obtained, which in some respects resembled emerald.

In subsequent researches Becquerel (*Comptes Rendus*, vol. lviii.), by the use of electric currents of high tension, succeeded in obtaining opals, &c. from solutions of silicates. Among the most successful of experimenters in this direction was the chemist Charles Feil of Paris, who successfully crystallised alumina, and by the introduction of colouring matter produced sapphires and rubies identical in hardness and composition, but not in brilliance, with the natural stones. Feil also succeeded in preparing true crystals of spinel, and a blue lime spinel of great hardness, but glassy rather than crystalline in structure.

Imitations of precious stones consist of a soft, heavy flint-glass called strass or paste, appropriately coloured, and they may readily be distinguished, among other peculiarities, by their great softness. Fraudulent combinations are made by cementing thin plates of precious materials over, and sometimes also under, a body of valueless glass, and thus the exposed surface or surfaces when tested are real stones, and the veneered mass passes as a large and valuable possession.

Stoneworts. See CHARA.

Stonyhurst, a great Roman Catholic college in north-east Lancashire, 4 miles SW. of Clitheroe, traces its origin to the seminary at St Omer (q.v.) in France, which was founded in 1592 by Father Parsons (q.v.). The seminary ere long had 200 students, but after many vicissitudes was suppressed by the tyranny of the Bourbons in 1762. After a short sojourn at Bruges till 1772, and at Liège till 1794 (when the French revolutionary armies were closing round it), the eighteen Jesuit fathers were offered a resting-place at Stonyhurst by Mr Weld of Lulworth, an old alumnus, to whose family the old home of the Shireburnes had in 1754 passed by marriage. The fine house, begun about 1594, was beginning to fall into ruin, and even when restored provided but scant accommodation for the 200 students who soon flocked to it. Extensions were made in 1810-78, the chapel being built in 1835, and other additions have since been made. The numbers have gone on increasing with some fluctuations, and are now about 400, including students of university standard and the younger boys of the preparatory school at Hodder, a mile distant. Games are much encouraged, and special forms of football and handball seem to have been brought from St Omer. The library has many valuable MSS. and early printed books; and the college possesses a collection of pictures, a museum of antiquities, scientific collections, and fine specimens of embroidery and church-plate in the sacristy (many of these treasures having been preserved from St Omer days). The college observatory rose into note under Father Perry, F.R.S. Many of the institutions—the names of classes, exercises, holidays—date from the residence abroad.

See Hewitson, *Stonyhurst College* (Preston, 1870; 2d ed. 1878); *Memorials of Stonyhurst College* (1881); Father Gerard, *Stonyhurst College* (4to, 1894); Gruggen and Keating, *History of Stonyhurst* (1901).

Stony Stratford, a market-town of Bucks, on Watling Street and the Ouse, 8 miles NE. of Buckingham. It had an Eleanor cross till 1646, and suffered from fire in 1742.

Stool of Repentance, facetiously called 'Cutty-stool' (normally a domestic wooden stool with short legs), represented in post-Reformation Scottish churches part of the old discipline of Penance (q.v.). The place of repentance was sometimes a stool or bench, sometimes a pew or part of the gallery, sometimes a special erection as high as the gallery, containing several seats or stances, and ascended by stairs. Whatever it was and whatever called, it was about the most conspicuous thing in the church; and here persons who had become subject to ecclesiastical discipline for immoral conduct were required by the kirk-session to stand during public worship in profession of their penitence. The penitent was usually bare-headed and bare-footed, clothed in sackcloth or a linen sheet (kept for the purpose by the kirk-session); the ceremony might or might not be concluded by a public rebuke from the minister. For minor offences one appearance in the place of penitence might suffice; for the sin of fornication three several Sundays' penitence were usually inflicted; a much larger number of days was not at all unusual; and some offences (such as incest) might imply fifty-two Sabbaths in the place of penance unless the culprit were condemned by the civil courts to capital punishment. The stool of repentance was steadily maintained during great part of the 18th century, but gradually fell into desuetude, its place being taken by public rebuke before the congregation (still enforced in some places to near the middle of the 19th century), and afterwards by rebuke administered in presence of the session only. See Dr Edgar on 'Discipline' in *The Church of Scotland*, vol. v. (1891).

Storax, a resin resembling benzoin, was in high esteem from the time of Pliny to the end of the 18th century. It was obtained from the stem of *Styrax officinalis*, a native of Greece and the Levant, but owing to the destruction of the trees it has now disappeared from commerce. It was used as a stimulating expectorant.—**LIQUID STORAX**, a soft viscid resin, opaque and gray brown, heavier than water, is obtained from the *Liquidambar orientale*, a tree 40 feet high, forming forests in the south-west of Asia Minor. It has a balsamic odour and a pungent burning aromatic taste. It contains from 6 to 20 per cent. of cinnamic acid, besides a hydrocarbon, *Styrol*, a volatile oil, and various fragrant ethers. It is used but seldom in medicine, but has a reputation in chronic bronchial affections. Externally it has been employed in scabies.

Stork, a group of birds characterised by having the bill larger than the head, very stout at base, not grooved, tapering to the straight recurved or decurved tip; nostrils pierced directly in the horny substance, without nasal scale or membrane, high up in the bill, close to its base; legs long, and with reticulate scaling; three toes, with sometimes a rudimentary fourth, the claws not acute. The storks are usually divided into the True Storks and the American 'Wood Ibises' (*Tantalus*). There are several genera of storks, including about a dozen species. They belong chiefly to the Old World. The most familiar representative of the family is the Common Stork or White Stork (*Ciconia alba*), a native of the greater part of the Old World, a migratory bird, its range extending even to the northern parts of Scandinavia. It is common in many parts of continental Europe (though not in France, Italy, or Russia), but is especially familiar in Holland and North Germany, the storks arriving annually in February and March, and in autumn returning to Africa in large flocks, flying mostly by night. It is about three feet and a half in length. The head, neck, and whole body are pure white; the wings partly black; the bill and legs red. The neck is long, and generally carried in an arched form; the feathers of the breast



Common Stork (*Ciconia alba*).

are long and pendulous, and the bird often has its bill half hidden among them. The flight is very powerful and high in the air; the gait slow and measured. In flight the head is thrown back and the legs extended. The stork sleeps standing on one leg, with the neck folded, and the head turned

backward on the shoulder. It frequents marshy places, feeding on eels and other fishes, frogs, lizards, snakes, slugs, young birds, small mammals, and insects. It makes a rude nest of sticks, reeds, &c. on the tops of tall trees, or of ruins, spires, or houses. There are four or five eggs, white tinged with buff; and the old nest is re-occupied next year. In many parts of Europe, especially in Holland, it is a very common practice to place boxes on the roof for storks, and children are told that storks bring the babies. Storks are protected by law in some countries, on account of their good services not only in destroying reptiles and other troublesome animals, but in the removal of offal from the streets of towns, in which they stalk about with perfect confidence, even in the midst of throngs of people. They have been celebrated from ancient times for the affection which they display towards their young, and have also had the reputation—not so well founded—of showing great regard to their aged parents. Before they take their departure from their summer haunts they congregate in large flocks, which make a great noise by the clattering of their mandibles, and are popularly regarded as holding consultation. The stork has no voice. It is a very rare bird in Britain, and was so even when the fens of England were undrained. Bower says that in 1416 storks came and built their nests on the roof of St Giles' Church in Edinburgh; there they remained a year and departed to return no more; 'and whither they flew,' adds the chronicler, 'no man knoweth.' The flesh of the stork is rank and not fit for food. The Umbrette (*Scopus umbretta*), an African and Madagascar bird, remarkable for the enormous domed nest which it builds, is nearly allied to the storks and seems to be a link connecting them with the herons. The Balæiceps (q.v.) or Shoe-bill is also a stork, with affinities to the herons.—For the migration of storks, see *Nature*, December 1910, p. 203.

Storm, THEODOR WOLDSEN (1817–88), German poet and story-writer, was born at Husum in Sleswick, and spent most of his life (1842–80) as magistrate and judge in the service of Sleswick-Holstein and Prussia. His poetic reputation rests upon his *Gedichte* (1852). Of his stories, mostly short, the best are *Immensee* (1852), a poetic idyll in prose; *Zerstreute Kapitel* (1873); *Aquis Submersus* (1877); *Psyche* (1877); *Carsten Curator* (1878); *Hans und Heinz Kirch* (1883); *John Riew* (1886); and *Der Schimmelreiter* (1888). The charm of these little tales lies in the poetic and idyllic atmosphere in which the action is placed, the unobtrusive skill with which they are told, and their deep feeling. See *Lives of Storm* by Schütze (1911) and Gertrud Storm (1912 *et seq.*).

Stormontfield. See PISCICULTURE.

Storms. The term storm is most frequently used to denote a very high wind or gale; but it is not strictly confined to wind, and its use to denote any intense meteorological phenomenon still survives in snowstorm, thunderstorm, hailstorm, while an integral part of a storm at sea is the turbulence of the waves.

The following special phenomena will be treated in this article: (1) Storms of temperate latitudes, arising generally from cyclones or depressions; (2) line squalls; (3) tornadoes; (4) tropical revolving storms and the associated hurricanes; typhoons; (5) thunderstorms; (6) sandstorms and haboobs, scirocco, Bora, Mistral, Simoom, Sumatras.

In Section 7 the character of the wind in a storm is described and a brief account of historic storms and of storm warnings is given.

1. STORMS OF TEMPERATE LATITUDES.—An

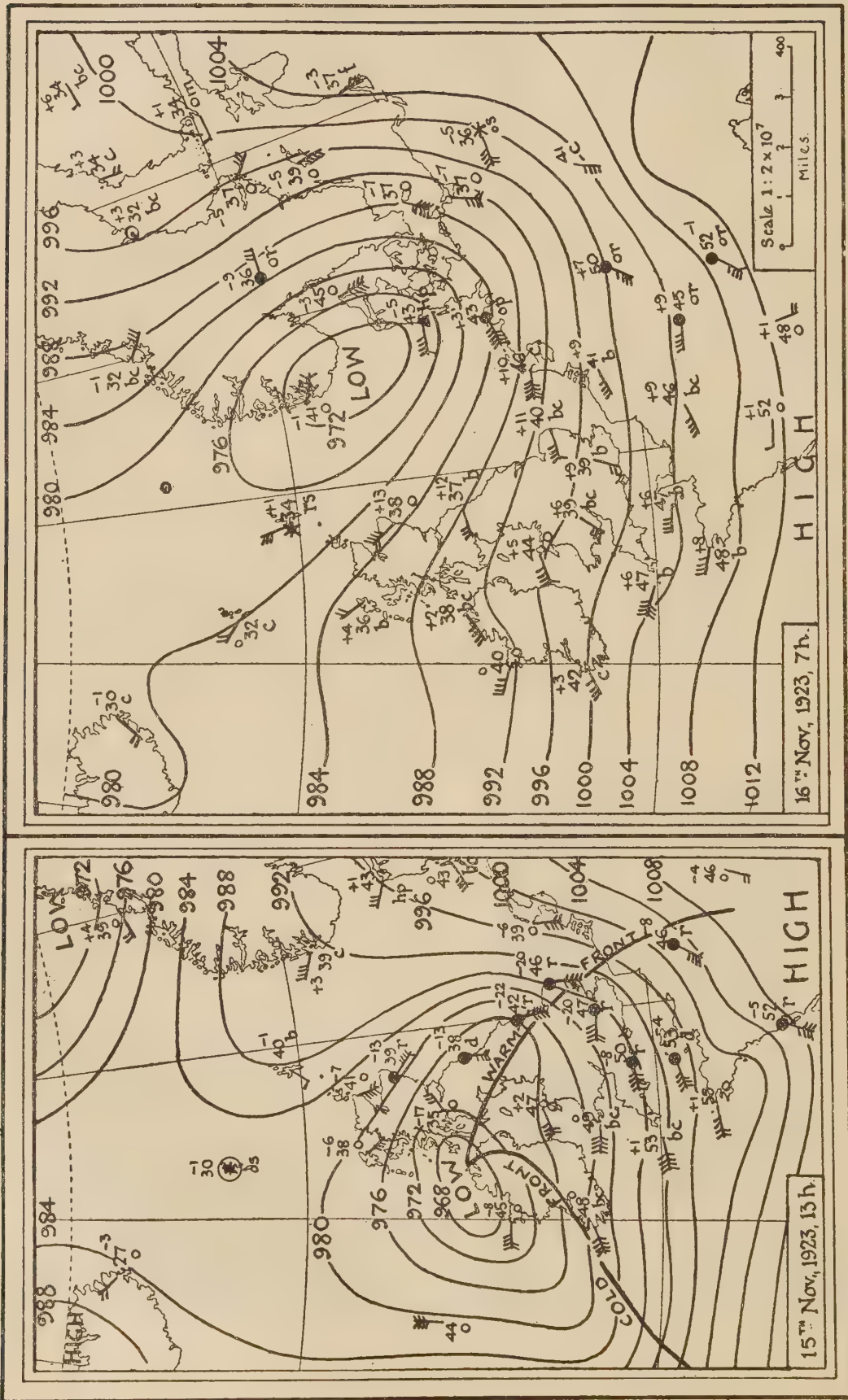


Fig. 1.

Fig. 2.

CL — Isobars; the distribution of pressure, temperature and wind; and weather in western Europe. N.R. — The black circles indicate places at which rain was

essential preliminary to understanding the way in which storms arise, progress, and die out is an account of weather maps. At a large number of places in different countries observations are made two, three, or four times a day of the barometer, temperature, wind, and weather. These observations are plotted according to certain simple conventions on an outline chart. When this is done, it is seen that the different observations are not a random spasmodic selection but fit together in a more or less systematic manner. Two such charts, called synoptic charts, are shown in figs. 1 and 2. They represent conditions over the British Isles and Western Europe on 15th and 16th November 1923. The continuous lines are isobars; along these lines the pressure of the atmosphere at sea-level is everywhere the same; in other words, if barometers were placed along one of these lines at places at sea-level they would all read exactly alike. The isobars are drawn for every 4 millibars (1 millibar = 1000 dynes per cm²; 1000 millibars = 29.53 in.). The arrows at the different places show the direction in which the wind is blowing, and the number of fêches on each arrow indicates approximately the speed at which the wind is blowing, according to the numbers of the Beaufort scale of wind force (No. 8 is a gale; see WIND). The figures alongside the arrows give the temperature of the air in degrees F., and the letters beneath show the character of the weather according to Beaufort's notation. The small figures above the temperature figures denote the rate at which the barometer is rising (+) or falling (-). The first map of this kind—constructed a long time after the actual date from observations collected in various publications—was made by Brandes for 6th March 1783, but the regular construction of synoptic charts did not begin until after 1860, when a scheme for the international exchange of telegraphic reports was introduced. This continued until after the war of 1914-18. In 1919 the exchange of reports by wireless telegraphy commenced, and now every country in Europe collects reports from its own stations, assembles them into a single report, and issues this collective report by wireless telegraphy, according to a time-table fixed internationally in such a way that the majority of the reports have been transmitted within 1½ hours of the time of observation, and practically all of them within 2½ hours.

The original idea underlying the collection of observations and the construction of charts was that storms *travelled*, and if their existence could be ascertained and their track deduced it would be a simple matter to give warning of them; in fact, the final impulse which launched the international scheme came from a travelling storm. On 14th November 1854 a storm burst suddenly upon the British and French fleets in the Black Sea and did much damage, wrecking one French battleship. The French astronomer Leverrier collected evidence of the storm's progress across Europe, and proved that its arrival in the Black Sea could have been foreseen had telegraphic weather reports been collected at a central office.

The earliest studies of synoptic charts revealed two outstanding features—cyclones, or regions of low barometer; and anticyclones, or regions of high barometer. The first were generally associated with windy and wet weather, and the second with quiet dry weather. An examination of the distribution of wind and weather in cyclones was made by Abercromby in 1880-85. Two of his conclusions are: 'there is no difference between ordinary weather and a storm except in that property called intensity,' and 'in forecasting storms we have not only to foresee the arrival of a cyclone, but of one possessing sufficient intensity to cause a gale; and

in tracking a gale it by no means follows that the same one (cyclone) causes a storm during every day of its existence. For instance, on 14th August 1873 a cyclone was formed a little west of the Cape Verde Islands, which passed as a hurricane round Bermuda to Newfoundland by the 27th, after which it crossed the Atlantic and Great Britain as an ordinary cyclone, till it died out in Norway on 2d September and gave rise to nothing more than moderate breezes.' It was also found that deformation of a cyclone might occur, and that a bulge of the isobars, usually at the southern extremity of the cyclone, might have the features of wind and weather appropriate to a cyclonic entity; and that the bulge sometimes developed into a definite new cyclone with closed isobars. Such bulges and their developments were called 'secondaries.' An explanation of their origin will be given below. The existence and development of these secondaries, and the variations both in the intensity of cyclones and in the distribution of wind and weather over the area of a cyclone make it impossible to achieve successful forecasts on the assumption that weather merely 'travels.' Account must be taken of 'development.' One of the most useful practical aids both for travel and for development is 'barometric tendency.' This is a numerical index of the rate of change of pressure per three hours, and it is combined with an index of the character of the change, e.g. rising steadily, rising then falling, steady then falling. It is indicated on the charts for 15th November 1923, and it will be noted that the centre of the cyclone moves towards the region of greatest negative tendency. A cyclone with negative tendencies all round it is growing deeper and more intense; a cyclone with positive tendencies all round it is growing less deep—it is, in fact, a dying cyclone.

Mention has been made of the isobars or lines of equal pressure. The speed of the wind in cyclonic storms of temperate latitudes is determined by the distance apart of the isobars; even if no observations of wind were available but only observations of pressure, the meteorologist could tell with great accuracy what the actual winds would be. For isobars with little curvature, the speed of the wind at a height of 1000 to 1500 feet can be computed from the equation:

$\Delta p = \Delta n \cdot d \cdot 2wV \sin \lambda \dots (1)$ where Δp = difference of pressure between consecutive isobars; Δn = distance between consecutive isobars; d = density of air; w = angular velocity of the earth's rotation; V = speed of wind (gradient wind); λ = latitude.

For latitudes between 50° and 55° and isobars differing by 4 millibars as those in fig. 1 the distance between the isobars for a wind of 100 miles per hour is approximately 40 miles. The direction of this wind, V , is along the isobars, and it blows so that a person facing it would have the lower pressure on his right hand in the northern hemisphere and on his left hand in the southern hemisphere.

The wind at a height of 30 or 40 feet over the open sea, or over level country free from obstructions like trees or houses, is usually about two-thirds of the gradient wind, but the actual value of the ratio over land depends upon the time of day; it increases in the middle of day and decreases at night. The wind at the surface is also inclined at an angle to the direction of the isobars, and therefore to the wind, V .

The relation expressed in the equation (1) is based on the hypothesis that the force on the moving air, which arises from the effect of the earth's rotation (the geostrophic force), is balanced by the pressure gradient. Hence the wind derived from the equation is called either the gradient wind or the geostrophic wind.

If the isobars are curved and stationary another

term, $\Delta n.d.V^2 \div r$, has to be added to the right-hand side of the equation if the curvature is cyclonic, and subtracted from it if the curvature is anti-cyclonic (r is the radius of the curved isobars). As the results of actual observation are in agreement with the winds derived from this equation, it will be readily realised how fundamental are charts of isobars in connection with storms of temperate latitudes.

Broadly speaking, storms arise through the juxtaposition of masses of air whose temperatures in the same horizontal plane are markedly different, and generally they are purely local and of short duration unless the masses of air are moving with different speeds or in different directions.

The cyclones of temperate latitudes are now considered usually to arise between masses of air of different temperature and different velocity. Over the polar regions there is a large section of the atmosphere which is colder not only at the surface of the earth but also up to heights of 20,000 or 30,000 feet, than the air of latitudes 30° – 45° . The surface separating these masses of air slopes upwards towards the poles much as if the polar air were a heavy liquid running forward under a lighter one. The line in which the surface of separation meets the surface of the earth is called the Polar Front—north of this line (or south in the southern hemisphere) the air near the earth's surface is of polar origin, south of it the air is of tropical origin. Cyclones originate at the surface of separation. According to V. Bjerknes they are due to the surface taking a wave form; and as the waves are propagated along the surface, so the cyclones move, generally west to east. According to Erner of Vienna, cyclones are formed by a tongue of the polar air stretching out into the relatively warm current and damming it up so that a whirl is formed and moves forward dragging the cold air with it.

Such masses of air at markedly different temperatures, like those over the polar and equatorial regions, could not remain at rest in equilibrium; if they were at rest at sea-level, the sea-level pressure of the atmosphere would be everywhere the same; but then at a height of 10,000 feet over the regions where the temperature was 80° F. the pressure would be some 30 millibars (nearly one inch of mercury) greater than the pressure at that height over regions where the temperature was 30° F. This difference of pressure would break down the equilibrium state, and, broadly speaking, cold surface air would move from the polar regions towards the equator, and, at greater heights in the atmosphere, air would move from the equator towards the poles.

This essential fact—interchange of air between the polar and equatorial regions—is fundamental; the cyclones of temperate latitudes constitute the mechanism by which the interchange is effected across the temperate zone. Nearer the equator the interchange can be made by broad general currents towards the equator at the surface (the trade winds) and by broad general currents from the equator at higher levels (the anti-trade winds); but no such straightforward scheme can persist in temperate latitudes, because the earth is a sphere and is rotating; the interchange takes rather the character of mixing, and the most effective mixing

agent in a fluid is a series of whirls. The whirls in this great mixing region of the atmosphere may be more than a thousand miles in diameter, and four or five of them sometimes encircle the earth in the higher temperate latitudes.

The manner in which cyclones of temperate latitudes develop is briefly as follows: the warm

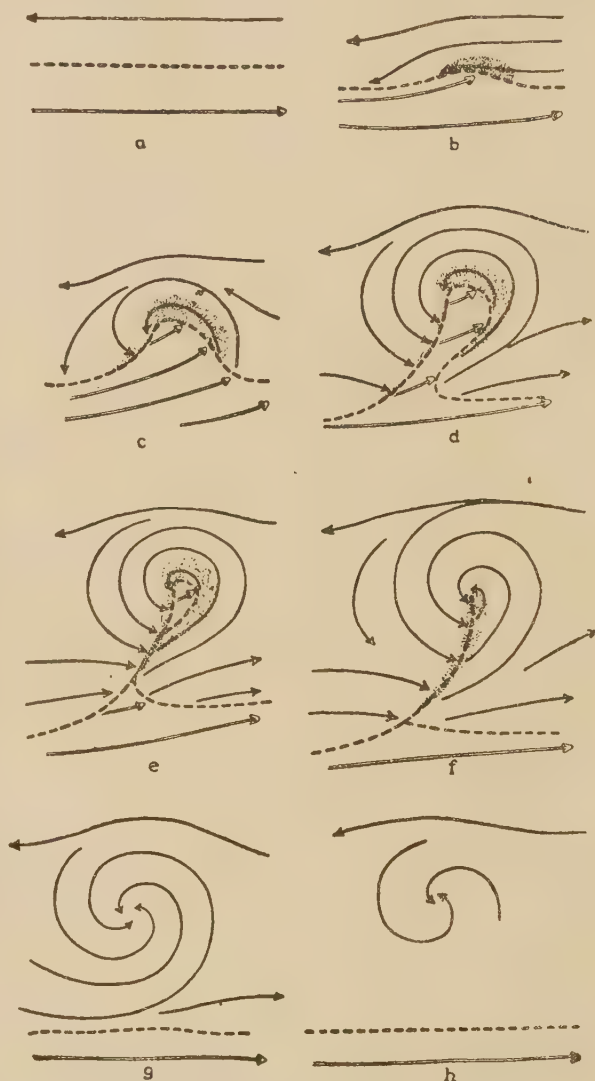


Fig. 3.—Life Cycle of a Cyclone (after Bjerknes and Solberg).

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air of lower temperate latitudes having in general come from nearer the equator has on the whole a motion from west to east; it retains, partially at least, the angular momentum about the earth's axis which it got in the neighbourhood of the equator. The cold air of higher temperate latitudes having in general come from nearer the pole has on the whole a motion from east to west; it retains similarly the smaller angular momentum about the earth's axis which it had when nearer the pole. In the temperate zone there is, therefore, in the north, cold air moving from eastwards, and, in the south, warm air moving from westwards. This state of affairs is represented schematically in fig. 3 (a) (due to Bjerknes and Solberg). This shows only conditions at the surface of the

earth; the division between the two currents is not a vertical plane but a sloping surface rising upwards towards the north; so that the warm air is moving over the top of the cold air. The slope of the surface is in actual cases small—it may rise only one mile in 200 miles or even less. Two such currents cannot go on running steadily alongside one another; the irregularities in the surface of the earth would produce irregularities in the surface of separation of the currents; and, apart from that, waves would form, as they always form, at the surface of separation of two fluids of different density. Fig. 3 (b) shows, therefore, a second stage in the development; the warm air begins to move northwards over the cold air, and the cold air to move southwards beneath the warm air at some place or other. Once the development has begun it tends to go on, and fig. 3 (c) shows the motion, become now cyclonic. In fig. 3 (d) the cold air, which tends to lag behind in the front part of the cyclone and to catch up in the rear part, has nearly cut off a section of the warm current, and in fig. 3 (e) it has achieved this; while in fig. 3 (f) the small patch of warm air has entirely disappeared.

So long as there is warm air in the cyclone every development results in more potential energy being converted into kinetic energy; the cold air rushes under the warm air with increasing intensity and the cyclone keeps growing deeper; but when all the warm air has been lifted up, the available potential energy (though it still exists at first in the stages 3 (e) and 3 (f) when the cold air is still lifting higher the warm air over the line of separation) soon disappears and the cyclone gradually dies. When the warm air has been lifted from the surface the cyclone is said to be *occluded*, and the line where the cold air from the rear meets the cold air in front is called an *occlusion*; consideration of what happens at this line will be renewed later.

It is now necessary to consider what is happening in the cyclone during the development described. Fig. 4 will assist. The middle diagram indicates the motion of the air about the centre, and the shaded areas show the region in which rain (or snow) falls as a rule during the development; the rain in the wider strip along the warm front is usually continuous rain of moderate intensity, though it may be heavy; the rain in the narrower strip behind the cold front is usually in the form of showers, sometimes very heavy showers with hail and thunder. The upper diagram is a vertical section through the cyclone to the left of the path of the centre (right in the southern hemisphere); it shows the dividing surface between the cold air and the warm air, with the warm air above still streaming from west to east, though the cold air beneath is moving from east to west; there is a mass of cloud spread along this surface, and in the middle it is thick and dense enough to produce steady rain.

The lower diagram is a vertical section through the cyclone to the right of the path of the centre (left in the southern hemisphere) where the surface of separation comes right down to the ground. The slope of the surface is gradual over the cold air in front, and here the mass of cloud, thick and dense near the point where the surface meets the ground, spreads away perhaps for hundreds of miles until it is no more than a thin veil of cirro-stratus, causing haloes around the sun or moon. In the rear where the cold air is undercutting the warm air the slope of the surface is steeper, and there is a narrow but dense band of cloud, towering to great heights, and spreading forward a little over the warm air. In this illustra-

tion there is no cloud or rain over the regions where the warm air is at the surface; but in some cases where the cyclone is growing rapidly deeper, the whole of this warm air is being forced upwards and cloud and rain extend also over the warm sector or a part of it.

If a barogram were taken at a place corresponding with the upper diagram of fig. 4 it would show

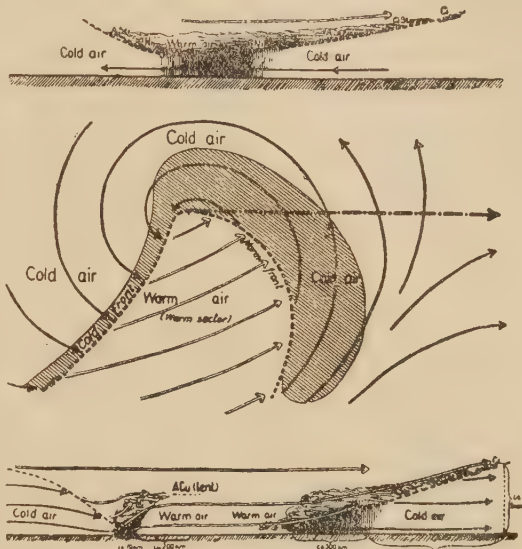


Fig. 4.—Constitution of a Cyclone (after Bjerknes and Solberg).

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a gradually falling barometer, followed by a gradually rising barometer: the wind also would change gradually from SE. or E. to NE. A barogram at a place corresponding with the lower diagram would be quite different: it would show a comparatively rapid fall, ceasing rather suddenly, and then a nearly steady barometer, perhaps rising slightly and then falling again slightly; suddenly there would be a sharp change in the curve and it would show a rather rapidly rising barometer.

Some of the most intense storms of temperate latitudes are caused by 'secondary' depressions: these are whirls in the general current moving round a primary cyclone; they are formed usually on the southern side of a primary (northern side in the southern hemisphere); the severest winds are on the side of the secondary, remote from the primary centre. The reason for this may be understood from the following illustration. Suppose a wheel 4 feet in circumference has an axis near its rim on which is a smaller wheel 2 feet in circumference, as in the diagram. ACB is the large wheel, DEF the small wheel. Suppose the large wheel is turning on its axis, O, 5 times per second, and the small wheel is turning on its axis, C (which is itself moving round O), 10 times per second, both in the directions shown by the arrows. Then C will be moving at 20 feet per second, E will be moving at 40 feet per second, and G will be instantaneously at rest. Similarly, the wind in a secondary cyclone is the result of the secondary circulation superposed on the primary circulation.

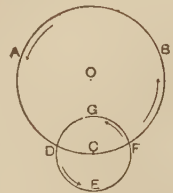


Fig. 5.—Rotating Wheels.

The method of formation of a secondary cyclone

is illustrated in fig. 6. The primary cyclone having become occluded, the cold air in front of the line of discontinuity cannot move away quickly enough, and is either actually moving westwards or is moving westwards relative to the current of warm air. This produces a condition similar to fig. 3 (b), and a new cyclone begins to develop while the rotation about the centre of the old cyclone is still going on.

Mention has been made of an occlusion, the line



Fig. 6.—Formation of Secondary (after Bjerknes and Solberg).

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along which the two masses of cold air in front of and behind a cyclone meet. As the different processes illustrated in fig. 3 take time, and simultaneously the cyclone is moving at perhaps 30 miles per hour, the two masses of cold air which meet at the occlusion will not be of identical constitution or temperature. If the air in the rear is colder than the air in front, the occlusion becomes a secondary cold front and the air in front is gradually lifted up as the colder air advances beneath it. Such a front is preceded by Cirro-Stratus clouds, whereas the ordinary cold front is preceded by Alto-Cumulus clouds. If the air in front is colder than the air in the rear, the latter begins to rise over the colder air and a secondary warm front results; the rain from such a warm front is usually slight, because there is not much moisture in the cold air. In very large cyclones, however, there may be considerable rain accompanying occlusions; and the potential energy, which is being converted into kinetic energy, is sufficient to maintain the cyclonic circulation for several days. Thus, although most of the cyclones which reach western Europe from the Atlantic are occluded before their arrival, they do not die rapidly, as they would if there were no discontinuity beyond the two fundamental ones of the primary cyclone.

It remains to add that the discontinuities in the cyclone are not always revealed by the surface temperature: the latter is frequently affected so much by the ocean or the land over which it passes that it is no good index of the temperature of the mass of air. It is therefore necessary to take account of the cloud, wind, and weather, as well as of the temperature, in examining a synoptic chart for discontinuities.

So far no mention has been made of the motion of the centre of the cyclone: this is determined primarily by the motion of the air in the warm sector. This air usually moves as a comparatively uniform current, and the centre advances in the direction and with the speed of the current of warm air. In other winds the path of the centre is parallel to the isobars in the warm sector, and the speed is approximately the same as the gradient wind in that sector. When the warm sector has vanished, the cyclone continues at first to move in the direction of the warm air above, but usually becomes stationary after a short time.

In fig. 1 the warm front and the cold front are indicated approximately by two thick lines radiating from the centre of the cyclone or 'low.' The warm sector is enclosed between these lines. On

this occasion the air in the warm sector was actually polar air, which had travelled a long distance towards the south over the Atlantic Ocean, and had then turned north again. In its passage over the ocean it had become rather warm and humid, and had therefore the fundamental qualities of the warm air of a cyclone. It can be seen that the cyclone was a vigorous one: there was a gale along the south of Ireland, in the west of England, in the Channel, and on the east coast, where the barometer was falling very rapidly. Next day, fig. 2, the gale was blowing in northern Holland and in Denmark, but the cyclone had become occluded; there was not much rain falling and the barometer was rising in most places, though still falling over Denmark and part of north Germany. The centre of the cyclone had moved almost exactly parallel to the isobars in the warm sector of fig. 1.

2. LINE SQUALLS.—This name is given to a type of storm which occurs frequently in western Europe. At a single place the characteristic feature of the storm is a rapid increase of wind to a gale or more, and a sudden change of direction, usually from south or south-west to west or north-west, with violent squalls and heavy rain or hail, sometimes thunder and lightning also. Simultaneously with the change in the direction of the wind, the barometer rises suddenly and the temperature falls 5° or 10° F. The squall approaches the place not from the direction in which the wind is blowing before the squall, but from the direction which the wind has after the squall. When the observations from many places are collected it is found that these squalls are not isolated and disconnected occurrences, but that they occur simultaneously at all places along a line, more or less radial from the centre of a cyclone, though not necessarily continued right to the centre and not necessarily a straight line; the line of the squalls advances with a speed approximately equal to the speed of the current of air behind the squall. This is usually different at one end of the line from what it is at the other, so that the line rotates somewhat as it advances. Practically every cyclone has line squalls associated with it, but they are usually of minor intensity. In practice the name line squall is reserved for those cases in which the wind in the squall reaches gale force and there are violent or rather violent storms of rain or hail. The cause of the line squall is the advance of a mass of cold air which cuts under the warm air in front of it. The cold air gets further forward at some height, 1000 or 2000 feet, above the ground than it is at the ground itself; the forward extension may be as much as four or five miles. The cold air up above moves forward unretarded by the friction of the earth's surface, and the warm air beneath the advancing upper cold air is squeezed out in front of it. The warm air is usually also humid, and, as it rises in front, the water vapour condenses, forms cloud, and accelerates the upward motion; conditions similar to those of a tornado are produced with violent squalls of wind. The actual front of the line squall, though there is a discontinuity all along it, is not continuously uniform. This is due partly to the irregularities which necessarily arise when a thunderstorm or tornadic development occurs; it is impossible for every point of the front to be the centre of a thunderstorm or tornado; it is also due partly to the irregularities in the advancing mass of cold air which are produced by the configuration of the land. The front of a severe line squall may therefore be taken to consist of a chain of disturbances with clouds rising up to 20,000 feet or more,

in which the vertical currents are intense enough to produce hail and thunderstorms.

Though the term line squall was introduced in Europe and its peculiarities have been investigated specially in that area, it is by no means confined to the European area. It is probable that practically all the storms of brief and intense duration in which a rapid fall of temperature follows the violent wind and precipitation are of the same character as the line squall—viz. Southerly Bursters, Pamperos, Tornadoes.

3. **TORNADOES.**—The name Tornado, originally introduced to describe the violent thunderstorms of the tropical Atlantic, is now usually applied to very violent storms affecting a comparatively narrow strip of country, 100 or 200 yards up to one mile in width, and varying in length from a few miles up to 200 miles or more. The tornado moves across the country (or sea) in a nearly straight line, with a speed of 20 to 60 miles per hour. [*N.B.*—This is the rate at which the tornado itself moves; it is *not* the speed of the wind in the tornado.] The speed of the wind in a severe tornado has not been measured; it is certainly well above 100 miles per hour, and probably exceeds 200 miles per hour in the most violent gusts. Tornadoes are more frequently reported from the United States of America than from any other region. The chart, fig. 7, shows the total

suddenly. Quite apart from any effect of wind, this sudden change of pressure would itself be sufficient to do considerable damage to any closed buildings.

At Edwardsville, where the storm was very intense, rain began about 5.20 P.M. and lightning at 5.25 P.M., after which the rain ceased for a time about 5.30 P.M. The schoolmaster at Edwardsville described the occurrence afterwards as follows: 'A few seconds before 5.50 P.M. we heard a noise resembling the hissing of an express locomotive. The sound grew rapidly in volume, at last resembling the rushing speed of many road lorries racing along. The oppressiveness increased. We endeavoured to move out of the room to the passage for greater safety when the panes of our window were broken by stones, tiles, slates, dried cement, and splintered timber. The missiles broke the venetian blinds, and struck the opposite wall.' During this tornado a corrugated-iron sheet was carried from the roof of a store for a distance of more than half a mile, where it came in contact with a telegraph-pole, and was wrapped round the pole. A Congregational chapel was practically wrecked, and the pews in the chapel were all huddled up against the west side.

The air in a tornado is generally rotating about the centre, but cases have been observed in which the air appears to have moved directly towards the centre. It appears certain that quite near the centre the motion is always rotational, but that the air moves spirally towards the centre, and at some comparatively short distance away the component towards the centre exceeds on occasions the transverse component.

The rotation of the wind is usually in the same direction as in a cyclone—viz. counter-clockwise in the northern hemisphere. There are some cases (about 5 per cent.) where the rotation is in the opposite direction, and on a few occasions two funnel clouds have been observed simultaneously rotating in opposite directions. The track of the tornado is usually from south-west to north-east. The winds

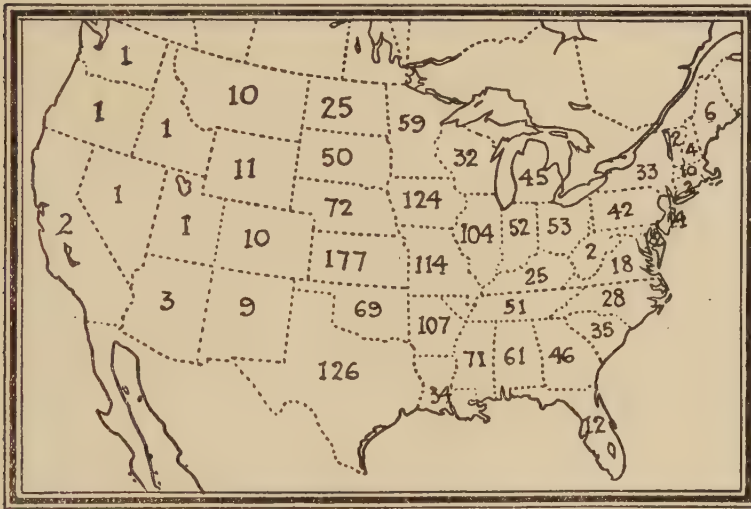


Fig. 7.—Number of Tornadoes in each state in 25 years.

number occurring in 25 years in each state. (Only a small strip of country in each state is actually affected by each tornado.) In the states most affected by tornadoes, between 10 and 20 lives are lost each year on the average from this cause; and the total damage to property caused in the United States by tornadoes in each year does not fall below 2 million dollars, and may reach 20 million dollars.

Tornadoes occur in Europe far less frequently than in the United States of America. There was one in South Wales in 1913; one in Holland in 1926. In the case of the storm in South Wales on 27th October 1913, this was of genuine tornado type. It travelled at a speed of about 36 m.p.h., and the width of the track, where severe damage was caused, was about 300 yards. The barometer at a place near the middle of the track fell suddenly 10 millibars and rose again immediately afterwards by the same amount. The pressure would therefore fall suddenly by about 20 lb. per square foot, and afterwards increase equally.

are said to be more violent on the right-hand side of the track of the centre, and this is what would be expected in a travelling storm rotating counter-clockwise; the speed of travel would be added to the speed of rotation on the right-hand side and subtracted from it on the left-hand side. The barometric pressure in the centre of a tornado is low, owing to the centrifugal action of the rotating air. Sudden falls of 10 millibars ($\frac{1}{8}$ in.) have been observed near the centre; in the centre itself the pressure must be sometimes as much as 50 millibars ($1\frac{1}{2}$ in.) below the pressure outside the tornadic area.

There is, in fact, one actual record of a barometer at the centre of a tornado at Bizerta in November 1898, which fell 44 millibars ($1\frac{1}{2}$ in.) in four or five minutes and immediately rose again the same amount. This intense fall of pressure must be accompanied by an equally intense fall of temperature; if air expands suddenly through a fall of pressure of 50 millibars it will cool about 10° F.

The depression of the barometer in the centre of a tornado can be related to the velocity of the rotating air in the following way: If the rotational velocity is v , and the density of the air d , then the depression of the barometer will be $\frac{1}{2}dv^2$, on the hypothesis that the moving air retains constant angular momentum about the centre. If the velocity v is 200 miles per hour, the value of $\frac{1}{2}dv^2$ is approximately 50 millibars.

The leading features of a tornado are: (a) the writhing funnel-shaped cloud swaying to and fro which projects from the main dark mass of cloud, itself seething and boiling like some huge witches' cauldron; (b) the rapidity of its approach; (c) the frightful roar, as of '10,000 freight-trains,' when the whirl itself comes; (d) the semi-darkness and heavy rain, sometimes hail, and thunder and lightning accompanying or closely following the whirl. The tornado passes as rapidly as it approached; in a minute all is over, and buildings lie wrecked, and people killed or injured.

If a tornado is seen approaching from the south-west there is usually just time for an alert man to get out of the danger-zone if he runs quickly to the north or north-west; but it is far better to seek shelter in a cellar or dug-out. One of the most heartrending catastrophes occurred in the case of a family who ran out of their house to avoid a tornado in May 1879. They were caught by the storm, and the father and mother and two children were killed. In Europe also storms of tornado character usually move from south-west or west towards north-east or east. The violent winds of a tornado are accompanied by a violent up-draught, and animals, vehicles, haystacks, and human beings have been carried up and transported hundreds of yards; boards have been blown as far as 2 miles from where the storm caught them.

4. TROPICAL CYCLONES.—Tropical cyclones are great whirls or vortices which travel as the air revolves; they originate over the ocean near the equator, for the most part between latitudes 8° and 12° north or south; they move usually westwards at first, then polewards, north or south according to the hemisphere, and afterwards towards the east. In the last stage they pass sometimes into cyclonic depressions of the temperate zone. They are seldom if ever formed over the land, and if they reach the land of a continent they rapidly lose their distinctive violence and either become depressions of the temperate zone or die out.

There are six regions of occurrence of these storms—viz. (1) North Atlantic Ocean. The West Indies, the Gulf of Mexico, the Caribbean Sea, and the coast of Florida. In this region the storms are usually called 'Hurricanes' or 'Hurricanes of the West Indies.'

(2) North Indian Ocean. Bay of Bengal and Arabian Sea. In this region the storms are usually called 'cyclones' after the Greek word for a 'circle.' The word 'cyclone' was, in fact, first introduced to describe these storms in 1848 by Piddington, who wrote the *Sailor's Horn Book for the Law of Storms*. (If Piddington's original analogy of these storms to the spiral coil of a snake had been followed, the word would have been 'cyclome'.)

(3) South Indian Ocean. East of Madagascar, near Mauritius and Réunion. In this region also the storms are usually called cyclones, but sometimes hurricanes.

(4) South Indian Ocean. Between Australia and the Cocos or Keeling Islands. In this region the storms are usually known as cyclones, or in Australia as 'Willy-Willies.'

(5) North Pacific Ocean. Philippines and China Sea. In this region the storms are usually called typhoons. Tropical cyclones also occur in the

North Pacific to the West of Mexico and Central America; and it has been suggested that some of them move west across the Pacific and appear as typhoons in the China Sea.

(6) South Pacific Ocean. From the coast of Queensland to Fiji, the Marquesa and the Low Archipelago called Tuamotu or Paumotu Islands. In this region the storms are variously known as cyclones, typhoons, or hurricanes.

It will be noted that these storms are not found in the South Atlantic Ocean, and that the majority of the areas have continent to the west and ocean to the east. But information for large areas of the Pacific Ocean is meagre, and the most recent view is that no large part of the tropical Pacific is free from these cyclonic storms.

The general character of a tropical cyclone is briefly as follows: On the outer limit there is a slow fall of the barometer towards the centre, roughly one millibar ($\frac{1}{80}$ inch) in 50 or 100 miles, and the winds are relatively light: the rate of fall of the barometer towards the centre increases usually gradually and the wind increases similarly; nearer the centre the fall of the barometer is very rapid, it may be as much as one millibar per mile, and the wind blows with hurricane force; over a small area at the very centre there is usually a calm, with a nearly steady barometer: this is called the 'eye' of the storm. This area varies, diameters of 5 to 15 miles having been observed. The vortex with winds of hurricane force may be as small as 20 miles in diameter, or it may extend over an area of 400 miles in diameter. The barometer is sometimes very low indeed in the centre of a tropical cyclone, though not usually so low as in the centre of the deepest depressions of the temperate zone. In one case, however, the barometer at the centre reached the lowest level ever recorded at sea-level. This was in the famous False Point cyclone of 22d September 1885, when the lowest reading was 919 millibars (27.14 in.).

On the outer limit the weather is fair, often with cirrus cloud or cirro-stratus, which causes haloes round the sun or moon, and may be responsible for the lurid sunsets which are among the characteristic signs of an approaching cyclone. Nearer the centre the sky is overcast and rain, sometimes hail, falls torrentially; thunder and lightning may also occur.

There is sometimes a region of light rain between the fair weather and the torrential downpour, but the transition may be almost instantaneous. Some investigators consider that the area of rain is elliptic in shape, prolonged towards the rear of the storm. In the eye of the storm the sky frequently clears and the rain ceases, but cases occur in which the sky continues overcast even in the centre; sometimes lightning is observed near the centre, but as the diameter is relatively small, the origin of the lightning may be in the storm region around. The temperature is usually rather lower (2° F. to 4° F.) within the area of the storm than in the region outside, and the relative humidity is nearly 100 per cent., although just outside the storm it may be only 80 per cent. The decrease of temperature and increase of humidity are probably due to cooling of the air partly by the torrential rain and partly by the reduction of pressure. The amount of rain which falls during the passage of a tropical cyclone is usually large and may be excessive; amounts of 20 inches have been measured on islands over which the centre has passed. A reduction of pressure of 10 millibars would correspond with an adiabatic cooling of nearly 2° F.

Records of the speed of the wind in the worst cyclones are lacking, because the instruments are blown away. Speeds of over 100 miles per hour have been recorded, and it is probable that in

squalls the velocity sometimes exceeds 150 miles per hour.

The following are descriptions of hurricanes at sea in the Bay of Bengal and in the West Indies: 'In the evening the weather was dark, gloomy, and threatening, and at midnight there were very heavy squalls and rain, the wind being ENE., force 9. The wind continued from NE. or ENE. strong to a gale until noon on the 2d, but at 2 P.M. the ship ran into a dead calm, and a number of land birds, such as a hawk, a paddy bird, several smaller kinds, some butterflies and insects, and also several dragonflies. The wind went right round to SSW. and began to freshen, and by midnight was blowing force 11 from SSW. The distance run by the ship during the relatively quiet period was about 10 or 12 miles. In the evening the moon was just visible. There was a good deal of thunder observed to the NE.'

'There was an ugly threatening sunset on 24th August 1924. The whole heavens assumed a lurid red colour intermingled with orange and purple, and the sky to the westward retained a dull red glow long after the sun went down. During the night the barometer fell comparatively rapidly, and at 6 A.M., the wind having increased to force 11, with squalls of hurricane force, the ship was hove to. At this time the wind was blowing from the ESE. At 3 P.M. the wind veered to S., and retained full hurricane force. At 3.30 P.M. it changed to SW. At 4 o'clock the barometer began to rise. There was no change in the weather or conditions, but the wind veered gradually to WSW. The barometer rose rapidly and the wind decreased. Owing to the rain and spindrift the visibility during the hurricane was very poor (i.e. it was not possible to see much more than 200 yards). The dry and wet bulb readings at 4 A.M. on the 25th were 80 and 74, and the same at 8 A.M. At noon they were 76, 76, and the same at 4 P.M. By midnight they were 80, 76. There was no thunder during this hurricane, but lightning was observed to the eastward after the hurricane had passed and the wind had changed to WSW.'

There are in the different regions definite periods of the year when cyclones occur, and the table below shows the number recorded per month in the past: the period of years for which records are available varies, and the numbers have been reduced to correspond with a ten-year period. Many storms probably occur which are not recorded, either because they do not pass near land or only near un-civilised lands. Some of the severest storms in the different regions have occurred in the months at the end of the cyclonic period: a notable one visited Mauritius on 29th April 1892—seventeen days later than any previously recorded cyclone there—and was so severe that the sugar-crop was reduced from 120,000 tons to 70,000 tons.

It is seen from the table that the season of tropical storms is, broadly speaking, late summer and early autumn in both hemispheres. The Bay of Bengal storms are divided into two classes. Class I. are the more severe storms with winds exceeding force 10. Class II. are storms with winds between forces 8 and 10.

The number and intensity of tropical cyclones vary greatly in different years: in the West Indies in 1886 and 1887 there were eleven hurricanes in each year, while in 1897 and in 1913, 1914 there were none. There does not appear to be a common cause for these variations, inasmuch as a year of maximum frequency in one region may be a year of normal or of minimum frequency in another region.

The damage caused by tropical storms has been already mentioned in the case of an exceptionally late storm at Mauritius. Not only is the damage to property often severe, but great loss of life is also frequently caused. For example, in the storm of 16th–17th August 1915 the death-roll at Galveston was 3000, and the damage to property six million dollars, while the same storm caused about 6000 deaths in other areas and enormous damage to crops and property in one-half of the state of Texas. The West Indian hurricane which passed over Miami, Florida, on 18th September 1926 is illustrated in the map, fig. 8. The barometer at the centre fell to 935 millibars (27.61 inches) at Miami at about 6.30 A.M. on 18th September, and the central lull lasted about half an hour. A wind velocity between 120 and 130 miles per hour was measured before the anemometer was blown away. More than 200 people were killed, thousands rendered homeless, and the damage to property was nearly 100 million dollars. Four days earlier, on 14th September, an intense hurricane had passed just west of Bermuda, the Miami cyclone being then just north of St Kitts. It travelled at about 14 miles per hour.

In the typhoon of 20th April 1905 over 2000 houses on the island of Ponape in the Eastern Carolines were destroyed. A storm in Queensland in February 1927 caused the loss of over 40 lives and damage to property estimated at £3,000,000. Sometimes, however, the rainfall associated with these storms, which falls over an area much larger than that of the violent winds, is most beneficial, especially in India.

In all the regions of tropical cyclones, systems of warnings have been developed, though not all to the same extent. The most efficient are probably those of the United States in the West Indies, of India in the Bay of Bengal, and of the United States, Japan, and Hongkong in the case of typhoons of the North Pacific. One of the principal difficulties of effective warning arises from the fact that these storms originate over the ocean where

there are no fixed observing stations, but against this must be set the relatively slow movement of the centre, usually only 10 or 12 miles per hour. Warnings inland are effective in reducing the loss of life by enabling persons to get into places of relative safety; warnings to ships may enable them to avoid the storm altogether.

NUMBER OF TROPICAL CYCLONES PER 10 YEARS.

Region.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
West Indies.....	—	—	—	—	*	2	2	9	13	10	1	—	37
Bay of Bengal—I...	—	—	—	1	3	2	2	1	2	4	5	2	22
Bay of Bengal—II.	—	—	—	†	2	4	8	6	7	6	4	1	38
Arabian Sea.....	1	—	—	1	2	4	1	—	1	4	3	1	18
Mauritius.....	6	16	14	10	4	‡	†	—	—	1	5	8	74
Philippines and } China Sea	5	2	3	6	14	16	32	39	44	29	21	12	223
S. Pacific.....	3½	2	3½	1	†	—	—	—		§	½	1½	12
West Australia.....	2½	2	2	1½	—	—	—	—	—	—	*	1	9

* 1 in 40 years. † 1 in 36 years. ‡ 1 in 35 years. || 1 in 50 years. § 1 in 100 years.

In the case of ships, a knowledge of the system of wind in cyclones and of the normal tracks is of the highest importance; the wind does not blow exactly in circles around the centre, but is inclined towards the centre at an angle of approximately 30° with the tangent to the circle. The direction of the centre can therefore be found by drawing a line making an angle of 60° with the direction towards which the wind is blowing; there are, however, variations from the average value of 30°

of the angle: it may be as small as 20° or as large as 40° . It is larger on the outskirts of the storm than nearer to the centre; in fact, it is better to assume an angle of 45° on the outskirts and an angle of 25° if the barometer has fallen 10 millibars. Another observation of importance to mariners is derived from the swell caused by the storm; this swell moves away from the centre and may be observed when the centre itself is hundreds of miles away. The principal rules for mariners

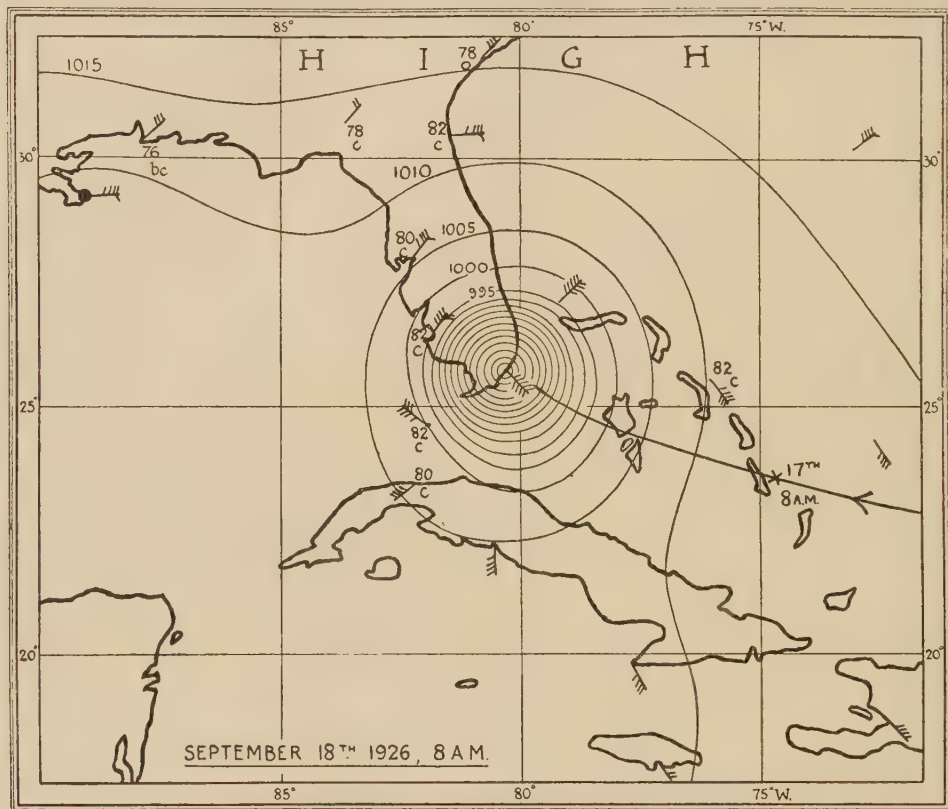


Fig. 8.—Miami Hurricane. Isobars for every five millibars.

are: (1) if possible keep out of the dangerous half of the cyclone, i.e. the half on the right-hand side of the direction of motion of the centre in the northern hemisphere, and the half on the left-hand side in the southern hemisphere; (2) in the northern hemisphere heave to on the starboard tack, and if the wind veers, remain hove to. If the wind is steady in direction and increases, or the barometer falls, run with the wind on the starboard quarter. If the wind backs, run with the wind on the starboard quarter until the barometer rises. In the southern hemisphere follow the same rules, replacing 'veering' by 'backing,' and *vice versa*, and 'starboard' by 'port.'

It has already been mentioned that tropical cyclones usually begin to move westward and later in their life turn and move eastwards. The actual tracks are usually something like the curve ABC. The point B is called the re-curve. It is at this point that the storms frequently reach their greatest intensity. It has been suggested that the storms move round an anticyclone whose centre is over the ocean far

to the westwards of the point B; the direction of the general wind circulation around such an anticyclone would be the direction ABC, and in the latitudes in which these cyclones occur the speed of the wind at moderate heights in the atmosphere would be of about the same magnitude as the speed at which the centres of the cyclones move.

On some occasions a West India hurricane changes into a cyclone of temperate latitudes after travelling some distance along BC of the curved path; and such storms have been traced right across the Atlantic from the coast of Florida to the British Isles. In such cases the speed of travel in the temperate zone is greater than the speed in the tropical part of the track.

The place of origin of tropical cyclones is the doldrums, the region of calms between the two systems of trade winds. If this region is actually over the equator, there will, as a rule, be no disturbances in it except wind-squalls, waterspouts, and heavy showers. It is only when the doldrums are some distance north or south of the equator that the instability, which gives rise to these minor effects, can act as the trigger to concentrate the angular momentum due to the earth's rotation in a

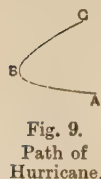


Fig. 9.
Path of
Hurricane.

well-defined cyclone. This is in all probability the reason why tropical cyclones are not found in the South Atlantic Ocean—the doldrums are never far enough south.

If a fluid has a motion of rotation about a centre towards which it moves, then the speed of rotation increases towards the centre. A familiar instance of this is the swirl of water running out of a bath—the rotation is inappreciable at a distance from the hole through which the water escapes, but it becomes intense enough near the hole to cause a marked depression of the surface. A tropical cyclone is analogous—the velocity of rotation is roughly twice as great 20 miles from the centre as it is at 40 miles, and the isobars must conform to the rotation. The question naturally presents itself, 'What corresponds with the plug?' No perfectly satisfactory answer has been given to this question, partly because the analogy with the plug is not itself perfect. The important fact is not the plug, but the vertical current resulting from its removal in the bath; and a vertical current over a definite area is an essential condition for the formation of a tropical cyclone. Such a vertical current may arise in the following way.

In air free from cloud which is warmed gradually at the bottom (or cooled above) the rate of fall of temperature with height is $1^{\circ}\text{F. per } 180 \text{ feet}$ ($1^{\circ}\text{C. per } 100 \text{ metres}$); if the air at tropical temperatures is saturated with moisture and cloud is formed the rate of fall is about half as great— $1^{\circ}\text{F. for } 350 \text{ feet}$ (or $1^{\circ}\text{C. for } 200 \text{ metres}$). If a comparatively thick layer of relatively cool air over the ocean lies beneath a slightly warmer layer of dry air, the lower layer will gradually take up moisture from the ocean and simultaneously, in tropical regions, rise in temperature. After a time the lower layer may become as warm as the upper layer, and when that stage is reached the lower layer will begin to rise into the upper layer, and photographs of clouds show that when this happens the rising air does not move upwards in threads over the whole region, but bursts through in masses. As this lower air, saturated with moisture, moves upwards its temperature will fall only half as fast as the temperature in the dry layer, so that it will always be warmer than the surrounding air at the same level and the upward motion will be intensified. Near the surface, air will move inwards towards the region of the upthrust and the air nearest the ocean surface will have the greatest moisture content of any air in the region; it will therefore form cloud at a lower level and the tendency to upward motion will be further intensified.

If there is little or no rotational motion pre-existing a waterspout or local whirl will result which will be gradually damped out by the descent of dry air from above. If, however, there is a pre-existing rotational motion, as there must be in a region where the earth's rotation is effective, the inflowing air will form a whirl, and, once started, this whirl will be kept going for a considerable time by inertia. If the whirl were stationary it would be practically symmetrical and would gradually die out, but a whirl would usually move with the general current in which it was formed. Owing to this motion and the consequent dissymmetry the whirl will be continually taking in fresh supplies of air from the surface layer, and not air which has descended from above and which would supply no fresh source of energy to replace that dissipated by friction. This qualitative description of the theory of formation of these storms is in general accordance with the facts. Storms rotate counter-clockwise in the northern hemisphere and clockwise in the southern hemisphere: which is conclusive proof that the effect of the earth's rotation is the decisive factor. They also form after air has been moving

slowly for some days over the ocean and has become warmed and saturated; the fact that they do not form more frequently indicates that special conditions in the upper air are also an essential factor; they do not form over the land although local warming is more intense than over the oceans, which is conclusive proof that the moisture evaporated from the ocean is also an essential factor; and the invariable occurrence of heavy rain in the area of the storm shows that air saturated with water vapour is continuously ascending and cooling and thereby condensing the vapour into rain.

It has recently been suggested by V. Bjerknes that tropical cyclones form as waves in a surface of discontinuity in a manner similar to that in which cyclones of temperate latitudes form. The air in the trade winds constitutes the 'polar' air; the surface of separation (in the northern hemisphere) slopes from north to south and also from west to east over the Atlantic; it will therefore come lowest in the neighbourhood of the Cape Verde islands, where, in fact, many of the tropical cyclones of the North Atlantic originate.

5. THUNDERSTORMS.—These are commonly divided into two types. The first type is similar in origin to the waterspout; air near the surface of the earth is warmed during the day by the sun's radiation; this air either contains originally appreciably more water-vapour than the air above it, or it gains water-vapour by evaporation until its water-content is sufficiently increased. The heating of the air near the surface starts convection in the lower layers and a stage is eventually reached when condensation begins. If the vertical temperature gradient in the drier layer above is greater than the rate for ascending saturated air the lower layer then breaks into the drier layer and forms towering clouds of cumulus type; if the comparatively large vertical temperature gradient in the drier layer persists to a great enough height, the clouds grow high enough first to produce rain; this rain would normally fall as a heavy shower, but the vertical upward current in a cloud produced in the manner described becomes very strong and carries the raindrops up with it, and by this very process increases the intensity of the rain when it does fall, and probably also produces the necessary electric field to give the thunderstorm. There are probably in every thunderstorm of this type the same violent whirls as occur in waterspouts; but the whirls are produced at considerable altitudes in air which is already filled with cloud; the whirls are not, therefore, directly visible. Thunderstorms of this type are always produced in relatively calm conditions; they are usually sporadic and move slowly.

The second type of thunderstorm is essentially a phenomenon of line-squall type. It is produced at the front of a mass of cold air which is undercutting a mass of warmer and, generally, more humid air. Thunderstorms of this type are associated with strong and even violent squalls of wind, and the thunderstorm moves comparatively rapidly across the country.

Heavy rain falls as a rule with thunderstorms of both types, and, in temperate latitudes, hail is also frequent. Hail also occurs, though less frequently, with tropical thunderstorms. The cause of the formation of hail may be described briefly as follows. Owing to the resistance of the air a drop of water falling through the atmosphere does not go on falling with increasing velocity, but rapidly arrives at a certain limiting velocity dependent on its size; the limiting velocity increases with the size of the drop up to a value of about 25 to 30 feet per second for drops $\frac{1}{4}$ -inch in diameter. These are the largest drops which can fall without breaking up rapidly into smaller drops. If there-

fore the upward current in a thunderstorm exceeds 25 to 30 feet per second any rain drops which get into the current are carried *upwards* with the current; as the temperature decreases rapidly upwards the drops may be carried up through a region where the cloud consists of minute super-cooled water-drops and fine ice-crystals; the drops freeze and collect further ice in the cloud; they may then be ejected at the top of the current and fall to earth, or they may fall some distance only into the rain-section of the cloud and there be caught again in a strong ascending current. It is possible in this way to get several layers in a hail-stone consisting of clear ice alternating with softer white snow-like layers. The clear ice comes from the water or super-cooled water-drops, while the snow comes from the fine ice-crystals.

It is now generally agreed that the separation of positive and negative electricity in a thunderstorm is effected through the agency of precipitation, the larger drops carrying down a charge of one sign and the smaller drops or cloud particles carrying the charge of opposite sign. It is further proved that generally a lightning flash must start from a seat of positive electricity and develop or branch towards a seat of negative electricity. The precise manner in which the large and small particles acquire their charges of opposite sign is not yet completely understood. It is generally considered either that the charges arise from disruption of raindrops or that the charge is induced on the drops by the earth's electric field. When a water-drop breaks into two the two new drops are both positively charged and the surrounding air and any minute drops in it negatively charged. As there must be a large number of drops which are broken into two in the violent upward currents of thunderstorms, it is certain that some, if not all, of the separation of electricity arises in this way; and the theory is supported by the fact that the large drops of thunderstorm rain are found to be positively charged. It has been objected against this theory of the origin of the charges in a thunderstorm that the process would result in the upper part of the cloud having a negative charge, whereas observations of the change in the electric field in a thunderstorm suggest that the upper part of the cloud has more frequently a positive charge. The reconciliation of the apparently divergent evidence appears to lie in discharges from the cloud downwards which do not extend to the earth. Most of the electric discharges in a thunderstorm take place between the upper and lower parts of the cloud; the discharges (lightning flashes) to earth are much less frequent; they usually go from the lower part of the cloud to the earth, but sometimes from the upper part of the cloud to the earth. Sometimes, too, discharges go from the top of the cloud to the conducting upper atmosphere (Heaviside layer). The potential gradient in the atmosphere must reach something like 3 million volts per metre before a lightning discharge can begin; with a thunderstorm 6 miles distant variations in the potential gradient of 1000 volts per metre occur. The energy dissipated in a single lightning flash is enormous—10,000 million joules; in other words, if a lightning flash occurred every ten seconds energy would be wasted at the rate of 1,000,000 kilowatts. Lightning discharges take place more readily to forests than to bare ground, and, *ceteris paribus*, to mountain summits and ridges than to valleys or plains. In this latter connection, however, it is to be noted that the thermal conditions which give rise to thunderstorms of the first type occur more readily over the valleys than over the ridges, and the thunderstorms, therefore, have a tendency to form over the valleys and to move along them.

In mountainous country the frequency of thunderstorms appears to vary little with altitude so long as the mountains are of moderate height; the frequency may even increase slightly with altitude. But in Switzerland the frequency is definitely less at great altitudes than at intermediate and lower heights; places above 6000 feet have only half as many thunderstorms as places below 1500 feet, and in Java the thunderstorms are said to move towards the plains even when they originate on the lower slopes of the mountains. As water and water-vapour play a fundamental part in thunderstorms, the decrease in the amount of water-vapour in the atmosphere at great heights may cause a decreased frequency of thunderstorms over high plateaux or mountain regions where the general level of the land is very high over considerable areas.

The distribution of thunderstorms over the earth's surface shows much variation. If the number of days in the year on which thunder is heard is taken as representing the frequency of thunderstorms, the regions of greatest frequency are Madagascar (95 days), Central Brazil (106 days), Panamá (136 days), Southern Mexico (143 days), Central Africa (150 days), and Java (223 days). In Java thunderstorms occur on the average on 6 days out of 10. Regions of least frequency are the polar regions and the north of Norway, the north of Iceland, Greenland and Northern Canada, where thunderstorms occur less frequently than once a year. At places north of the Arctic circle thunder occurs about once in ten years. Thunderstorms are also relatively infrequent on the west coasts of North and South America and the west coast of Africa, except close to the equator.

Over Europe the average frequency is 17 days, with a maximum of about 40 days in Württemberg and Bavaria. In Ireland the average frequency varies from 4 days on the coast to 8 days inland; in Scotland from 2 or 3 days in the Shetlands and Hebrides to 7 or 8 days inland; in England and Wales from 3 or 4 days on the west coast to 15 days inland. Thunderstorms over the land occur most frequently in the afternoon between noon and 6 P.M.; about 60 per cent. come in this period. Thunderstorms over the ocean occur most frequently at night, between midnight and 4 A.M.

Taking the whole world, there are on the average nearly 2000 thunderstorms occurring at any one time; and every second there are about 100 lightning flashes. Energy is being continuously dissipated in thunderstorms at the rate of 1000 million kilowatts. The magnitude of this may be better understood by stating the cost of the energy, calculated at the rate of one penny per unit (kilowatt hour); it is £4,000,000 per hour, or £100,000,000 per day. There are indications of an extra-terrestrial influence on the frequency of thunderstorms. The number occurring in Siberia, for example, increases and decreases systematically with the number of sunspots.

6. SCIROCCO, SIMOOM, WATERSPOUTS, DUST-STORMS, HABOOTS, BORA, MISTRAL, PAMPERO, SUMATRAS.—*Scirocco* or *Sirocco*.—This term was originally used for a strong and gusty southerly wind in Italy. In southern Italy it was hot and dusty. Further north the same wind, after passage over the Adriatic, was damp, and brought cloud and rain. The term 'scirocco' is now generally used for a high wind in any part of the world which is hot, dry, and dusty. There are, however, many local names for it: in Egypt, 'khamzin'; in Syria, Arabia, and Persia, 'simoom'; in Tripoli, 'ghibli'; in Tunis, 'chili'. A similar type of wind in Australia is called a 'brickfielder'.

The scirocco wind is a desert wind, and it brings with it the characteristics of the region from which

it comes; sometimes, too, it brings thick storms of dust. Usually over the scirocco wind, which is not more than 2000 or 3000 feet thick, there is a westerly wind. In some cases the heat and dust brought by a scirocco are so marked that they cause the death both of men and animals. If a scirocco comes in the spring when the trees are in bloom or the crops tender, it is liable to cause almost a complete loss of harvest, especially of the vine and olive, and also sometimes of corn and maize. After a scirocco the temperature falls, and the air becomes humid; the sudden change frequently causes illness, fever, and heart trouble. The scirocco arises through a depression in the neighbourhood of a desert region which causes the wind to blow strongly from the interior of the desert; consequently this wind is not a purely local phenomenon, but forms part of a general wind system and spreads over a wide area. In the Mediterranean area the scirocco comes usually on the east or south-east side of a depression moving westwards over the sea; thus in addition to the scirocco's progress northwards, it also spreads eastwards. It may occur in winter as well as in summer, though in the winter season its characteristic features are dryness and dustiness rather than high temperature. The sand or dust brought by a scirocco may be so thick in the air that the sky is entirely obscured.

Simoom, or Poison Wind.—This is a high wind of scirocco character which blows more particularly in Persia and Sind. It is remarkable in combining a high velocity, 30 or 40 m.p.h., and a very high temperature, 120° F. or more. It gains its name from the fact that men or animals die if exposed to it for any length of time. It is now considered that death is caused from purely physical causes, and not from any obscure poison in the wind. The explanation is briefly as follows: If the air temperature is above 98° F., the heat conveyed from the air to the human body is balanced by heat lost through evaporation (perspiration). In a wind the body receives more heat from the air and loses more by evaporation than it does in calm air, but there is a limit to the loss which can be effected by evaporation from the skin; if the wind and temperature increase until this limit is passed, the body receives more heat than it loses; this is fatal if it persists for hours. The limit is believed to be reached by a wind of 30 m.p.h. if the temperature is 125° F.

Khamsin is a storm of scirocco character in Egypt; the wind is usually from the south or south-east. These storms come usually in March, April, and May, and fill the air with sand from the desert. They are reputed to occur on about 50 days, whence the name 'khamsin' is derived.

Waterspouts are similar in character to tornadoes, but are much smaller in size, in intensity, and in duration. They are very frequent near the equator, and occur in spring and summer throughout the temperate zone. The following is a description of a small waterspout observed from Loch Vennachar in Scotland in 1917. On a quiet, hot summer day with an overcast sky the lower surface of the cloud appeared at one place to become agitated; suddenly a spike of cloud thrust downwards from the spot, receded a little, projected still further, and then rushed to earth, forming an irregular column like a thick twisted rope; after a few minutes this column broke and disappeared. When a waterspout is formed over the ocean the surface of the water bulges upwards, and spray begins to rise; sometimes it appears to join the funnel descending from the cloud. Sometimes the spray appears to rise around the funnel like the splash rising round a heavy stone dropped into water. The spray from the agitated sea can be seen both before the funnel from cloud to sea appears and after it disappears;

the cyclonic whirl is, in fact, present in the atmosphere some time before the waterspout is visible, and persists some time after the waterspout disappears. Some of the spray from the sea may be carried up, but it is probable that the major part of the fall of water in the waterspout comes from the cloud. Water in the atmosphere invariably breaks up into drops, and the largest drops cannot fall if the upward current is greater than about 20 m.p.h.; any water in an upward current with a greater velocity than this would be carried upwards, and would fall in the region surrounding the intense upward current.

Dust-devils are small whirling storms which form over the land in hot countries such as Mesopotamia, and in nearly all desert areas. They usually occur in the middle of the day and die away in the afternoon. They reach heights of several hundreds of feet, and they owe their name to their fantastic appearance as they move across the burning sands. There is no rain with these storms, and the energy available for their formation arises solely from the intense heating of the surface air; each one is therefore, as a rule, of comparatively short duration. The diameter of a dust-devil may be as small as 5 feet or as large as 25 yards. Dust-devils move frequently at 10 to 15 m.p.h., either with the wind or sometimes across the wind; occasionally they remain practically stationary; occasionally they travel at speeds of 25 m.p.h. or more. The direction of rotation of the air in a dust-devil is sometimes clockwise and sometimes counter-clockwise; it is determined by purely local and usually accidental circumstances, and not, as in cyclones, by the rotation of the earth; though it is possible that those dust-devils in which the rotation is clockwise die out more quickly than the others which rotate in the direction of cyclones.

Haboobs.—A haboob is a very unpleasant type of sandstorm which occurs in Northern and Central Sudan, particularly in the region near Khartum and east of it. They come chiefly in the period May to October (rainy season), though they may also occur in the period November to April (dry season). They last from half an hour to several hours, the average duration being 2 or 3 hours. The dust is raised frequently to heights of over 3000 feet, and along the front of the storm, which may extend to 20 miles or more, there appear to be violent up and down currents. Haboobs are most frequent in the late afternoon, and in the rainy season about half of them are accompanied by rain, and one in three is followed by thunder and lightning. In the rainy season the wind in a haboob is between south and east, and changes to west after the storm; in the dry season the wind is northerly; the speed of the wind is usually not more than 40 miles per hour, but may reach 50 or 60 miles per hour. At Tokar, near the Red Sea, haboobs pile up dust in the course of July and August as high as 15 feet against obstacles transverse to the wind.

Reshabar (Black Wind).—A very gusty wind which blows from north or north-east in southern Kurdistan both in winter and in summer. It begins usually in the early morning, and practically never in the middle of the day. It is characterised by alternation of gusts and calm periods, the transition being almost instantaneous from a calm to a wind of 50 m.p.h.

Sumatras.—A sumatra is a storm of brief duration which occurs in the Malacca Straits, chiefly in the period April to October. Sumatras always occur at night between 9 P.M. and 3 A.M., and the wind is usually south-westerly, reaching 40 or 50 miles per hour in the squall. A bank of cumulo-nimbus spreads over the sky, and when the edge of the advancing bank of cloud has just passed the observer's zenith the squall breaks and is nearly

always accompanied by thunder, lightning, and heavy rain. The storm at any one place is usually over in less than two hours; although they affect the coasts of the Straits, especially between Malacca and Penang, they do not penetrate far inland, even over flat country. They are probably gravitational winds (see below).

Southerly Busters.—These are Australian storms of line-squall character experienced, especially in New South Wales, during the spring and summer months, October to February, occasionally also in September and March. After a period of high temperature varying from 3 hours to 3 days, with winds from west or north-west in early and late summer and from north-east near midsummer, cirro-cumulus clouds appear in the south, followed by a heavy roll of cumulus. An hour or so after the appearance of the roll-cloud the wind drops for a short time and then a whirl of dust ushers in the 'burst'; in a few moments a gale from the south is blowing; temperature falls rapidly between 15° F. and 20° F.; in an extreme case the fall was 37° F. A storm of similar type is experienced in South Africa in the neighbourhood of Durban; and in South America, where it constitutes the true pampero.

Bora, Mistral, Chinook, Pampero, Gregale.—The majority of storms are associated with cyclonic whirls, and arise over the sea or over land approximately at sea-level. They do not depend upon those differences in the atmosphere which arise from differences in the level of the ground. The winds in such storms are considered to arise from the horizontal difference of pressure. There is another type of wind which plays an effective part in certain storms. This wind is commonly called a 'gravitational' wind. It is caused when air on a plateau or mountain is cooled to a lower temperature than the temperature appropriate to its height. This cold air in such circumstances tends to run downwards. It produces, for example, the wind known as the 'valley' wind. The reverse effect occurs when air over the land or high ground is warmed to a higher temperature than that appropriate to its position. The warm air tends to rise, and air moves inward to take its place. The sea-breeze is an example of a wind caused by this effect. In most parts of the world the sea-breeze is a light or moderate wind, but on the coast of Northern Chile and Peru the sea-breeze in the middle of the day blows with the force of a gale.

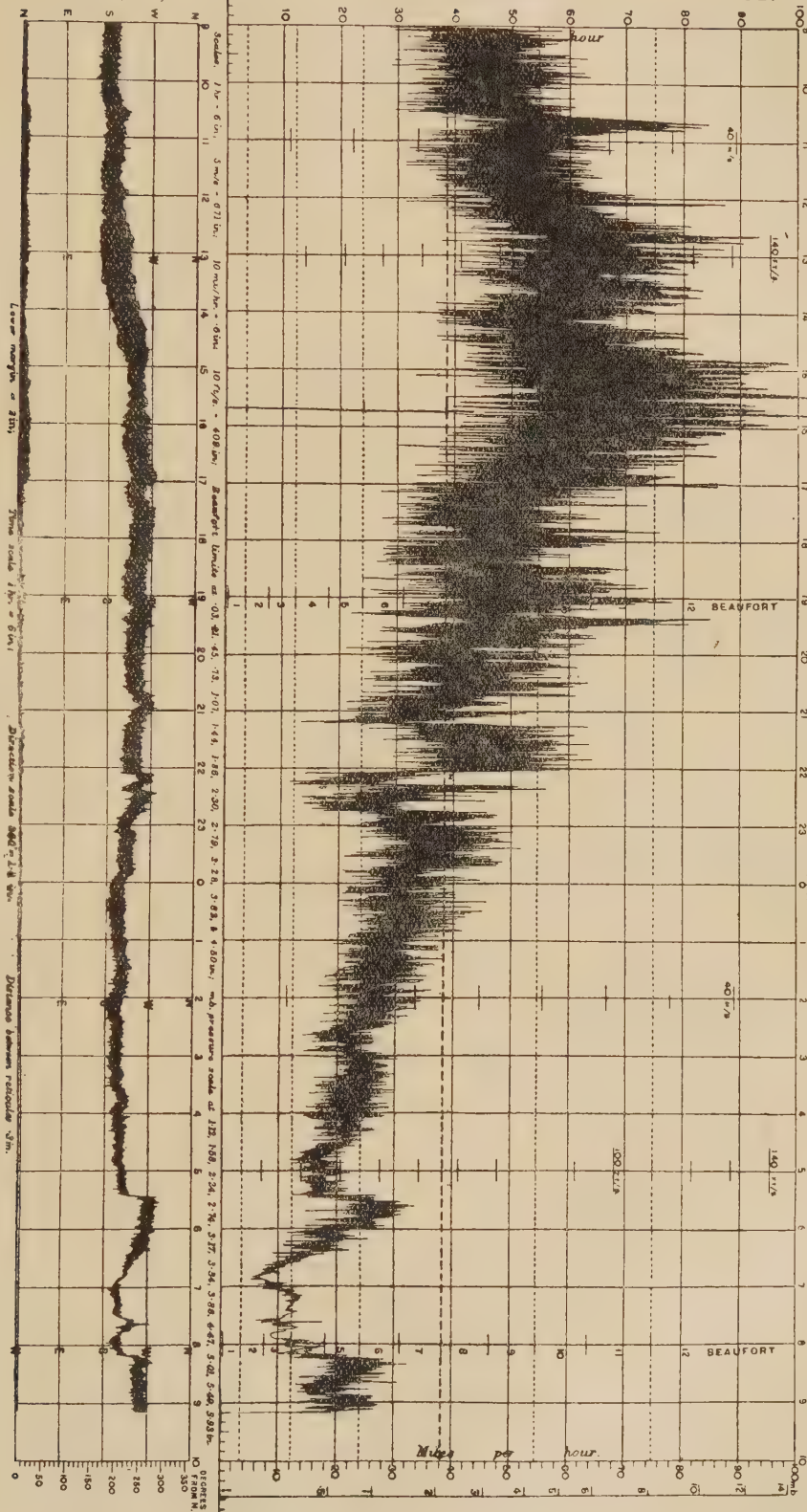
Storms in which the gravitational wind plays its part are the Bora of the Adriatic, the Mistral of the south of France, the Gregale of Malta and Sicily, the Chinook wind of Canada, and the pseudo-pampero wind of South America (the true Pampero partakes more of the nature of a line-squall). The Bora, literally the north wind, blows for about thirty days in the course of the winter along the Adriatic coast from Trieste to Lesina. It is rarely a north wind, but most frequently a north-east wind, and sometimes an east wind. It is a very squally wind. It blows sometimes with a velocity of 40 or 50 miles per hour, but in gusts the speed reaches 80 or 90 miles per hour. It occurs when there is an anti-cyclone over Europe and a low pressure over Italy or the western Mediterranean, in the winter months. It reaches its maximum intensity about 9 A.M., and decreases in the afternoon and evening. It is caused by the cold air from the Balkan tableland flowing down to the Adriatic and reinforcing the general north-east current arising from the pressure distribution. A similar wind to the Bora blows in winter on the north-east coast of the Black Sea. It is sometimes so intense and so cold that the spray which it blows up from the sea is frozen, and covers ships with a thick crust of ice: this is at times so heavy that ships sink in

harbour. The Mistral (or master-wind) is a north wind which blows on the Mediterranean coast of France in the winter months, sometimes with great violence. It occurs when the polar air has broken through to the Mediterranean behind a depression which has moved east across the British Isles or Northern France. The natural velocity of the general current is intensified partly by the constriction between the Alps and Pyrenees, and partly by the gravitational effect arising from the cold air on the tableland between the Garonne and the Rhone. The Gregale, or Greek gale (so called because it comes from the direction of Greece), is a north-easterly gale affecting specially the Mediterranean in the neighbourhood of Sicily and Malta. It sometimes blows consistently for two or three days in winter. It is similar in character to the Bora and Mistral, and occurs under similar conditions.

7. CHARACTER OF WIND—HISTORIC STORMS—STORM WARNINGS.—The wind in a storm is by no means steady either in speed or in direction: its character is best understood from an actual instrumental record. Fig. 10 is a copy, on reduced scale, of a record taken in the island of Tiree during the storm of 28th January 1927. The upper trace is the record of velocity, the scale in miles per hour being printed at the side of the record, which goes from 9 A.M. on 28th January to 9.15 A.M. on 29th January. It is clear that the wind is oscillating between wide limits; at the beginning it falls sometimes below 30 m.p.h. and rises sometimes above 60 m.p.h.; the mean speed at that time, taken from the middle of the rather ragged ribbon, was about 44 m.p.h. The lower trace is the record of direction; at the beginning the wind was southerly, but actually oscillating between SSW. and S. by E. At about 10.40 A.M. there was a sudden squall; the speed increased to over 80 m.p.h.; and there was, as there generally is with squalls, a simultaneous change in the direction, though only a small one. About 2 P.M. the wind began to change towards west, and to increase still further; by 3 P.M. the gusts were rising above 90 m.p.h., and the lulls falling below 40 m.p.h.; and at 3.25 P.M. there were several gusts of 100 m.p.h. and one of 108 m.p.h., the record rising above the top of the chart, up to the second A of the printed word Anemogram. There was another similar fierce gust 20 minutes later at 3.45 P.M., after which the storm began slowly to abate. Some idea of the 'buffeting' of a storm can be obtained from this record: at the time of the most violent gusts the pressure of the wind was varying rapidly between 30 lb. or more per square foot and 5 lb. per square foot; in other words, a medium-sized man would find himself pushed with a force equal to 100 lb. weight, suddenly falling to 15 lb., and then up to 100 lb. again; and not in a constant direction, but now a little to the right, now a little to the left.

It is appropriate here to mention some notable storms. The Armada storm of 30th May 1588, in the English Channel was of very brief duration; it was probably of line-squall type. Defoe's storm of 26th November 1703 was one of the most violent general storms in Britain; the cyclonic centre crossed the midlands of England, and the worst damage was caused in the south of England. Reference has already been made to the storm in the Black Sea during the Crimean War on 14th November 1854, which sank the French battleship *Henri IV.*; another storm, which contributed to the success of the efforts to establish telegraphic collection of weather reports, and the issue of storm warnings, was the *Royal Charter* storm of 25th October 1859. At 7 A.M. on that day the *Royal Charter* was wrecked at anchor off the north coast of Anglesey; the storm was caused by an intense

Direction. (True.)



(By permission of the Director of the Meteorological Office.)

secondary depression. In the *Eurydice* storm of 24th March 1878 the training ship *Eurydice* was caught unawares with ports open off the Isle of Wight and sank in sight of shore; the storm was due to a line-squall; the wind changed suddenly from SW. to NW. and temperature fell more than 10° F. Another storm due to a line-squall was the famous *Tay Bridge* storm of 28th December 1879, when the new bridge, across the Tay was blown down, and the train full of passengers plunged into the river beneath. A storm of different type was the snowstorm of January 18–19, 1881; this was caused by an ordinary cyclone which crossed the south of England, and brought a heavy fall of snow with easterly gales. Some trains were completely buried by the snow; railway traffic was disorganised; London was deprived of its milk supply. The *Samoa Hurricane* (1889) came upon the island from the north-eastwards; seven warships (viz. three American, three German, and one British) and six merchantmen were in the harbour; the British warship *Calliope* steamed out to sea when the hurricane was observed approaching, and was saved; all the other ships were lost. In the *Berlin* storm of February 20–21, 1907, the Great Eastern Railway Company's steamer *Berlin* was wrecked, with much loss of life, off the Hook of Holland. This storm was due to a large and very deep depression whose centre passed north of Britain to the coast of Norway, and caused severe westerly and north-westerly gales in the North Sea. In the storm of 3d December 1909, the Isle of Man steamer *Ellan Vannin* was lost with all her passengers and crew off the mouth of the Mersey. This was again a cyclonic storm, the centre of the depression being near Berwick-on-Tweed when the catastrophe occurred in the severe wintry NW. gale behind the depression.

The following table shows the highest winds recorded in storms crossing the British Isles. The speeds are those recorded in gusts of duration long enough to move the float of the recording anemometer. Greater speeds would be recorded if a more sensitive instrument were used, but they would be of very brief duration—one or two seconds only.

Place.	Date.	Speed in miles per hour.
Lerwick.....	14th January 1925	95
Aberdeen.....	25th October 1917	82
Edinburgh.....	5th November 1926	84
Paisley.....	28th January 1927	104
Tiree.....	28th January 1927	108
Eskdalemuir.....	25th October 1917	90
Birmingham.....	9th February 1925	78
London (Kew Observatory).....	28th March 1916	72
Southport.....	14th July 1914	90
Holyhead.....	16th February 1916	86
Plymouth.....	8th March 1922	96
Falmouth.....	8th March 1922	103
Quilly (West Ireland).....	27th January 1920	above 110
Valentia.....	7th February 1927	95
Dunfanaghy.....	28th January 1927	109
Scilly.....	8th March 1922	108

Storm Warnings are issued by meteorological services of all countries. They vary to some extent, but the signals consist generally of one or two cones which appear as triangles when viewed from a distance. In Europe, if a single cone is used, it denotes a N. gale if the point is upwards and a S. gale if the point is downwards. If two cones are used together they denote a NE.

gale if both point upwards, a SE. gale if both point downwards, and a hurricane if they are base to base. In some countries a ball is used in addition to cones. The ball indicates 'Be alert, a disturbance exists; no certainty that it will affect these coasts or that the wind will reach gale force.'

In India and the Indian Ocean warning signals consist of a cone, a drum, and a ball. The cone and drum alone are used as 'danger' signals to indicate a slight or moderate cyclonic storm, while the cone or drum in conjunction with the ball are used as 'great danger' signals to indicate a cyclonic storm of great intensity.

In the United States of America and in Australia the storm-signals consist of two red flags with black centre and a red or white pennant. The white pennant with a red flag denotes that the storm-centre has passed; the red pennant with a red flag denotes that the storm-centre is approaching; while two red flags together are used when a very dangerous storm or hurricane is expected. In Canada, on the other hand, the storm-signals consist of a cone and drum; the cone alone is used for an ordinary gale, and the drum and cone together for a heavy gale.

In Japan a red ball, red drum, and red cone are used, the ball denoting that stormy winds or gales are expected, the drum that a storm of rain or snow is expected, and the cone that a cyclonic storm of dangerous intensity is expected.

In China, at Shanghai, a drum, ball, cone, and diamond are used as storm-signals, and at Hong-kong a drum, ball, cone, and black cross.

See METEOROLOGY, WIND, &c.; Newnham, *Hurricanes and Tropical Revolving Storms* (1922); J. Bjerknes and H. Solberg, *Life Cycle of Cyclones* (1922); Hildebrandsson and T. de Bort, *Météorologie Dynamique* (1907); Geddes, *Meteorology* (1921); Wegener, *Wind und Wasserhosen in Europa*; Zistler, *Der Sirocco* (1924); Maraković, *Die Bora* (1913). Also *U.S. Monthly Weather Review* (Tornadoes and Tropical Cyclones); *Proc. R. S. and Phil. Trans.* (Thunderstorms); *Q. J. Royal Met. Soc.*; *Geophysical Memoirs of Meteorological Office, London*.

Stornoway, a seaport and important fishery-station in Lewis, the chief town of the Outer Hebrides, near the head of a spacious sea-loch, 59 miles N. by W. of Portree in Skye and 180 of Oban. The principal feature is Stornoway Castle, completed in 1870 by Sir James Matheson (1796–1878). A tower 85 feet high commemorates the Great War. Pop. 4000.

Storthing (from *stor*, 'great,' and *thing*, 'court'), the legislative assembly of Norway (q.v.). See also **THING**.

Story, JOSEPH, an American jurist, was born at Marblehead, Massachusetts, September 18, 1779, graduated at Harvard in 1798, and was admitted to the bar in 1801. He was elected to the state legislature in 1805, and there became a leader of the Republican (Democratic) party. In 1808 he was returned to congress, and in 1811 he was appointed by Madison associate justice of the Supreme Court of the United States, a place he filled with great credit for thirty-four years. In 1829 he became law professor at Harvard, and quickly raised the school to fame and prosperity. Of his many works the most valuable are his *Commentaries on the Constitution of the United States* (1833), on *The Conflict of Laws* (1834), and on *Equity Jurisprudence* (1835–36), which have passed through many editions. His legal writings and decisions are among those oftenest quoted in the higher courts of law. He died September 10, 1845. See the *Life* by his son (1851), who also prepared an enlarged edition of his *Miscellaneous Writings* (1851).—The son, WILLIAM WETMORE

STORY, was born at Salem 12th February 1819, graduated at Harvard in 1838, studied law under his father, and was admitted to the bar. He even entered with spirit on his profession; but soon (1848) the bias towards poetry and art, which had been checked in the father after one luckless venture, drew him to Italy and made him a sculptor. His productions in this field are numerous and of high excellence; and his writings include *Poems* (1847-56-86), *Roba di Roma* (1862), the *Tragedy of Nero* (1875), *Castle St Angelo* (1877), *He and She* (1883), *Fiammetta* (1885), and *Excursions in Art and Letters* (1891). Story, who died at Vallombrosa, 7th October 1895, had received distinctions from the French and Italian governments. See James, *W. W. Story and his Friends* (1903).

Stothard, THOMAS, designer and painter, was the son of a London innkeeper, who kept the *Black Horse* in Long Acre, and was born there, 17th August 1755. He received a respectable education in different boarding-schools, and on his father's death, having shown a predilection for the use of the pencil, was bound apprentice to a pattern-drawer in the city, but was released from his engagement before the term of expiry, and betook himself to more artistic work. His first notable effort was a series of designs for the *Town and Country Magazine*, which was followed by his imaginative compositions for Bell's *British Poets* and the *Novelist's Magazine*. The popularity of these was so great that for many years his services were constantly in request by the leading publishers in London. His earliest pictures exhibited at the Royal Academy were 'The Holy Family' and 'Ajax defending the Body of Patroclus.' In 1791 he was chosen an associate, in 1794 a member, and in 1813 librarian of the Academy. He died 27th April 1834. Stothard was a most graceful and facile illustrator. Not less than 3000 of his designs have been engraved, including those to Boydell's *Shakespeare*, *The Pilgrim's Progress*, *Robinson Crusoe*, and Rogers' *Italy and Poems*. His paintings, although skilfully 'composed' and finely coloured, lack the originality and force that come from a study of nature. Perhaps the best known is his 'Canterbury Pilgrims,' engraved in 1817. See Coxhead's monograph (1906), and the *Life* (1851) by Mrs Bray (q.v.), the widow of his son, CHARLES ALFRED STOTHARD (1786-1821), who acquired a great reputation as an antiquarian draughtsman.

Stoughton, JOHN, a learned English divine, was born in Norwich, 18th November 1807, and educated at Highbury College, Islington, and University College, London. Appointed Congregationalist minister at Windsor in 1832, he removed to Kensington in 1843, and here laboured till his retirement in 1875, when the congregation presented him with £3000. From 1872 till 1884 he acted as professor of Historical Theology and Homiletics in New College, St John's Wood. He was Congregational lecturer in 1855, chairman of the Congregational Union in 1856, received the D.D. degree from Edinburgh in 1869, took part in the Evangelical Alliance Conferences at New York (1873) and Basel (1879). He died 24th October 1897. See *Life* by his daughter (1899).

He edited for many years *The Evangelical Magazine*, and has written many books marked by profound learning, the most important *Church and State Two Hundred Years Ago* (1862); *Ecclesiastical History of England* (5 vols. 1867-74), supplemented by two volumes on the Reign of Anne and the Georges (1878), and two on the period of 1800-50 (1884); *Homes and Haunts of Luther* (1875); *Footsteps of the Italian Reformers* (1881); *Spanish Reformers* (1883); studies of Wilberforce, Penn, Howard; and *Recollections of a Long Life* (1894).

Stour, a river 47 miles long, flowing eastward along the Suffolk and Essex boundary to the sea at Harwich.

Stourbridge, a municipal borough (since 1914) of Worcestershire, on the Stour, at the border of Staffordshire and the Black Country, 12 miles W. of Birmingham. The famous Fireclay (q.v.) is said to have been discovered about 1557 by wandering glassmakers from Lorraine. Stourbridge now has earthenware and firebrick works, besides manufactures of iron, chains, shipping appliances, and heating apparatus, while important glass-factories are in the neighbourhood. The grammar school (1552), which Samuel Johnson attended, was rebuilt in 1862, since then has been much extended. The church of St Mary (1862) has a good 14th-century tower. Stourbridge has a corn exchange (1854), county court (1864), and a public library (1905), which also houses a school of art. Pop. (1851) 7847; (1921) 18,023.

Stourbridge Fair, Cambridge. See FAIRS.

Stourport, a town of Worcestershire, at the Stour's influx to the Severn, and the terminus of the Staffordshire and Worcestershire Canal, 14 miles by rail N. by W. of Worcester, and 4 SSW. of Kidderminster. Dating from 1770, it is a clean, neat place, with manufactures of carpets, iron, glass, &c. Pop. 5000.

Stouthrieff, in the law of Scotland, means robbery committed in a dwelling-house.

Stove. See WARMING.

Stove-plants is another name for hothouse plants—plants which require artificial heat to make them grow and keep healthy in the colder temperate climes. They may be practically classified according to the kind and degree of heat required—from those suitable to the dry hothouse to those fitted to thrive in a cool greenhouse; from tropical orchids to hardy heaths. See PLANT-HOUSES, and the articles on the several species of plants.

Stow, JOHN, one of the earliest and most diligent collectors of English antiquities, was born in London in the year 1525. He was brought up to his father's trade of a tailor in Cornhill, but about his fortieth year abandoned it for antiquarian pursuits with a noble devotion which ought to have ensured him an old age of ease and honour, but which brought him instead only want and beggary. In his eightieth year he was rewarded with letters-patent from James I. authorising him to become a mendicant, or, as it is expressed, 'to collect amongst our loving subjects their voluntary contributions and kind gratuities.' He died 5th April 1605, and was buried in the parish church of St Andrew Undershaft, where his monument of terra-cotta, erected at the expense of his widow, may still be seen. Stow's reverence for the institutions of the past caused him to be suspected of a secret leaning toward popery. The principal works of Stow are his *Summary of English Chronicles*, first published in 1565, and subsequently reprinted every two or three years, with a continuation to the date of each new publication; *Annals, or a General Chronicle of England* (1580); and, most important of all, the *Survey of London and Westminster* (1598; ed. Kingsford, 1908), an account of the history and antiquities of the two cities for six centuries, together with their municipal institutions and forms of government. Besides these original works Stow assisted in the continuation of Holinshed's *Chronicle*, Speght's edition of Chaucer, &c. His invaluable *Memoranda to Three Fifteenth Century Chronicles* was printed with the text of these by James Gairdner for the Camden Society in 1881. There is a memoir prefixed to the

compendious edition of the *Survey* (1842) by W. J. Thoms.

Stowe, HARRIET BEECHER. See BEECHER.

Stowe House. See BUCKINGHAM.

Stowell, WILLIAM SCOTT, LORD, the eldest brother of Lord Eldon (q.v.), was born at Heworth, Durham, 17th October 1745. He was educated at Newcastle, went to Oxford in 1761, and became a college tutor. In 1779 he took the degree of D.C.L., removed to London, and was called to the bar in 1780. Dr Johnson introduced him to the Literary Club. As a barrister at Doctors' Commons he obtained a large practice, and his promotion was rapid. In 1788 he was appointed judge in the Consistory Court, knighted, and nominated a privy-councillor. In 1798 he became judge of the Court of Admiralty. Both as an ecclesiastical and admiralty judge he won high distinction. He wrote no systematic treatise or text-book, but his judgments were admirably reported, and supply the best evidence of his extensive legal learning, his sagacity, and his great literary ability. He was long the highest English authority on the law of nations. He represented Oxford in the House of Commons for twenty years, but he took no part in the business of parliament, although, like his brother, he was a zealous supporter of the Conservative party and the established church. At the coronation of George IV. he was raised to the peerage under the title of Baron Stowell of Stowell Park. In 1828 he retired from the bench, and on the 28th January 1836 he died. See the lives of the two brothers by Surtees (1846) and the Life by Roscoe (1916).

Stowmarket, a market-town of Suffolk, on the Gipping, 12 miles NW. of Ipswich. Pop. of urban district, 4200. Its fine flint-work church (chiefly Decorated) is surmounted by a tower and spire 120 feet high, and the interior contains some interesting monuments, amongst them one to Dr Young—Milton's tutor, and a former vicar. An iron-foundry, chemical and gun-cotton works are in operation, whilst malting and stay-making are also carried on. Burkitt (the commentator) and the poet Crabbe were educated in the town, which, too, was the scene of Godwin's ministry (1778-87). See Hollingsworth, *History of Stowmarket* (1844).

Strabane, a market-town of County Tyrone, Ireland, on the Mourne, 14 miles by rail S. by W. of Londonderry. Its flax and grain markets are celebrated; and it has fine Catholic, Episcopalian, and Presbyterian churches, and a convent on the hill above the town. Pop. 5000.

Strabismus. See SQUINTING.

Strabo, an ancient geographer, born at Amasia in Pontus, probably about 64 B.C., although some authorities make it ten years later. By the mother's side he was of Greek descent, and also closely connected with the Mithridatidæ; of his father's family nothing is known. How the name Strabo ('squint-eyed') must have originated is obvious, but whether any of the family were so called before him is uncertain. Strabo studied under the grammarian Tyrannio at Rome, under Aristodemus at Nysa in Caria, and under the philosopher Xenarchus either at Rome or at Alexandria. He does not appear to have followed any calling, but to have spent his life in travel and study, from which it may safely be inferred that he was well off. He was at Corinth in 29 B.C., ascended the Nile with Ælius Gallus in 24, and seems to have been settled at Rome after 14 A.D., but all we know of the date of his death is that it was after 21 A.D. Of Strabo's great historical work in forty-seven books—from the fifth a continuation to his

own time of Polybius—we have only a few fragments; but his *Geographica* in seventeen books has come down to us almost complete. It is a work of great value in those parts especially which record the results of his own extensive observation. 'Westwards,' he says in a passage in the second book, 'I have travelled from Armenia to the parts of Tyrrhenia adjacent to Sardinia; towards the south, from the Euxine to the borders of Ethiopia. And perhaps there is not one among those who have written geographies who has visited more places than I have between these limits.' Yet it must not be supposed that he describes with equal accuracy or fullness all the countries of whose geography he treats. Some he seems to have visited hurriedly, or in passing elsewhere; others he knows like a native. For example, his accounts of Greece, particularly the Peloponnesus, are meagre in the extreme, and of many of the obscurer regions he writes chiefly from hearsay. He makes copious use of his predecessors Eratosthenes, Artemidorus, Polybius, Posidonius, Aristotle, Theopompus, Thucydides, Aristobulus, and many other writers now lost to us, but he strangely depreciates the authority of Herodotus, and quotes few Roman writers except Fabius Pictor and Julius Cæsar. Of the seventeen books of the *Geography* books i.-ii. contain a criticism of former geographers, and the mathematical part of physical geography—the poorest portion of the work; book iii. is devoted to Spain; iv. to Gaul, Britain, and Ireland; v. and vi. to Italy; vii. to the north and east of Europe as far as the Danube; viii.-x. to Greece; xi.-xvi. to Asia; xvii. to Africa. The style is pure and simple. The *editio princeps* of Strabo appeared at Venice in 1516. Good editions are those by Müller and Dübner (1853-56) and Meineke (1852-53). The Loeb Library includes a text and translation by H. L. Jones (1917 *et seq.*). Sir Walter Leaf edited the portions dealing with the Troad (1924).

Strabo, WALAFRID. See GLOSS.

Strachey, GILES LYTON, author, was born on 1st March 1880 and educated at Trinity College, Cambridge. His *Eminent Victorians* (1918) with its crisp and incisive portraits, set a new style in biography, and was followed by the still more masterly study, *Queen Victoria* (1921). Other works of his are *Landmarks in French Literature* (1912), *Books and Characters* (1922), *Pope* (1925).

Strada, FAMILIANUS (1572-1649), Jesuit rhetorician, born in Rome, taught in the Gregorian College there, and wrote *De Bello Belgico* (2 vols. 1632-47) and *Prolusiones Academicæ* (1617). The latter contains imitations of the styles of different poets, whereof that of Claudian has been translated into English by Ford the dramatist, by William Strode, and by Crashaw.

Stradella, ALESSANDRO, singer and composer, famous both in respect of his music and of his own fabulous history. His works, which consist of operas, airs, duets, cantatas, madrigals, sonatas, and oratorios, of which *San Giovanni Battista* is the best known, contributed to form the taste of such composers as Purcell and Scarlatti. The dates of his life are altogether uncertain; it can only be affirmed that he lived during the second half of the 17th century. He did not write *Pietà Signore*. According to an exploded story, Stradella, who was renowned for his exquisite voice and polished manner, was engaged by a wealthy Venetian to instruct his mistress in singing. But master and pupil became infatuated with one another and fled to Rome. They were traced thither by two bravos despatched by the Venetian; but both assassins, it is said, were so captivated with the music of Stradella's oratorio, which they heard him

conducting whilst lying in wait for him, that they abandoned their object, after betraying to him the plot. Stradella and the lady then fled to Turin. They were found there, and he was attacked and grievously wounded. He recovered and married the lady, and then passed to Genoa (1678). The day after both he and his wife were mortally stabbed by the emissaries of their unrelenting persecutor.

Stradivari, ANTONIO (1644–1737), of Cremona, a pupil of Nicholas Amati, carried the Cremona type of violin to its highest perfection. See VIOLIN; Life by Horace Petherick (1900); and monograph by W. H., A. F., and A. E. Hill (1902).

Strafford, THOMAS WENTWORTH, EARL OF, English statesman, was born on Good Friday, 13th April 1593, in Chancery Lane, London, at the house of his mother's father, Robert Atkinson, a bencher of Lincoln's Inn. The eldest of the twelve children of Sir William Wentworth, he represented a great Yorkshire family, which from before the Conquest had been seated at Wentworth-Woodhouse near Rotherham, and was allied to royalty itself. He grew up a keen sportsman, an apt and diligent scholar, and was sent at an early age to St John's College, Cambridge. In 1611 he was knighted and married; and having thereafter travelled for fourteen months in France and Italy, in 1614 he was returned to parliament for the county of York, and succeeded his father in the baronetcy and an estate of £6000 a year. In 1615 he became *custos rotulorum* for the West Riding—a post from which Buckingham sought two years later to oust him; else we know little about him during James I.'s reign save as a generally silent member in three brief parliaments, a strenuous student, and a frequent attendant at the Court of Star-chamber. His first wife, Lady Margaret Clifford, eldest daughter of the Earl of Cumberland, died childless in 1622, and in 1625 he married Lady Arabella Holles, the younger daughter of Lord Clare.

Conscious of his own splendid abilities, and with no great belief in parliamentary wisdom, loyal in his devotion to crown and church, an eager advocate of domestic reforms, and therefore opposed to all wars of aggression, Wentworth in Charles's first parliament (1625) acted with, yet was not of, the opposition; from the second he was purposely excluded by his appointment to be sheriff of Yorkshire. In the July of that same year (1626), after a vain application to Buckingham for the presidency of the Council of the North, he was curiously dismissed from the keepership of the rolls, and for refusing to pay the forced loan he was committed first to the Marshalsea and then to an easy captivity at Dartford. So in the famous third parliament (1628) he impetuously headed the onslaught, not on the king, but on his evil ministers, and pledged himself 'to vindicate—what? New things? No! our ancient, sober, and vital liberties! by reinforcing of the ancient laws made by our ancestors; by setting such a stamp upon them as no licentious spirit shall dare hereafter to enter upon them.' From its meeting on 17th March until 5th May he was the leader of the Lower House; on 7th July the Petition of Right (q.v.), superseding a similar measure of his own, became law; and on the 22d he was created Baron Wentworth, on 10th December Viscount Wentworth, and on the 15th President of the North. As such at York he set himself to govern, to strengthen government with an efficient militia and ample revenue, and to 'comply with that public and common protection which good kings afford their good people.' Towards these ends he used on occasion high-handed methods, which embroiled him, however, chiefly with the gentry. His second wife died in October 1631, leaving a son William,

second Earl of Strafford (1626–95, died *s.p.*), and two daughters; and within a twelvemonth he married privately Elizabeth, daughter of Sir George Rhodes, knight.

In January 1632 he was appointed Lord Deputy of Ireland, but it was not till the July of the following year that he landed at Dublin. His plans had, however, been meanwhile carefully matured; and with the subtlety of a Machiavel and the strength of an Englishman he straightway proceeded to coerce Ireland into a state of obedience and well-being unknown alike before and afterwards. He raised the revenue from an annual deficit of £14,000 to a surplus of £60,000, and the customs from £12,000 to £40,000; transformed the army from a rabble of 1300 to an orderly force of 8000; swept the seas of the corsairs infesting them; introduced the cultivation of flax, still Ireland's one flourishing industry; called into existence a docile parliament; did his utmost to cleanse the Augean stable of the Protestant Church; and, whilst seeking 'to draw Ireland into conformity of religion with England,' could yet boast truly that since he had 'the honour to be employed there, no hair of any man's head was touched for the free exercise of his conscience.' The aim of his policy (he and Laud called it 'Thorough') was to make his master 'the most absolute prince in Christendom'; and 'the choice for Ireland in the 17th century did not lie between absolutism and parliamentary control, but between absolutism and anarchy.' The words are Professor Gardiner's, and he adds that 'if Wentworth be taken at his worst, it is hardly possible to doubt that Ireland would have been better off if his sway had been prolonged for twenty years longer than it was.' Wentworth taken at his worst should be Macaulay's Wentworth—the killer of his first wife, the debaucher of women, the 'wicked earl,' the 'first Englishman to whom a peerage was a sacrament of infamy,' the 'lost Archangel, the Satan of the apostasy,' who from the time of that apostasy received, like fallen Lucifer, a fresh name, Strafford. By this last amazing blunder Macaulay's carelessness may be fairly gauged, the falsity of his first two charges estimated; yet by Macaulay's verdict Wentworth was too long condemned. His only apostasy was his breaking with the parliamentary party when he realised and disapproved their puritanism and their design to grasp the executive power. In Wentworth's own correspondence are revealed his tenderness for his family, his love of harmless amusements, his hatred of gaming and drunkenness, his contempt of courtiers, and the maladies which constantly beset him—fever, ague, gout, and the stone—and to which his choleric temper is largely ascribable. He was not otherwise faultless, though many of his errors—e.g. in the matter of monopolies and of the proposed plantation of Connaught—were errors of the age. He was too masterful and self-reliant, too heedless of the means towards his end, intolerant of opposition to his will. One instance of his methods must suffice. Lord Mountnorris, vice-treasurer of Ireland, was for words rashly spoken court-martialed, and sentenced to death. The sentence was never meant to be carried out; in fact, Wentworth added, 'I would rather lose my hand than you should lose your head,' and Mountnorris was simply stripped of his offices. He deserved to be stripped of them; still, this was not the way to get rid of an opponent.

Till February 1637 Charles seems never to have applied to Wentworth on questions of general policy, and then, when he sought his approval of a foreign war, he was met with dissuasion. Nor till September 1639 did Wentworth become the king's principal adviser, the mark of the royal

favour being his elevation to the earldom of Strafford and the dignity of Lord-lieutenant of Ireland (January 1640). In August he was appointed Captain-general of the army in Ireland, and of an English army to be sent to Scotland. He recommended active measures, many of them of the strongest—the masterful habit had grown on him in Ireland, and he had failed to recognise a change of temper in the English people. The rebellion, provoked in Scotland by Charles's unwisdom, had spread to England. He hastened to Ireland to raise money and troops for Charles, but it was all too late. His Irish parliament was all subserviency, but a week after the meeting of the Long Parliament in November he was impeached of high-treason and lodged in the Tower. In the great trial by his peers, which opened in Westminster Hall on 22d March 1641, Strafford, broken though he was by sickness, defended himself with a fortitude and ability that moved even his accusers. The twenty-eight charges, covering 200 folios, at most amounted to 'cumulative treason.' The first was his having 'traitorously endeavoured to subvert the laws and government of the realms of England and Ireland, and instead thereof to introduce an arbitrary and tyrannical government against law.' The gravest charge—his having in a committee of the Privy Council advised the king that 'he had an army in Ireland which he could employ to reduce *this kingdom*' (query England or Scotland)—was supported by only one witness, his personal enemy, Vane. The spirit of the Commons was shown in St John's declaration that 'we give law to hares and deer, as beasts of chase, but knock foxes and wolves on the head as they can be found, because they be beasts of prey.' As the charges against him did not constitute treason as defined by the statute of Edward III., on 10th April the 'inflexibles'—Pym and Hampden were not of their number—dropped the impeachment for a bill of attainder, declaring that treason which could not be proved to be treason. His doom was sealed when it was discovered that Charles, while scheming to gain over the leaders in parliament, was also plotting to rescue him by force. The bill passed a third reading by 204 votes to 59 in the Lower House, by 26 to 19 in the Upper ('Stone dead hath no fellow,' said Essex); and on 10th May it received the royal assent. Strafford had written to Charles releasing him from his reiterated pledge that he should not suffer in life or honour or fortune; and Charles at last accepted the release. 'Put not your trust in princes'—the cry was wrung from Strafford; then he prepared for death. They would not let him see his old friend Laud; but he knelt for his blessing under the prison window as he passed to the scaffold. He died on Tower Hill, 12th May 1641, and was buried at Wentworth-Woodhouse.

When he found his choice lay between helping the Commons to master the king or the king to master the Commons, he had never hesitated to espouse the king's quarrel with all his might. But no doubt he sincerely believed that the well-being of England lay in government by the king rather than by the parliament, and in extending the power of the executive.

We know Strafford better now than his contemporaries could possibly know him, through his *Letters and Correspondence*, edited by Knowler (2 vols. 1739), and Whitaker's *Life and Correspondence of Sir George Radcliffe* (1810). Radcliffe (1593–1657) for years was Strafford's confidant; and his brief 'Essay towards the Life of my Lord Strafforde,' appended to Knowler's work, is one of our chief authorities. Modern Lives are by John Forster (*Emin. Brit. Statesmen*, vol. ii. 1836: Dr Furnivall in Berdoo's *Browning Cycl.* asserted that this was completed 'on his own lines' by Robert Browning, and as Browning's it was edited for the Browning Soc. by C. H. Firth in 1892), J. B. Mozley (*Essays Hist.*

and Theological, 2d ed. 1884), Elizabeth Cooper (2 vols. 1874), and H. D. Traill (1889). See also the articles CHARLES I. and LAUD, with works there cited; Gardiner's *History of England*, and his article in *Dict. Nat. Biog.*; Browning's strangely unhistorical *Strafford: a Tragedy* (1837; ed. by Miss Hickey and Prof. S. R. Gardiner, 1884); and John Smith's *Catalogue Raisonné of the Works of Dutch Painters* (vol. iii. 1831) for a list of the half-dozen portraits by Van Dyck, in which the 'lion-faced' earl still lives for us.

Strain and Stress. A strain is any change of form or bulk of a portion of matter either solid or fluid. The system of forces which sustains the strain is called the stress. When a body is so strained that parallel lines remain parallel lines and parallel planes remain parallel planes, the strain is said to be homogeneous. Any cubical portion becomes a parallelepiped with angles, in general, other than right angles; and any spherical portion becomes an ellipsoid. The principal axes of this ellipsoid were originally mutually perpendicular diameters of the sphere. Clearly one of them must be the direction of greatest elongation (or least contraction), and another must be the direction of least elongation (or greatest contraction). These directions are the principal axes of the strain. A special case of the homogeneous strain is the isotropic strain, in which all lines suffer equal elongations—i.e. unit-length in any direction changes by the same amount. Here there is simple change of volume without any distortion; and the associated stress is of the type of a hydrostatic pressure. Now the most general homogeneous strain involves distortion as well as change of volume. If the strain is small we may decompose the complete strain into these two types of strain, which, as explained under Elasticity (q.v.), have to do with two quite distinct coefficients—viz. the Rigidity (q.v.) and the bulk modulus (see COMPRESSIBILITY). A distortion is a strain which involves no change of volume; and any distortion can always be decomposed into a number of shears or simple distortions. The simplest representation of a shear is given by the slight deformation of a circle into an ellipse of the same area. The major and minor axes of the ellipse are the principle axes of the shear, which is completely determined when its plane, axes, and elongations or contractions along these axes are given. A shear may also be represented by the sliding action of layer over layer which transforms a square into a parallelogram of the same area. Corresponding to a shear is the shearing stress, whose ratio to the shear is called the rigidity. It is obvious that in bending a bow or twisting a rod (see TORSION) we are producing strains which are not homogeneous; but by considering very small portions we are able to discuss the relations holding between the strains and corresponding stresses as if the strains were homogeneous.

When a body is perfectly elastic the relation between stress and strain is unchanging; in other words, to sustain the strain the same stress must be constantly applied. All solids, however, may be strained to such a degree that the strain may be supported by a weaker stress than that which produced the strain at first. Or, when a given stress is kept applied, the body may gradually alter its condition of strain as time goes on. Solids, in short, are found to possess Viscosity (q.v.), in virtue of which they yield slowly to a steady stress. Thus Tresca has caused metals to flow through ducts by application of great pressure. See STRENGTH OF MATERIALS.

Bodies may be strained by the action of other agents than mechanical forces. The most familiar example of this is the change of bulk which accompanies change of Temperature (q.v.). Electrification also produces changes of volume. Again, the mag-

netic metals, iron, nickel, and cobalt, undergo very complicated strains when magnetised in various ways. In all these instances there is always a reciprocal effect, a particular straining producing thermal, electric, or magnetic changes.

Straits Settlements, consisting then of three settlements on the coast of the Malay Peninsula and in the adjacent small islands of the Straits of Malacca, formerly under the Indian government, became a British crown colony in 1867. The capital is Singapore. The settlements, Singapore, Malacca, and Penang (including its dependencies, Province Wellesley and the Dindings), are separately dealt with. In 1886 the Cocos or Keeling Islands in the Indian Ocean were transferred from the government of Ceylon to that of the Straits Settlements, as was Christmas Island in 1889. The latter was made part of the settlement of Singapore in 1900, the former in 1903. In 1906-7 the island of Labuan, off the north-west coast of Borneo, passed from the administration of the British North Borneo Company to that of the colony, and in 1912 became a settlement. For particulars of these, see the respective articles. The total area is 1600 sq. m., and the total pop. (1881) 423,384; (1911) 714,069; (1921) 883,769. In 1918 275,000 were Malays, 433,000 Chinese, and 94,000 natives of India. Singapore is the seat of government. The government of the colony is in the hands of a governor and executive and legislative councils, the former wholly official, the latter partly official and partly nominated. Each settlement has a municipal board, the members being appointed by the governor. The governor is also high commissioner for the Federated Malay States and for Brunei, and British agent for British North Borneo and Sarawak. The principal productions of the colony are tin, gambier, tapioca, rice, rubber, sugar, pepper and other spices, hides, and rattans.

Stralsund, a seaport of Prussia, is situated on a narrow strait called the Strela Sound, which divides the mainland from the island of Rügen. Down to 1873 the place was a fortress of the first class. Many of the houses are finely gabled, which gives the town a quaint and ancient look. The most interesting building is the town-house (1306), with a museum of antiquities from the island of Rügen. Stralsund carries on a large export trade in sugar and grain, and manufactures cement, mineral waters, lacquer, machinery, safes, iron castings, electric lamps, soap, furniture, and playing-cards. Pop. (1925) 39,404. Stralsund was founded in 1209, and became one of the most important members of the Hansa. During the Thirty Years' War it successfully withstood a terrible siege (1628) by Wallenstein; but in 1678 it capitulated to the Great Elector after a furious bombardment. It again opened its gates to Prussia and her allies in 1715, to the French in 1807, and to the Danes and others in 1809. The town was held by the Swedes from 1628 to 1814; in the year following (1815) Denmark gave it up to Prussia.

Stramonium. See THORN-APPLE.

Strange, SIR ROBERT, engraver, was born at Kirkwall, in Orkney, on 14th July 1721. He had tried sailing and a law-clerkship with an elder half-brother in Edinburgh, when in 1735 he was apprenticed for six years to an English engraver there, Richard Cooper. His apprenticeship ended, he fell in love with a young Jacobite lady, Isabella Lumisden, and for her sake in 1745 espoused the cause of Prince Charles Edward, engraving not only his portrait but his bank-notes, and enlisting as a private in the prince's life-guards. He fought at Culloden, escaped his pursuers by hiding beneath his sweetheart's ample-hooped gown, in

1747 married her, and next year repaired to Rouen and thence to Paris, and studied under Des-camps and Lebas. In 1750 he returned to Britain, and settling in London soon attained the very highest rank in his profession. On a second visit to the Continent (1760-65), to execute engravings after the old masters, his eminence was recognised by the academies of Paris, Rome, Florence, Bologna, and Parma, which all conferred on him the honour of membership; and subsequently, in 1787, he was knighted, having made peace with the reigning house by engraving West's picture of the apotheosis of George III.'s children, Octavius and Alfred. He died a wealthy man on 5th July 1792, his wife surviving him by fourteen years.

See Dennistoun's *Memoirs of Sir Robert Strange* (2 vols. 1855); the Life by the Rev. F. Woodward prefixed to *Twenty Masterpieces of Strange* (1874); and also the Introduction to Marshal Keith's *Memoir* (Spalding Club, 1843).

Strangford, VISCOUNT. Percy-Clinton-Sydney Smythe was born 31st August 1780, studied at Trinity College, Dublin, and entered the diplomatic service. He succeeded to the title as sixth viscount in 1801, was secretary of legation at Lisbon, and later ambassador successively to Portugal, Sweden, Turkey, and Russia. He was raised to the English peerage as Baron Penshurst in 1825, and died 29th May 1855. His translation of the *Rimas* of Camoens he published in 1803.—His youngest son, PERCY-ELLEN-FREDERICK-WILLIAM SMYTHE, was born at St Petersburg, 26th November 1825, and had his education at Harrow and Merton College, Oxford. He entered the diplomatic service, early acquired an unexampled command of languages, and served as Oriental secretary during the Crimean war. In 1857 he returned home to succeed as eighth and last viscount, thereafter lived mostly in London, immersed in philological studies ranging from Turkish, Persian, Arabic, and Afghan to Basque, Celtic, and Lithuanian, and died there, 9th January 1869. In spite of his phenomenal acquirements, he wrote little more than a few *Saturday*, *Pall Mall*, and *Quarterly* articles. His *Selected Writings: Political, Geographical, and Social*, was edited by his widow (2 vols. 1869), who also published his *Letters and Papers upon Philological and Kindred Subjects* (1878). See Fonblanque's *Lives of the Lords Strangford* (1878).

Strangles is a contagious eruptive disease of the horse, most common in young animals. It is ushered in by sore throat and cough, a mucopurulent nasal discharge, and the formation of an abscess in the space between the branches of the lower jaw. In a few days the abscess comes to a head, bursts, and in favourable cases the patient is soon well again. From exposure to cold, poverty, or other causes, the swelling, however, occasionally appears in less favourable situations, as about the glands lying within the shoulder, in those of the groin, or even internally in those of the mesentery. Such irregular cases are apt to be protracted, accompanied by much weakness, and often prove fatal. Bleeding, physic, and irritant dressings are injurious. Good food and nursing, with fomentations to the throat and steaming of the head, favour the healthier maturation of the swelling. When there is debility, coax the animal to eat by offering him at short intervals small quantities of scalded oats, malt, bran, or green food, and allow him several times daily a pint of sound ale if he will drink it, but do not force it upon him, as the throat is often irritable and the animal might be choked. Keep isolated, to prevent the communication of the disease to other animals, and disinfect the loose-box after recovery.

Strangulation may be defined as an act of violence in which constriction is applied directly to the neck, either around it or in the forepart, in such a way as to destroy life. This definition obviously includes hanging, which differs from other forms of strangulation only in that the body is suspended. The direct cause of death in the great majority of cases is arrest of the respiration owing to pressure on the windpipe—i.e. asphyxia. If much violence is used, it may be produced by direct injury to the upper part of the spinal cord from fracture or dislocation of the cervical vertebrae (as is now the rule in execution by hanging), or by syncope from shock, and in such cases must be almost instantaneous. On the other hand, if the constriction is so applied as to compress the great vessels in the neck and not the windpipe, as may happen in 'garotting,' it is due to coma, and is somewhat slower than in cases of asphyxia. Or if both vessels and windpipe are compressed, coma and asphyxia may both contribute to cause death.

The internal appearances of the body after death are those of Asphyxia (q.v.), with specially marked congestion of the brain; the most constant external appearances are congestion of the face, with prominence of the eyes and protrusion of the tongue, and marks on the neck corresponding to the cord or other constricting agent. The latter are most evident and the injuries to the neck most severe in homicidal cases. Death by hanging (excepting judicial executions) is almost always suicidal; by other forms of strangulation it also is frequently suicidal, but often homicidal. Accidental strangulation in any form is rare.

When suspension of the body has not continued for much more than five minutes, and the parts about the neck have not suffered violence, there is a probability that resuscitation may be established; although many cases are recorded when after only a few minutes' suspension it has been found impossible to restore life. Moreover, if a person who has hanged himself has been cut down sufficiently soon to allow of the respiratory process being restored, he is by no means safe: death often taking place from secondary effects at various periods after the accident. It is believed that unconsciousness comes on very rapidly, and death takes place without causing any suffering; the violent convulsions that are so often observed being similar to those which occur in epilepsy. In homicidal cases, however, the appearance of the face sometimes indicates much distress. A man named Hornshaw, who was on three occasions resuscitated from hanging—a feat which he performed in London for the amusement of the public—stated that he lost his senses almost at once; and other persons who have been restored state that the only symptoms of which they were conscious were a ringing in the ears, a flash of light before the eyes, then darkness and oblivion. The treatment to be adopted after the patient has been cut down may be briefly summed up as follows: Exposure to a free current of air, cold affusion if the skin is warm, the application of ammonia to the nostrils, of mustard poultices to the chest and legs, and of hot water to the feet, and the subsequent abstraction of blood if there should be much cerebral congestion; above all, artificial respiration should be used if natural breathing do not at once commence. From the post-mortem appearances, together with circumstantial evidence, the medical practitioner is not unfrequently called upon to decide such questions as these: Was death caused by hanging, or was the body suspended after death? Was the strangulation the result of accident, homicide, or suicide? In case of strangulation from other causes than that of hanging the post-mortem symptoms are similar, but the injury

done to the parts about the neck is commonly greater. In manual strangulation the external marks of injury will be in front of the neck, about and below the larynx; and if death has been caused by a ligature the mark round the neck will be circular, whereas in hanging it is usually oblique. See Taylor's *Medical Jurisprudence*.

The term Strangulation is also applied to a dangerous complication which may arise in cases of Hernia (q.v.).

Strangury. See URINE.

Stranraer, a royal burgh and seaport of western Wigtownshire, beautifully situated at the head of Loch Ryan, 73 miles WSW. of Dumfries by rail. The buildings are a 16th-century castle in which the bloody Claverhouse lived as sheriff, the town-hall and court-house (1872-73), and several handsome churches. There are no manufactures, but considerable trade in farm-produce, two large creameries operating within the burgh. Loch Ryan affords fair fishing, including oysters. There is a considerable shipping-trade, and a commodious mail-steamer plies daily between Stranraer and Larne in Ireland, the 'short-sea passage' merely taking about 2½ hours, only half being in open channel. Pop. (1871) 5977; (1921) 6138. Till 1885 Stranraer returned one member with Wigtown (q.v.).

Straparola, GIOVAN FRANCESCO, was born near the end of the 15th century at Caravaggio, about half-way between Milan and Cremona. In 1550 he published at Venice *Tredecì piacevoli notti*, the second part at the same place in 1554. This famous work was a collection of stories in the style of the *Decameron*, grouped round an imaginary incident. Francesca Gonzaga, daughter of Ottaviano Sforza, Duke of Milan, on account of commotions in that city, retires to the island of Murano, near Venice, where, surrounded by a group of brilliant ladies and gentlemen, she passes the time listening to stories related by the company. Thirteen nights are thus spent, and seventy-four stories told, each followed by an enigma, when the approach of Lent brings an interruption. These stories are derived from the most various sources; twenty-four are borrowed from Jerome Morlini, fifteen from Boccaccio, Sacchetti, Brevio, Ser Giovanni, the *Fabliaux*, the *Golden Legend*, and the *Romance of Merlin*. Six are of plain oriental origin, and may be found in the *Panchatantra*, *Forty Viziers*, *Siddhi Kûr*, and *Thousand and One Nights*. Twenty-nine stories remain, and of these twenty-two are genuine folk-tales. Two of Straparola's stories found a wider immortality in Perrault's 'Peau d'Âne' and 'Le Chat Botté'; and many of Madame d'Aulnoy's fairy-tales, as well as others in the *Cabinet des Fées*, are mere translations. Straparola's book passed through sixteen editions in twenty years; a French translation of the first book by Jean Louveau appeared in 1560, reprinted in 1573, along with the second book as translated by Pierre de Larivey (*Les Facétieuses Nuits de Straparole* in P. Jannet's 'Bibliothèque Elzevirienne,' 2 vols. 1857; new ed. of Jouaust, with preface by Gustave Brunet, 1882). Many of Straparola's stories are *facetious* in its narrowest sense; but at least they are no worse than their contemporaries. The work was prohibited by the church in 1605; yet another reprint appeared at Venice so soon after as 1608.

See F. W. V. Schmidt's German translation of eighteen tales, with valuable notes (Berlin, 1817); the Dissertation by F. W. J. Brakelmann (Göttingen, 1867); Liebrecht's translation of Dunlop's *History of Fiction* (1851); and the translation of the *Nights* by W. G. Waters (2 vols. 1894).

Strasburg (Ger. *Strassburg*, Fr. *Strasbourg*), the capital of the French department of Bas-Rhin, in 1871-1919 capital of Alsace-Lorraine, stands on the

river Ill and the canals connecting the Rhine with the Rhone and the Marne, 2 miles from the left bank of the Rhine, on which it has a port (1891). The citadel, originally built by Vauban (1682-84), was demolished by the Germans during the bombardment of 1870, but they rebuilt it and strengthened the fortifications (demolished 1920) with some fourteen detached forts on the adjacent heights, so that Strasburg ranked as a first-class fortress of great strength. Its position near the borders of France, Germany, and Switzerland is favourable to its commerce, and gives it great strategic importance. The most celebrated building in the city is the cathedral or minster, founded in 1015 or in 1179, but principally built between 1277 and 1439; some of the oldest parts are Romanesque (portions of choir and transept), but the church as a whole is one of the sublimest specimens of Gothic architecture in existence. The principal architect (to whom most of the glorious western façade is due) was Erwin von Steinbach (fl. 1318). Only one of the two towers was completed, with a spire of open stone-work (1439); it is 466 feet high. The minster has a remarkable astronomical clock dating from 1838-42; in it are portions of an older one made in 1571, but there was a remarkable clock here in the 14th century. In the present one are, besides a complete planetarium and perpetual calendar, many automaton figures—angels which strike the quarters, twelve apostles which come forth at noon and pass in procession before a figure of Christ, and a cock which crows at stated times. In the church are also a magnificent rose-window (42 feet across), a fine pulpit, and grand stained glass. The damage done to the structure during the siege of 1870 was carefully repaired. Other notable buildings are the Protestant church of St Thomas, with the tomb of Marshal Saxe, the imperial palace, the library (formerly the castle, and then the episcopal palace), the new university, the public buildings of the province, and the arsenal. The university of Strasburg was the only French university besides Paris with the full complement of faculties. Founded in 1621, on the basis of the academy of Johannes Sturm (q.v.), it became specially famous in the branches of medicine and philology, but was broken up during the Revolution. In 1803 a Protestant academy was established with ten chairs; and five years later Napoleon founded an imperial academy with faculties of law, medicine, physical science, and philosophy; in 1819 a partial fusion of these academies took place. The university was reorganised as a German institution in 1872, is equipped with new buildings, magnificent laboratories, &c., and was again refounded as a French university in 1919. The famous library, with nearly 200,000 volumes and precious *Incunabula*, was entirely destroyed by fire during the bombardment in 1870, but was replaced by a new collection that had swelled to 1,200,000 volumes when Strasburg was given to France. The trade of Strasburg is very extensive, and it has a great variety of manufactures—beer, pâtés de foie gras, leather, cutlery, engines, musical instruments, jewellery, tobacco, furniture, chemicals, fancy articles, &c. Pop. (1880) 104,471; (1890) 123,566; (1900) 151,041; (1910) 178,913; (1921) 165,835.

Strasburg, the *Argentoratum* of the Romans, was colonised by them during the reign of Augustus. Here Julian won a great victory over the Allemanni in 357 A.D. The name *Stratisburgum* first appears in the 6th century. It became a free town of the German empire in the 13th century, and both then and in the early part of the 15th century occupied a prominent position in respect of culture and enlightenment. In 1681 it was seized by Louvois, at the command of Louis XIV., in a time

of profound peace, and was confirmed to him by the treaty of Ryswick, but retained the quaint appearance of a German imperial city. On September 28, 1870, after a siege of seven weeks, Strasburg surrendered to the Germans. With the rest of Alsace-Lorraine (q.v.) Strasburg passed to France in 1919.

Strata. See STRATUM.

Strata Florida (Latinised from Ystrad Fflŵr, 'Plain of the Fflŵr'), the ruins of a Cistercian abbey founded in 1164, 17 miles SE. of Aberystwyth. Little of the building but a Norman archway and part of a wall are now standing; but excavations in 1857-88 laid bare the foundations and some fine tiled pavements. See the monograph by S. W. Williams (1889).

Strategy has been defined by military writers as the 'science of generals,' 'the art of making war on the map,' or 'the art of rightly directing masses of troops towards the object of the campaign'; it is dependent upon the due consideration of everything that can possibly influence the campaign. Roughly speaking, strategy directs the movements of troops until contact with the enemy is imminent. From that moment all combinations and manoeuvres are classed as *Tactics* (q.v.), until perhaps the opposing armies become again sufficiently separated for strategy to be employed. The object of strategy is to bring an adversary into such a position that the chances of victory will be against him, and defeat will entail disasters beyond the loss of the battle. Strategy will be offensive or defensive according to political or geographical considerations and the relative strength or mobility of the belligerents. The former will give all the advantages of the initiative to the commander who can adopt it. He will by invading the enemy's country, consume his supplies, and spare his own the horrors of war. He will be able to make and carry out his plans with confidence, his opponent, ignorant of his positions and intentions and of his force on this or that line of advance, having to make guesses which may easily be quite erroneous. Defensive strategy, on the other hand, has advantages in facility of supply and transport, freedom of movement, and power to utilise obstacles. Both sides have to guard with care their lines of communications with their bases of operations, and in some campaigns the advancing assailant finds this a heavy tax on his numbers. But in a struggle like the Great War both belligerents so contrived to cover the whole front continuously, and to have their flanks so safe on neutral or other obstacles, that communications and bases could only be threatened by a break-through.

The best strategy aims continuously at the destruction of the enemy's chief armed force; that being achieved, he is at your mercy. The commander operates so that his force is in full strength at the decisive or any important battle, while trying by manoeuvres and deceptions to prevent the enemy having his full strength there. If his total force is larger than the other's, he will aim at an eventual outflanking whenever possible, on one or both wings, for this sort of envelopment often produces the most comprehensive result. The opponent's strategy will then be that of the *interior lines*, viz., an attempt by sudden massing in a particular direction to bring a local preponderance to bear, sufficient to effect quickly a serious breach. For both sides, even for the defender, the need is activity combined with secrecy, so that surprise may be achieved. Passivity, if too prolonged, is the road to defeat, for opportunity is being granted to the foe to act as suits him best. To lose freedom of movement is pernicious.

This short statement of principle applies in spirit both to earlier warfare, when there was plenty of room for manoeuvre beyond flanks, and to the era of vast armies like those of the Great War, when there was in the chief theatres no open flank. Of the *interior line* system Napoleon was the great exponent, having in his earlier years of command often the inferior force; of the enveloping system von Moltke (1866 and 1870) gave the most striking examples, always outnumbering his enemy. When fronts developed into continuity, as in 1914 to 1918, the aim was, by secret massing and the use of a titanic bombardment, to effect a complete breach and thus to create artificially two flanks in the enemy's front. On a few occasions it nearly succeeded, but never quite.

See Hamley's *Operations of War* (1907); Napoleon's Military Correspondence; works by Marshal Foch; works by von Schlieffen; and TACTICS.

Stratford, a thriving town of Essex, on the Lea, 4 miles ENE. of London. It had a Cistercian abbey (1134) and the Empress Matilda's three-arched bow-shaped bridge (removed in 1839); it has a handsome town-hall (1869), and extensive manufactures. It is now included in the parliamentary and county borough of West Ham. On the other side of the Lea is the parish of Bow, or Stratford-le-Bow, now included in the London metropolitan borough of Poplar.

Stratford, a port of entry and capital of Perth county, Ontario, on the Avon, 88 miles by rail W. of Toronto, with railway-shops, woollen-mills, and manufactories of machinery, farming implements, boots and shoes, &c. Pop. 13,000.

Stratford de Redcliffe, SIR STRATFORD CANNING, K.G., G.C.B., first Viscount, the famous ambassador, known as 'the Great Elchi,' was descended from the Cannynghams of Bristol, but was born in London, 4th November 1786, the fifth and youngest child of Stratford Canning, a merchant, and was first cousin to George Canning the statesman. He was educated at Eton, and proceeded in due course as scholar to King's College, Cambridge, where, however, his terms were interrupted by diplomatic appointments, and he did not take his degree till 1812, when it was granted by royal mandamus. In 1807 he acted as *précis*-writer to his cousin at the Foreign Office, and in the same year went as second secretary with Merry's mission to Copenhagen. In 1808 he was appointed first secretary to Sir Robert Adair's embassy to Constantinople, and succeeded him as minister-pleni-potentiary in 1810. His duty was to counteract the influence of France at the Porte, and he succeeded on his own initiative and without the smallest countenance from his government or the Foreign Office in negotiating the important treaty of Bucharest in 1812 between Russia and Turkey, who were then at war, just in time to release the Russian army of the Danube and enable it to fall upon Napoleon on his retreat from Moscow. This signal service was recognised by Lord Castlereagh's government, who appointed him minister in Switzerland, 1814; there he assisted in framing the Swiss constitution, and visited Vienna as commissioner during the famous Congress of 1815. He resigned the mission in 1819, and was immediately appointed minister to the United States, and remained at Washington till 1823. In the following year he was sent on a special mission to Vienna and St Petersburg, connected with the Greek question, and in 1825 went to Constantinople as full ambassador. Here he witnessed the massacre of the Janizaries, and exerted himself on behalf of the insurgent Greeks. After the battle of Navarino the embassy was necessarily withdrawn, and, in consequence of serious differ-

ences with Lord Aberdeen on the policy to be adopted towards Greece, Canning resigned his post in 1828, but his services were recognised by the decoration of the Grand Cross of the Bath. In 1831 he was again sent to Constantinople on a special mission, to draw the boundaries of the new kingdom of Greece, and on his return was gazetted ambassador to St Petersburg; but the tsar, without alleging a reason, declined to receive him—probably because he dreaded so keen an eye at close quarters. In 1833 Sir Stratford went to Madrid on a special mission relating to the Portuguese succession, but his efforts were, as it was foreseen they must be, fruitless. During the intervals in his diplomatic career he sat in the House of Commons as a moderate Tory, or 'Stanleyite,' for Old Sarum, 1828–30; Stockbridge, 1831–32; and King's Lynn, 1834–42; but failed to make his mark as an orator or a debater. From 1842 to 1858 he was again ambassador at Constantinople, and built up that extraordinary influence so eloquently described by Kinglake, which gained him the name of the 'Great Elchi.' He induced the sultan to inaugurate a series of reforms, and to authorise numerous improvements in the condition of the Christian rayas, culminating in the celebrated Hatti-Humayun of 1856, which may be termed the Magna Carta of the Christian subjects of the Porte. His diplomatic skill and his unbounded influence over the Turks were never seen to greater advantage than in 1853, in his negotiations with Prince Menschikoff, the Russian special ambassador, concerning the dispute about the Holy Places and the Russian claim for predominating influence on behalf of the Christians of Turkey. His strenuous and unflinching exertions to preserve peace were, however, defeated by the obstinacy of the Tsar Nicholas and the vacillating weakness of Lord Aberdeen's government; the war which ensued between Russia and Turkey involved England and France; and the result was the expedition to the Crimea, and the siege of Sebastopol. At the close of the war, after obtaining the proclamation of the Charter of Reform, Lord Stratford, who had been created a viscount in 1852, resigned his embassy in 1858, at the age of seventy-one, and a diplomatic career of unexampled distinction, lasting over half a century, came to an end. Stratford de Redcliffe was the last of the old style of semi-royal and half-independent ambassadors: the telegraph-wire has made ministers of his mettle and character impossible if not superfluous. After his retirement he occasionally took part in the debates on foreign policy in the House of Lords, and devoted part of his leisure to the writing of poetry, which had been a favourite occupation with him since he wrote a fine poem on *Buonaparte*, which attracted the admiration of Byron, in 1814. Some articles on the *Eastern Question* were collected after his death and edited by Dean Stanley. He was created a Knight of the Garter in 1869 at Gladstone's recommendation, and died in the full enjoyment of his mental powers though at the great age of almost ninety-four, 14th August 1880. His tomb is at Frant, Sussex; but a statue was erected in Westminster Abbey in 1884.

See *Life of Stratford Canning, Viscount Stratford de Redcliffe*, by Stanley Lane-Poole (2 vols. 1888; 1 vol. 1890).

Stratford-upon-Avon, Shakespeare's birth-place, a municipal borough and market-town of Warwickshire, 8 miles SW. of Warwick, 22 SSE. of Birmingham, and 101 NW. of London. It stands on the right bank of the stately Avon (q.v.), which is here spanned by the 'great and sumptuous bridge' of fourteen pointed arches, 376 yards long, built by Sir Hugh Clopton, then the Lord Mayor of London, who died in 1496. The prosperity of the town depends on the thousands of

Shakespeare pilgrims. Shakespeare is over all. 'Shakespeare's House' (where he was born in April 1564), in Henley Street, was purchased by the 'Trustees and Guardians of Shakespeare's Birthplace,' and became a national trust in 1847, being restored in 1858-59. Here is a museum containing the 'Stratford portrait,' and, on the walls of one of the rooms, the signatures of Byron, Scott, Tennyson, Thackeray, Dickens, &c. King Edward VI.'s grammar-school, where Shakespeare was educated, was founded by a priest named Thomas Jolyffe in 1482, and re-endowed by Edward VI. It occupies the second floor of the ancient guildhall, founded in 1296 by Robert de Stratford, and was restored in 1892. The 'New Place,' built by Sir Hugh Clopton in the reign of Henry VII., was purchased by Shakespeare as a residence in 1597. Here he died 23d April 1616. Here, too, Queen Henrietta Maria stayed in 1643. It (or rather its successor, 1702) was wantonly razed in 1759 by a vicar of Stratford, who also felled the poet's mulberry, beneath which Garrick was regaled in 1742. Its site (now a garden in which can still be traced the foundations of the house) became a national trust in 1861. Holy Trinity, a beautiful cruciform parish church, Early English to Perpendicular in style (having been built gradually between 1332 and 1500) contains, in the chancel, Shakespeare's grave and that of Anne Hathaway, his wife, the portrait bust (1616) by Gerard Janssen, the parish register (with the entries of Shakespeare's baptism and burial), and the American stained-glass memorial window of the 'Seven Ages.' The Shakespeare Fountain (1887) was also erected by an American, G. W. Childs (q.v.). The Shakespeare Memorial building, consisting of a theatre, library, and picture gallery, was founded in 1875, and is situated close by the river. The theatre (connected with the rest of the building by a corridor bridge) was destroyed by fire 6th March 1926, the library and picture-gallery, with their contents, fortunately escaping serious damage. The theatre had been severely criticised architecturally, and was, moreover, too small for the Shakespeare Festival, which had been held there annually since 1879. A national fund was opened to build a new theatre. The library possesses some of the early quartos, the first four folios, and several other rare editions of Shakespeare's works; in the picture gallery are paintings by Romney, Lawrence, Reynolds, Opie, and others of the English school, and the original 'Droeshout' portrait. Houses associated with Shakespeare are Hall's Croft, the home of Shakespeare's son-in-law, Dr John Hall, and his wife Susanna; Nash's house (restored 1911-12), the home of Thomas Nash, first husband of Shakespeare's grand-daughter, Elizabeth Hall, now a museum and a national trust, in which are relics made from the wood of the famous mulberry; Quiney's house, the home of Thomas Quiney, a vintner, and his wife Judith (Shakespeare's younger daughter), the cellar of which used to be the town lock-up; and Shaw's house (Julius Shaw witnessed Shakespeare's will), now the Shakespeare Head press. Close to Stratford are Shottery, with Anne Hathaway's cottage (purchased for the nation in 1892 for £3000); Luddington, where tradition says they were married; Charlecote Hall, the seat of the Lucys; Clopton, with memories of the Gunpowder Plot; and Mary Arden's (Shakespeare's mother's) home at Wilmcote.

In Stratford itself there still remain to be noticed the chapel of the Guild of the Holy Cross (13th century; the chancel rebuilt about 1450, and the rest by Sir Hugh Clopton); the half-timbered houses, especially Harvard House (1596), so-called after John Harvard, who founded Harvard University, U.S.A., to which it now belongs; and the

town hall (1633, rebuilt 1768-1863) with Gainsborough's portrait of Garrick. Stratford was incorporated in 1553. Pop. (1921) 9392.

See 'Shakespeare's Birthplace, &c., Trust Act, 1891'; Wheler's *History and Antiquities of Stratford-on-Avon* (1806); works by J. O. Halliwell-Phillipps (1863-85); Bloom's *Shakespeare's Church* (1902); Sir S. Lee's *Stratford-on-Avon from the Earliest Times to the Death of Shakespeare* (1902); W. Salt Brassington's *Shakespeare's Homeland* (1913); Dugdale Society's *Minutes and Accounts of the Corporation of Stratford-upon-Avon, and other Records*, vol. i. 1553-66 (1921), vol. ii. 1566-77 (1924), vol. iii. 1577-86 (1926); Patrick and Lascelles Abercrombie's *Stratford-upon-Avon: Report on Future Development* (prepared for Stratford-upon-Avon Preservation Committee in 1923); H. E. Forrest's *The Old Houses of Stratford-upon-Avon* (1925); and other works cited at SHAKESPEARE.

Strathaven, a town of Lanarkshire, 1 mile W. of Avon Water, and 16 miles SSE. of Glasgow. On the north side is the picturesque ruin of Avondale Castle, and 5 to 7 miles south-west are the battlefields of Drumclog and Loudoun Hill.

Strathclyde. In the 8th century the ancient confederacy of the Britons was broken up into the separate divisions of Wales and English and Scottish Cumbria. Scottish Cumbria, otherwise called Strathclyde, thenceforth formed a little kingdom, comprising the country between Clyde and Solway; governed by princes of its own, and having the fortress-town of Alclyde or Dumbarton for its capital. Becoming dependent on Scotland (see BRETTES AND SCOTS), it was annexed to the Scottish crown at the death of Malcolm I., on failure of the line of native sovereigns. Edgar bequeathed Strathclyde to his youngest brother David, again separating it from the crown of Scotland, which went to his intermediate brother, Alexander I. David held it throughout Alexander's reign in spite of that king's opposition, and on Alexander's death without issue in 1124, it was permanently reunited to the Scottish kingdom under David I.

Strathcona, BARON (Donald Alexander Smith), born at Forres in 1820, entered the Hudson's Bay Company's service in 1838, and rose to be governor in 1889. He was special commissioner during the Red River rebellion in 1870, main promoter and director of the Canadian Pacific Railway, and held other important offices in the Dominion. In 1896 he was made High Commissioner for Canada in London. He was raised to the peerage in 1897. He died in 1914. There is a *Life* by Beckles Willson (1915).

Strathfieldsaye, a Hampshire estate 7 miles NNE. of Basingstoke, was purchased by parliament in 1817 and presented to the Duke of Wellington (q.v.).

Strathmore (Gael., 'Great Valley'), the most extensive plain in Scotland, is a low-lying tract extending north-eastward across the country from Dumbartonshire to Stonehaven in Kincardineshire, bounded on the north by the great mountain-rampart of the Highlands, and on the south by the Lennox, Ochil, and Sidlaw Hills. It is 100 miles long and from 5 to 10 miles broad; but Strathmore proper extends only from Perth to near Brechin (about 40 miles).

Strathnairn, LORD, commander-in-chief in India. Hugh Rose, son of Sir George Rose, was born 1801, and entered the army in 1820. He was military attaché to the Turkish army in the war with Mehemet Ali in 1840, was consul-general for Syria, and as secretary to Lord Stratford de Redcliffe was *chargé d'affaires* at Constantinople in 1853-54. He was commissioner at the French headquarters during the Crimean war, and, now K.C.B., was sent to India in 1857 to command the Central Indian army. In command of this force he virtually reconquered

Central India; and, though his campaign was overshadowed by those of Sir Colin Campbell, it is generally admitted that the operations of Sir Hugh Rose were more brilliant and skilful than those of his chief. On the departure of Lord Clyde Sir Hugh Rose became commander-in-chief in India; in 1865-70 he held the same post in Ireland. Raised to the peerage in 1866, and made field-marshal in 1877, he died 16th October 1885. See Sir O. T. Burne, *Clyde and Strathnairn* (1891).

Strathpeffer, a fashionable Scottish watering-place in the county of Ross and Cromarty, to the south of Ben Wyvis (3429 feet), and 5 miles W. of Dingwall by rail, 215 NNW. of Edinburgh. Its sulphur and chalybeate springs are highly efficacious in digestive and rheumatic disorders; and it has a pump-room, baths, and large hotels.

Strathspey, a Scottish dance, allied to and danced alternately with the Reel (q.v.). The name is derived from the strath or valley of the Spey, where it seems to have originated; but it does not occur before the middle of the 18th century, and was at first applied indiscriminately to music now known as reels. It differs from the latter in being slower, and abounding in the jerky motion of dotted notes and semiquavers (when the latter precede the former it constitutes the *Scotch Snap*), while the reel is almost entirely in smooth, equal, gliding motion. Many of Burns's songs were written to the music of strathspeys.

Stratitotes. See WATER-SOLDIER.

Stratum (Lat. 'spread out'), equivalent in Geology to the term *bed* or *layer*, but implying that the beds or layers of rock have been spread out over the surface. Rocks so arranged are said to be stratified. The stratified rocks include all those that are of derivative origin, such as conglomerate, sandstone, shale, &c. Many igneous rocks, however, are also arranged in layers or beds, as in the case of the basalt plateaus of Antrim, the Inner Hebrides, the Faeroe Islands, Iceland, &c. In these regions we encounter a great succession of sheets of basalt with interbedded layers of fragmental materials (tuff, &c.). Such consecutive series of igneous rocks are truly stratified. But when a geologist speaks of 'the stratified rocks' he is understood to refer more particularly to the derivative or aqueous rocks, the most important characteristic of which is their bedded or stratified arrangement. In a series of stratified rocks each individual layer of sandstone, shale, limestone, &c. is a stratum, which may or may not be homogeneous in structure. For while some beds consist of a series of thinner layers or laminæ, others show no such subordinate divisions. Thus, the particular variety of sandstone which is called *freestone* is not laminated, but of homogeneous structure, while a stratum of shale is composed of numerous thin laminæ. Such laminæ have a more or less close cohesion, which is sometimes so great that it is almost as easy to break the rock against as with the grain. Individual strata are more readily separated from overlying and underlying beds. The degree of cohesion between laminæ probably depends upon the rate at which sedimentation took place. If deposition was comparatively rapid the successive laminæ would tend to cohere more readily than would be the case where each individual layer had had time to become more or less solidified before the deposition of the succeeding laminæ. But in very many cases the cohesion of laminæ has been effected by subsequent pressure, and sometimes by infiltration of cementing material. The planes of stratification are always more strongly pronounced than those of lamination, and generally point to some lapse of time (longer or shorter as the case

may be)—to a pause in the deposition of sedimentary matter. For further remarks, see GEOLOGY.

Straubing, an old town of Lower Bavaria, on the right bank of the Danube, 25 miles by rail SE. of Ratisbon, makes large quantities of bricks, lime, cement, and leather. Fraunhofer was a native. In a little chapel here there is a monument to Agnes Bernauer (q.v.). Pop. (1925) 23,593.

Strauss, DAVID FRIEDRICH, was born on the 27th January 1808, at Ludwigsburg in Württemberg. His education was begun in his native town, and completed in the theological seminaries of Blaubeuren and Tübingen. In 1830, his head filled with Hegel's philosophy and Schleiermacher's theology, he became a country pastor; but already in the following year he was in Maulbronn acting as professor in the seminary. He was later *repent* in Tübingen theological seminary, and lectured on philosophy in the university. All at once he became a man of mark by the publication, in 1835, of his *Life of Jesus critically treated* (4th ed. 1840; trans. by George Eliot, 1846). In this work he applied to the New Testament the method which had already worked havoc with the old legends of Greece and Rome, and which De Wette had to some extent applied to the Old Testament. Strauss attempted to prove the received gospel history to be a collection of myths gradually formed in the early Christian communities, and sought by an analytical dissection of each separate narrative to detect, where it existed, a nucleus of historical truth free from every trace of supernaturalism. The book made a real epoch in theological literature, and produced a violent excitement in and out of Germany, calling forth numberless replies from opponents, frightening many by its bold disregard of consequences back into the ranks of orthodoxy, and stirring up others to similar investigations. The first consequence to the author was his dismissal from his academical position in Tübingen, and transference to the Lyceum of Ludwigsburg. He soon retired into private life at Stuttgart, to have leisure to defend himself. In 1837 he published his *Streitschriften* against his opponents; and in 1838 *Zwei friedliche Blätter*, a more conciliatory exposition of his views. His appointment in 1839 to the Chair of Dogmatics and Church History in Zurich University raised such a storm of opposition that he had to be pensioned off, and the cantonal government fell.

Strauss's second great work was *Die christliche Glaubenslehre*, a review of Christian dogma 'in its historical development and its struggle with modern science' (1840-41). In *Der Romantiker auf dem Throne der Cäsaren* (1847) a parallel was drawn between the orthodox William IV. of Prussia and Julian the Apostate, as having both attempted to restore dead religions. His fellow-townsmen put him forward as a candidate for the German revolutionary parliament of 1848, but he was unable to stand against the clerical influence; and when his native place sent him as its representative to the Württemberg Diet, he unexpectedly displayed conservative leanings, and soon retired. In this period he also issued lives of the Swabian poet Schubart and of his college-friend Christian Märklin; and a work on the old Swabian humanist Frischlin (1855). His third period of activity was opened in 1858 by a remarkable life of Ulrich von Hutten, followed up by the publication of Hutten's *Dialogues* in 1860, a work on Reimarus (1862), and a series of brilliant lectures on Voltaire (1870). A new *Life of Jesus, composed for the German People* (1864; trans. 1865), retaining the mythical theory, attempted—not very convincingly—to reconstruct a positive life of Christ. His last work, *Der alte und der neue Glaube* (1872),

endeavours to prove that Christianity as a system of religious belief is practically dead, that there is no conscious or personal God, and that a new faith must be built up out of art and the scientific knowledge of nature. Strauss died at Ludwigsburg, 8th February 1874. In 1841 he had married the opera-singer, Agnese Schebest (1813-70), but some years after they separated. Strauss's literary, critical, and polemical powers were of a very high order; no more effective German prose than his had been written since Lessing.

A collected edition of Strauss's works was published in 12 vols. (including one of poems), edited by Zeller, in 1876-78. The *Life* by Zeller (1874) was translated the same year; and there are works by Hausrath (1878), Eck, Harräus, and Ziegler (1909). For his position in the history of criticism, see Schweitzer's *Quest of the Historic Jesus* (1910).

Strauss, JOHANN (14th October 1825-4th June 1899), composer, best known for his waltz-music, was born in Vienna, the son of a Johann Strauss (1804-49) who also was renowned as a composer of dance-music. On his father's death he took the direction of his orchestra, and for many years travelled with it, at the same time producing melodious and catching waltzes (*An der schönen blauen Donau, Künstlerleben*, &c.). He also composed some very popular operettas—*Die Fledermaus* (1874), *La Tsigane* (1877), *Der Zigeunerbaron* (1885), &c.

Strauss, RICHARD, was born on 11th June 1864, at Munich, where his father, Franz Strauss, was first horn-player in the Court Opera House. His aptitude for music showed itself very early. About the age of ten he became a pupil of Hofkapellmeister F. W. Meyer, and he soon acquired a scholarly knowledge of music. Many of his compositions received a public hearing while he was still gaining a wide general culture in the gymnasium and the university. He attracted the attention and came under the influence of Bülow, whom he succeeded in 1885 as Kapellmeister at Meiningen. After a visit to Italy he assisted Hermann Levi at the Munich Opera (1886-89) and Eduard Lassen at Weimar (1889-94). During a journey to Greece, Egypt, and Italy, undertaken to recover from the effects of overwork, he composed the opera *Güntram*. In 1894 he produced it at Weimar, and married the singer Pauline de Alina, who performed the principal part. In the same year he became conductor at the Munich Opera House, and in 1898 at the Royal Opera House, Berlin. He was made Chevalier of the Legion of Honour in 1907. From 1919 to 1924 he was director of the State Opera House in Vienna. He has made many tours as a conductor, and excels in the interpretation of Mozart. As a composer his work falls into three periods: the first is occupied with sonatas, &c., in severely classical forms; the second, characterised by enormous orchestras and complicated scoring, comprises a set of brilliant tone-poems, *Don Juan* (1889), *Tod und Verklärung* (1890), *Till Eulenspiegel* (1895), *Also sprach Zarathustra* (1896), *Don Quixote* (1898), *Ein Heldenleben* (1899), and the operas *Salome* (1905) and *Elektra* (1909); in the third, an attempt is made at 18th-century simplicity with the operas *Der Rosenkavalier* (1911), *Ariadne auf Naxos* (1916), *Die Frau ohne Schatten* (1919), and the ballet *Schlagobers* (1923). Strauss has also written over a hundred songs, many of them very beautiful, but his astonishing contrapuntal virtuosity and command over the orchestra are often spoilt by a certain inconsistency of style. Frequently he strives after effect, but not only does he never lose touch of ordinary tonality, but he is apt to fall into the banal and common-place. His later works are, on the whole, inferior to those of his second period.

There are studies by Newman (1908), Specht (1920), and Muschler (1925). See PROGRAMME-MUSIC.

Stravinsky, IGOR, Russian composer, was born at St Petersburg in 1882, and in 1904 became a pupil of Rimsky-Korsakov. His works include the operas *Le Rossignol* (1909-14) and *Mavra* (1921), and the ballets *L'Oiseau de Feu* (1910), *Petrouchka* (1911), *Le Sacre du Printemps* (1913), *Le Renard* (1915), and *Les Noces* (1923). His chamber music is comparatively insignificant. Stravinsky emphasizes the importance of rhythm, sacrificing melodic and harmonic development to it, and lays stress on the 'absolute' nature of music, freeing it from all emotional content. Though the three earlier ballets are magnificent examples of their kind (with brilliant and piquant orchestration) many of his subsequent works such as *L'Histoire du Soldat* (1917), and especially those in the smaller forms in which he makes use of rag-time rhythms, are, on the whole, neither convincing or permanent. His rhythmic audacities and excursions into atonality have aroused much discussion.

Straw, apart from its uses in agriculture, thatching, packing, for paper-making, and for mattresses and door-mats, is utilised to an enormous extent in the manufacture of hats and small baskets. Wheat straw chiefly is employed in this plait trade, centred mainly in Bedfordshire in England, Tuscany in Italy, and Canton in China. At first the plait was what is called *whole straw*; that is, the straw was cut into suitable lengths without knots, and merely pressed flat during the operation of plaiting; and so it continued until the reign of George I., when it was in great demand for ladies' hats, and some plait was made of split straw. Since that time split straw has been chiefly used. The instrument employed for splitting consists of a number of little square steel blades radiating from a stem. The English straw used in plaiting is obtained principally from varieties of wheat which succeed best on the light rich soils of Bedfordshire and the neighbouring counties. Only bright, clear, and perfect pipes can be employed, and to obtain the straw in good condition great care has to be exercised. The crop is not mowed, but pulled up, and the ears are cut off by the hand for thrashing.

Strawberry. The Strawberry (Lat. *fragum*, whence the name of the genus *Fragaria*) belongs to the family Rosaceæ. Probably our name is descriptive of the habit of the fruiting plant, when the berries are strewn or strawn upon the ground—*humī nascentia fraga*—by their weight on the flexible footstalk. It is hard to believe, on the best authority, that the plant waited for its name till straw was laid beneath it. The calyx is ten-cleft, the petals five, and the seeds are imbedded in a fleshy receptacle, which is the delicious and fragrant fruit. The plant is a dwarf perennial, of stocky habit, and with handsome foliage, each leaf consisting of three leaflets, boldly toothed, and deeply ribbed; the stalk is generally long, and more or less hirsute, according to variety. The principal species are *F. vesca*, including the alpine and wood varieties; *F. elatior*, the hautbois; *F. viridis*, a rather scarce European plant; *F. virginiana*, a scarlet fruit; *F. grandiflora*, the pine strawberry; and *F. chilensis*, the Chilean. The hautbois, which is now believed to be a cultivated form of *F. vesca*, was probably our earliest garden strawberry, and the name is still used by the London street-vendors—'fine hoboy, ripe hoboy!'—for strawberries of all descriptions. The true hautbois is cultivated still for its rich and musky flavour, but larger and more fruitful kinds have generally superseded it. The magnificent fruit we now possess is chiefly the result of judicious crossings

betwixt and among *virginiana*, *grandiflora*, and *chilensis*. The first great improvement appears to have been the introduction of the scarlet kind from Virginia in the beginning of the 17th century; and the old scarlet, though too acid for dessert, is still the very best for preserving. *F. grandiflora*, the old pine, has larger fruit of higher flavour, and darker and more substantial leaves. It is believed to have come from Carolina, and under that name was regarded for some years as the best and finest of strawberries. Even now there is none to surpass it in flavour, or equal it perhaps in texture; but larger and more productive kinds have ousted it from popularity. The garden strawberries of the present time have been obtained by repeated crossings, and it is impossible now to give their pedigree; but many of them show by hispid stalk and foliage a trace of Chilean lineage, for the Chilean is a very hairy plant and of vigorous growth, but tender.

Planting strawberries for ourselves, we may rely upon a fine sweet crop if we show a little sense and take due care. First of all seek out the proper kinds for soil and climate, dividing (as may be fairly done, at least for practical purposes) all strawberries into three classes—(1) those of Chilean interbreed, which must have heavy soil even if poor, and weather not too barbarous; (2) those of more glabrous and substantial leaf, being closely allied to the pine race, which care more for the quality than the substance of the soil; (3) those of a strain so mixed that they must be studied individually, and sometimes flourish most upon a mixen. But however widely strawberries vary, almost all rejoice in having the earth well hardened around them, and the grower will marvel after all his labours to find the most vigorous and buxom of his plants established in the gravel-walk outside his higher culture. The strawberry is propagated in three manners—by seed, by side-shoots from the stool, and by runners. The last is the general course; and the runners or filiform stems (which issue generally at or soon after the fruiting season) should be pegged or fixed till the young plant is rooted. As early in the autumn as the young plants are strong enough, they are set out in the new beds in rows from 2 to 3 feet asunder, according to the vigour of the sort, and at intervals in the row of 15 or 18 inches. If the soil is light it should be rolled or heavily trodden before the planting time, and every young plant should have the earth rammed round it. Whenever a scarcity of runners or the weather has forbidden early planting it is better to wait till the spring than attempt to overtake the lateness lamely; and many kinds do best after wintering with their parents. The duration of a strawberry-bed depends very much upon the variety. Some of the small and early kinds are worn out by the second year of fruiting; while others of more robust habit do well for five or six years, or even more, if frequently cleared and kept in order and good heart. But none of these things has a hard and fast law. The forcing of strawberries is a special subject upon which we cannot enter. Brief as its season is of appearance in the market—from the first week of June to the last of July may be taken as the period of outdoor fruit in the neighbourhood of London—the strawberry has long won the affection of the people (at least for immediate despatch) more entirely than any or all other fruit whatsoever. At the height of the 'berry-time' it is amazing to see the fruit pouring into Convent Garden, from ship and from train, and by the English grower's van from all the nearer counties. The imported fruit is coarse, insipid, and generally in bad condition, but it serves to keep the prices low.

Strawberry Hill. See TWICKENHAM.

Strawboard is a kind of Millboard (q.v.), or thick cardboard, made of straw after it has been boiled with lime or soda to soften it. Cheap strawboards are used for making common boxes of various kinds, and for protecting articles sent by post or railway. Good qualities of board suitable for binding books and other purposes are made of straw mixed with flax and jute waste from spinning-mills.

Streatham, a suburban district of London, 6½ miles SSW. of St Paul's. The Thrales' house, visited by Dr Johnson, is gone; but the church, though rebuilt in 1831, retains some interesting monuments. Streatham is in the metropolitan borough of Wandsworth.

Streator, a mining-town of Illinois, on the Vermilion River, and on five railways, 94 miles SW. of Chicago. Pop. 15,000.

Street, GEORGE EDMUND, architect, born at Woodford in Essex, 20th June 1824, was educated at Camberwell and Crediton, and studied for five years with Gilbert Scott. Starting in practice for himself in 1849, he designed many churches and restored more—the chief restoration being Christ Church Cathedral in Dublin. Cuddesden College and Uppingham School are by him; but his most famous work is the Law Courts in London, the subject of so much controversy (see Vol. VI. p. 739). Street became an A.R.A. in 1866, an R.A. in 1871, and P.R.I.B.A. in 1881. He died in London, 18th December 1881, and was buried in Westminster Abbey. He published *The Architecture of North Italy in the Middle Ages* (1855) and *Gothic Architecture in Spain* (1865). See Memoir by his son (1888), and G. G. King, *Unpublished Notes and Reprinted Papers* (1917).

Strength of Materials is the heading under which it is usual to discuss the elastic or resisting properties of the materials used in engineering or building operations (see ELASTICITY, also STRAIN AND STRESS). When a structure is being designed the engineer must know first of all the amount and character of the stresses (loads, wind-pressures, &c.) that will act upon the structure. He must then decide as to the size and shape of the pieces that are to compose the structure, so that they may easily stand these stresses. For this purpose he must know beforehand what 'strength of material' is possessed by the steel, iron, or wood that is to be used.

When any substance is strained beyond a certain limit it will break, and the greatest stress which the substance can bear without being torn asunder is called its ultimate strength. The value of this for any given piece of material will depend upon the kind of strain to which it is being subjected. But whatever this strain be, whether extension, compression, flexure, or twisting, there are two, or at most three, distinct kinds of ultimate strength which practically fall to be considered. The one is the ultimate tension or pressure applied in one direction, usually longitudinally; and the other is the ultimate shearing stress, such as comes into play in simple torsion. In certain cases, such as in steel, wrought-iron, and ductile metals generally, the strength under tension and that under longitudinal pressure—in other words, the tenacity and the resistance to crushing—are practically the same. In other cases, however, of which cast-iron is the most interesting instance, the resistance to crushing is much greater than the tenacity. The ultimate strength under shearing is generally less than that under tension or compression. For example, the ultimate tensile strength of steel varies from 30 to 45 tons' weight per square inch of section, while the ultimate shearing strength

varies from 22 to 35. Cast-iron, again, which has a tensile strength of $7\frac{1}{2}$ tons' weight per square inch, has a strength under crushing of 45 and a shearing strength of 12. The requirements of designers of the motor-car and aeroplane have led to considerable improvements in the materials used in their construction, so that there are now available high-carbon and alloy-steels containing chromium, tungsten, or vanadium which have peculiar qualities of resistance to tensile stress or shock, or, after special heat treatment at very definite temperatures, acquire a high degree of hardness, toughness, or elasticity as may be required for the particular service for which they are intended. In this connection steels having a tensile strength of 70 tons per square inch of section are in regular use.

It is out of the question to make a structure in which the pieces are strained up to their ultimate limits. For, even although the limit is not exceeded and the material not torn asunder, the excessive straining to near the limit will produce a permanent deterioration in strength. In other words, the 'working strength' is much smaller than the ultimate strength, being obtained from it by dividing by a number known as the 'factor of safety.' In the case of steel this factor is about 6; so that in no structure should a hard steel rod be subjected to a greater tension than $7\frac{1}{2}$ tons' weight per square inch. Experience is the sole guide as to the value of this factor which must be taken large enough to provide a margin of strength for all possible contingencies. Again, although theoretically a long column should have the same tensile strength as a short one of the same material and section, practically it is not so. There is greater chance of there being weak places in the longer column, and at the weakest place the material will begin to yield. Thus a greater factor of safety must be used in estimating the working strength of the longer rod. Manufacturers are, however, now prepared to supply materials such as iron and steel of quite regular quality, which will satisfy a very exact chemical specification and mechanical tests, a small percentage of the tonnage supplied is tested to destruction to check the quality. Then, in the second place, the character of the stress to which the material is to be subjected must be considered. If it is to be a fluctuating and not a steady stress the factor of safety must be increased, and similarly a wider margin of strength must be provided if the material is to be subjected to sudden shocks or impacts. For example, a bridge which is strong enough to allow a train to rest on it or to crawl over it may be unable to support the train dashing at full speed. In fact, under a stress which fluctuates between wide limits the ultimate strength is diminished, and this has given rise to the design of machines for the testing of samples of material under varying and reversing loads and under shock.

A very important part of the subject is the consideration of the form best suited to resist certain strains. A glance at any fine modern structure, such as the Forth Bridge, will show how the form is varied, according as the member is in compression or in extension. Here the question of bending action enters in. For although the strengths under extension and compression may be the same, yet if a rod is taken too thin and subjected to a longitudinal pressure, it will bend long before the true compression limits are reached. This bending or buckling must be prevented, and the only way of doing so is to increase the lateral dimensions of the section. Thus tubular or hollow figures resist buckling better than rods of the same length and mass. Herein also lies the great virtue of the I-shaped rod, which if laid horizontally and sup-

ported by its ends bends under its own weight very slightly as compared with the bending of a solid cylindrical rod of the same length and mass.

See Sir J. A. Ewing, *Strength of Materials* (1914); Prof. J. Goodman, *Mechanics Applied to Engineering* (1919); E. S. Andrews, *Strength of Materials* (1925); Dr. A. Morley, *Strength of Materials* (1923, reprint 1925); Dr. A. Morley, *Theory of Structures* (1912, reprint 1923); J. Husbard and W. Harly, *Structural Engineering* (1924); J. Case, *Strength of Materials* (1925).

Strepsiptera, very peculiar insects, sometimes referred to Coleoptera, sometimes to an order by themselves. They are parasitic inside other insects, of the orders Hymenoptera and Hemiptera. Bees modified by them are said to be 'stylopedised,' Stylops being the name of a common Strepsipteron. The young larvæ, called triungulins, enter the larva of the host—e.g. the grub of the bee *Andrena*; they feed and develop; the males emerge as minute, very active, short-lived, winged insects; the females remain as degenerate stationary sacs, developing triungulins in their interior.

Streptococcus. See BACTERIA.

Stress. See STRAIN.

Stretton, HESBA, the pen-name of Sarah Smith, novelist and popular writer for the young, who was born at Church Stretton, Shropshire, the daughter of a bookseller. Her first manuscript was accepted by Charles Dickens, and published in *Household Words* (1859), to which she continued to contribute, as also to *All the Year Round*, until the death of its founder, whom she had found the most generous and sympathetic of editors. *Jessica's First Prayer*, published by the London Tract Society in 1867, was followed by a long series of semi-religious stories. She died, 8th October 1911.

Streuvels, STIJN, Flemish novelist, whose real name is Frank Lateur, was born in 1871 the son of a baker. He himself plied the trade of pastry-cook at Avelghem before settling down to literature. As the author of vivid and artistic stories of peasant life he enjoys a wide popularity in Holland and to some extent in Germany. His chief works are *De Aanslag*, *De Oogst*, *De Werkman*, *Langs de Wegen*, *Mijn Rijkswiel*, *Open Lucht*, *Stille Avonden*, and *Zomerland*.

Strickland, AGNES, historian, was born at Reydon Hall near Southwold, Suffolk, August 19, 1806. She had begun verse-making ere her twelfth year, and had issued several volumes of poetry when the idea occurred to her of writing historical biographies of the queens of England. The suggestion came from some interesting biographies of female sovereigns written for a periodical by her sister Elizabeth (1794-1875). A start was made, and the first two volumes were published by Colburn and had a rapid sale; a misunderstanding between author and publisher was healed by Colburn's offer of £150 per volume until the work was completed (12 vols. 1840-48; new ed. 6 vols. 1864-65; abridged ed. 1867). In the production of this work she was assisted by her sister Elizabeth, though only the name of Agnes appears on the title-page. The work was dedicated to Queen Victoria, and as each volume appeared its picturesque style and anecdotal character made it a general favourite, though the *Quarterly Review* complained of a poverty of style and an equally pervading feebleness of thought, while the *Times* said it possessed 'the fascination of a romance united to the integrity of a history.' Miss Strickland, whose volumes give vivid pictures of the court and domestic life of the various periods, had strong opinions as to ecclesiastical government and royal prerogative, and was a partisan of the Stuarts. A civil list pension was conferred upon her in 1870. She died 8th July 1874. Agnes

Strickland also wrote several novels and juvenile tales. Other works, written jointly with her sister Elizabeth, were *Lives of the Queens of Scotland* (1850-59), *Lives of the Seven Bishops* (1866), *Lives of the Tudor Princesses* (1868). The remaining works from the pen of Agnes were *Victoria from Birth to Bridal* (1840); *Letters of Mary Queen of Scots*, in whose innocence she believed (1842-43; new ed. 1864); *Bachelor Kings of England* (1861); *Lives of the Last Four Stuart Princesses* (1872). Her *Life of Mary Queen of Scots* (2 vols. 1873) was a redaction from the volumes in the *Queens of Scotland*. See *Life*, by her sister Jane (1887).

Stricture is a term employed in Surgery to denote an unnatural contraction, either congenital or acquired, of a mucous canal, such as the urethra, œsophagus, or intestine. When, however, the affected part is not mentioned, and a person is stated to suffer from stricture, it is always the urethral canal that is referred to. Contraction of this canal may be either permanent or transitory. The former is due to a thickening of the walls of the urethra in consequence of organic deposit, and is hence termed organic stricture. The latter may be due either to local inflammation or congestion, or to abnormal muscular action; the first of these varieties may be termed inflammatory or congestive stricture, and the second spasmodic stricture. The last-named form seldom exists except as a complication of the other kinds of stricture. There are two principal causes of organic stricture—the first being inflammation of the canal, and the second injury by violence. Inflammation is by far the most common cause, and gonorrhœa is the common agent by which it is excited. Not unfrequently stimulating injections thrown into the urethra with the view of checking the gonorrhœal discharge excite an inflammatory action which gives rise to stricture. Fortunately it is only in exceptional cases that a stricture results from inflammation of the urethra, the inflammation, in the great majority of cases, terminating by resolution, and leaving the canal as healthy as before the attack. It is when the complaint assumes a chronic character that it most commonly lays the foundation of stricture. Stricture from injuries is produced by such causes as falling across spars, scaffolding, ladders, &c., or from some sharp object which punctures the perinæum—e.g. earthenware vessels which break under the sitter.

The earlier symptoms of stricture are a slight urethral discharge and pain in the canal behind the seat of the stricture at the time of micturition. The stream of urine does not pass in its ordinary form, but is flattened or twisted; and as the disease advances it becomes smaller, and ultimately the fluid may only be discharged in drops. The straining efforts to discharge the urine often induce Tenesmus (q.v.).

As the case advances the urine becomes alkaline and ropy, and deposits a precipitate when allowed to stand; and attacks of complete retention of urine occur with increasing frequency. But these symptoms are not in themselves sufficient to establish the presence of stricture. It is necessary to examine the urethral canal with a Catheter (q.v.) or Bougie (q.v.) to ascertain whether an organic obstruction exists, whether one or more strictures are present (as many as eight have been recorded, although four are rare, and one is the most common number), and their calibre. The treatment of organic stricture is too purely surgical to be discussed in these pages. It is sufficient to state that its object is twofold—viz. first, to restore the natural calibre of the canal so far as this can be safely effected; and secondly, to maintain this patency after it has been established.

Spasmodic stricture usually occurs as a complication of organic stricture or of inflammation of the mucous membrane, but may arise from an acrid condition of the urine, from the administration of cantharides, turpentine, &c., and from the voluntary retention of urine for too long a time. The treatment consists in the removal of the causes as far as possible and the hot bath. The inhalation of chloroform sometimes gives immediate relief; and several cases are recorded in which when the spasm occurred periodically it was cured by quinine. Inflammatory or congestive stricture commonly arises from some local irritation such as exposure to cold, gravel, from indulgence in alcohol, &c. The patient complains of heat, fullness, and soreness in the perinæum; the passage of the urine is extremely painful, the stream being small and ceasing before the bladder empties. The treatment is much the same as that for retention of Urine (q.v.).

Striegau, a town of Lower Silesia, 25 miles SE. of Liegnitz, with granite-quarries, and manufacture of brushes, whips, sugar, &c. At Hohenfriedeberg near by Frederick defeated the Austrians in 1745. Pop. 14,000.

Strike, a term borrowed by geologists from the German *streichen*, 'to extend,' and adopted with the technical meaning it has in that language. It is applied to the direction of a stratum. This line is always at right angles to the dip of the bed. The angle of dip and the direction of strike are determined by a clinometer and compass. A perfectly horizontal stratum can have neither dip nor strike.

Strikes. See COMBINATION, TRADE-UNIONS.

Strindberg, JOHAN AUGUST, the most prominent figure in modern Swedish literature, was born in unhappy circumstances at Stockholm on 22d January 1849. His keenly sensitive nature, subjected to a family life of poverty and even squalor, prompted the early growth of that restless cynicism and discontent which characterises so much of his work. He entered Uppsala university in 1867, but his studies were intermittent. He later became successively schoolmaster, journalist, telegraph employee, tutor, and librarian at the Royal Library, where he learned Chinese. But he had turned to writing other than journalism. His first great drama, *Master Olof*, was written in 1872, but not thought worthy of publication till 1878. Strindberg's mortification at the delay called forth his *Red Room* (1879), a bitter satire upon conventional Swedish society. This made its author enemies, and to their attacks he replied in another stinging satire, *The New Kingdom* (1882); but after its publication he had to go into voluntary banishment. Two years later he published a collection of short stories, *Married*, in which he protests against the prevalent idealisation of woman, and describes all sorts and conditions of nuptial alliances with cynical frankness. Accused of outraging Christianity in this book, Strindberg repaired to Stockholm and stood his trial. After making an eloquent defence he was acquitted, and two years later he produced a second collection of stories under the same title, but much more vehement in their denunciation of women than the first. The same general theme, carried to morbid excess, inspires his autobiographical *Fool's Confession* (1888). Four autobiographical novels, *The Bondswoman's Son*, *Fermentation Time*, *In the Red Room*, *The Author*, appeared in 1886-87, and were followed by three more novels describing with admirable art the life and manners of the inhabitants of the Stockholm skerries—*The People of Hemsö*, *Fisherfolk*, and *At the Edge of the Sea*, the last, written under Nietzschean influences, showing Strindberg the novelist in his most genuine mood. By 1880 Strindberg had already written

some half-dozen plays. Three more followed in 1880-83—*The Secret of the Guild*, *Sir Bengt's Wife*, *The Journey of Lucky Peter*. The series of thirteen plays (1887-97), beginning with the powerful play *The Father*, and including *Lady Julie*, *Comrades*, *Creditors*, *The Link*, gained Strindberg a European reputation as an exponent of the naturalistic drama and as an unconventional misogynist. But while Berlin and Paris were acclaiming his genius as a playwright, he gave up writing and turned to a study of the exact sciences to quiet his tormented soul. He hoped to revolutionise chemistry, he dabbled in alchemy, he became a visionary, and gradually went mad. When he regained his mental balance he mirrored the 'great crisis' in his autobiographical *Inferno* (1897) and *Legends* (1898), unique works of their kind. More at rest now, enjoying 'light after darkness,' he returned for a few years (1898-1903) completely to the field of drama, and showed his absolute supremacy there both in the subtle psychological characterisation of the historical plays (*The Saga of the Folkungs*, *Gustavus Vasa*, *Eric XIV.*, *Engelbrecht*, *Charles XII.*, &c.), and in the mystic, imaginative flights of *To Damascus*, *Advent*, *Easter*, *Swan-white*, *The Dream Play*, &c. Ten more plays appeared in 1907-9, making a total of fifty-three during his lifetime. There are also voluminous historical writings, essays, treatises on the theatre and philology, stories, and poems, for Strindberg was a veritable titan of literature. He was no orator. His literary style is rich, generally pure, voluble; his moods are many—lyrical, artistic, vigorous, cynical, turbulent. His character is one of contrasts and inconsistencies, yet his philosophy—an ardent subjectivism—is clear enough. Until his later years he was without honour in his own country, and to the end he made no peace with the Swedish Academy. But his sixty-third birthday was an occasion of national celebration, and his death on 14th May 1912 one of national mourning. Björkman translated (1912) three of his plays, with a valuable introduction, and several other volumes translated by him and by E. and W. Oland followed. Many of Strindberg's other works have been translated also. See, besides Strindberg's autobiographical works noted in the article, an English study by Miss Lind-af-Hageby (1913), and A. Henderson's *European Dramatists*.

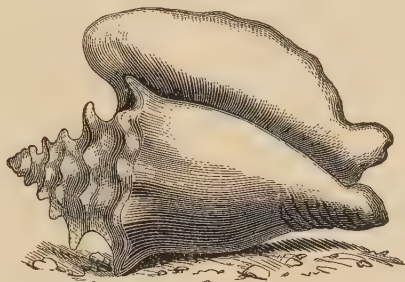
Stringhalt is a peculiar catching up of the horse's limbs, usually of one or both hind-legs. It is most noticeable when the animal is first brought out of the stable, when he is excited, or made to turn suddenly round. A variety of chorea or St Vitus's dance, it may not interfere with usefulness, but is a serious eyesore, as a rule incurable, and depreciates the value of the horse.

Strode, RALPH, a schoolman who flourished between 1350 and 1400, was apparently born in the west of England, studied at Oxford, and, as a fellow of Merton, opposed his colleague Wycliffe. To him and Gower Chaucer dedicated *Troilus and Cryseide*. He was eminent as a logician and philosopher, but only fragments of his work survive or have been printed. For a while he had a European reputation.

Strode, WILLIAM (c. 1600-45), born probably near Plympton, Devon, from Westminster passed to Christ Church, Oxford, and became chaplain to the bishop (Richard Corbet the poet), canon, and public orator, as well as doctor of divinity. He had some repute in his own time as a lyric and elegiac poet, but was almost totally forgotten when his poems were first edited by Bertram Dobell in 1907.

Stromboli, one of the Lipari Islands (q.v.), with a volcano almost constantly active.

Strombus, a genus of marine Gasteropods, typical of the family Strombidae. Their shells, often called conch-shells, are well known, being often used as decorative objects and in the manufacture of cameos (see *CAMEO*). Large numbers are exported from the West Indies and other tropical regions, and it is recorded that 300,000 fountain-shells (*Strombus gigas*) were brought to Liverpool in 1850. This species is the largest Gasteropod, the shell sometimes weighing 4 or 5 lb. The stromb-shell has a short conical spire and a much expanded outer lip, to which the popular name 'wing-shell' refers. The animals are allied to the cowries and whelks (*Buccinum*),



Fountain-shell (*Strombus gigas*).

and are very active, moving by short jumps. They feed on dead and decaying animal matter. See *CONCH*.

Stromness, a seaport in Mainland, Orkney, on a beautiful bay, 15 miles W. by S. of Kirkwall. Gow, Scott's 'Pirate,' was born here. Pop. 1660.

Strongbow. See *PEMBROKE*.

Stronsay, one of the Orkney Islands (q.v.).

Strontium (sym. Sr.; dyad, atom. wt. 87.3, atom. number 38; sp. gr. 2.542) is a ductile pale yellow metal, prepared by the electrolysis of the fused chloride. It occurs as the carbonate in the mineral *Strontianite* (so called from being first found in 1790 at *Strontian* in Argyllshire) and as the sulphate in *Celestine*. It belongs to the barium group of metals, and has most of the properties of the group. Its salts, especially the nitrate and chlorate, are used in pyrotechny for the purpose of producing a crimson flame. The metal decomposes water at the ordinary temperature, evolving hydrogen, but it is hardly affected in pure dry air. Its oxide and hydroxide are used in the purification of beet-sugar as its compounds are non-poisonous. The soluble salts are the nitrate $\text{Sr}_2(\text{NO}_3)_2$, the chloride, SrCl_2 , and the chlorate $\text{Sr}_2(\text{ClO}_3)_2$. Strontium is detected by giving a precipitate with sulphuric acid or with soluble sulphates, and by imparting a crimson colour to the Bunsen flame; it is distinguished from barium by the fact that it is not precipitated by silico-fluoric acid or by thiosulphates. The pure metal was first prepared by Bunsen in 1855, but Davy had separated it in an impure condition in 1807.

Strophanthus, a genus of Apocynaceæ, natives of tropical Africa and Asia. The flowers are in terminal heads; the corolla is funnel-shaped, with its limbs divided into five long cord-like segments (hence the name, Gr. *strophos*, 'a twisted cord,' *anthos*, 'a flower'); the style is thread-like, surmounted by a cylindrical stigma; and the fruit is a double follicle. Each follicle contains a large number of seeds having beautiful comose awns. There are several species, but the best known is *Strophanthus Kombé*, the seeds of which are largely used in medicine. This species is widely distributed in tropical Africa, and climbs up

the highest trees, hanging from one to the other in festoons. It has follicles 8 to 12 inches long, containing from about 100 to 200 seeds, each of which weighs about 3 centigrams. An extract of the seeds is used as an arrow-poison (Kombé or inee) in districts widely apart, as at Kombé, in the Manganja country, in the Zambezi district, in the Somali country, in the Gabun district, in Guinea, and in Senegambia. Dr Livingstone described it as used for killing animals only. The wounded animal is followed until the poison begins to take effect, it is then watched until it drops, the portion of meat round the wound is cut away, and all the rest eaten.

In the British Pharmacopœia *Strophanthus* is defined as the mature ripe seeds of *Strophanthus Kombé*, freed from the awns. Each seed is about $\frac{3}{8}$ inch long, $\frac{1}{4}$ inch broad, oval in shape, and flattened at the sides. The seed-coat is of a fawn colour, and covered with silky hairs. The kernel is white and oily, with a very bitter taste. The seeds contain an active principle, *strophanthin*, which is extremely poisonous, the medicinal dose of it being $\frac{1}{120}$ to $\frac{1}{60}$ grain. The drug is usually administered in the form of the official tincture of strophanthus made from the seed, of which the dose is 12 to 30 centimils (2 to 5 minims). Its action and uses are very similar to those of *Digitalis* (q.v.).

Stroud, a manufacturing and market town of Gloucestershire, 9 miles SSE. of Gloucester, on an eminence in a valley sheltered by the Cotswolds, where the Frome and Slade rivulets unite to form the Stroud Water or Frome. The water of this stream being peculiarly adapted for use in dyeing scarlet and other grain colours, cloth-factories and dyeworks have been built along its banks; and Stroud itself is the centre of the woollen manufactures of Gloucestershire, and contains a number of cloth-mills. The parish church, St Lawrence, was rebuilt, with exception of the old steeple, in 1867; the town-hall, incorporating an Elizabethan façade, in 1865; and there are also the Subscription-rooms (1836), the Holloway Institute, and art and technical schools. Stroud makes an excellent centre for visiting the Cotswold district. From 1832 to 1885 it formed a parliamentary borough with twelve other parishes, returning two members. Pop. (1881) 9535; (1921) 8561.

Struensee, JOHANN FRIEDRICH, COUNT, was the son of a German pastor of Halle, where he was born 5th August 1737. He studied medicine, and was appointed (1759) town physician in Altona. But in 1768 he accepted the post of private physician to Christian VII. of Denmark (1749-1808). He soon gained the complete confidence not only of the weak young king, but also of his consort, Caroline (1751-75), sister of George III. of England, who had a most unhappy lot as the wife of Christian. Struensee and the queen speedily possessed themselves of all power in the kingdom, dismissing the former ministers, forcing the king to abstain from all interference with government, and endeavouring to free Denmark from Russian influence, and to find a natural ally in Sweden. The changes which Struensee undertook in internal affairs were directed to the advancement of the prosperity of the country, of civil liberty, and enlightenment. He put the finances in order, reduced the expenditure, loosened the fetters in which industry and trade had been bound, encouraged education, mitigated the penal laws, and brought order into the administration. An act passed in 1771 to a certain extent abolished serfdom. But by all these measures he offended and outraged the nobility and the clergy, and by the haste and want of statesmanlike tact and skill with which they were carried out he appeared to the peasantry as little different from a despotic tyrant.

The disaffected nobles and deposed ministers found a supporter in Christian's step-mother, and procured from the king an order for the arrest (16th January 1772) of the queen and Struensee. From both a confession of criminal intimacy was extorted; the queen was confined in the prison-fortress of Kronborg, while Struensee was cast in chains into the citadel of Copenhagen. Various charges of abusing the royal authority, attempting to force the king to abdicate, besides that of adultery with the queen, were laid to the charge of the favourite, and on 28th April 1772 he was beheaded. Queen Caroline's marriage was dissolved, and, parted from her only little daughter, she was conveyed by a British frigate to Hanover, where she died at Celle in 1775.

See a very full account in the *Memoirs and Correspondence* (1849) of Sir Robert Murray Keith, who was British envoy to Copenhagen at the time, and saved the queen from the fury of the populace; Wraxall's *Life and Times of Queen Caroline Matilda* (3 vols. 1864); the article by Ward in *Dict. Nat. Biog.* (vol. ix.); and Life by Wilkins, *A Queen of Tears* (1904).

Strutt, JOHN WILLIAM. See RAYLEIGH.

Strutt, JOSEPH, antiquary, was born at Springfield in Essex, 27th October 1742, at fourteen was apprenticed to an engraver, studied art in the Royal Academy, and early gave himself to exceptionally laborious studies at the British Museum. He died in London 16th October 1802, after a life spent, spite of poverty and sickness, in devotion to learning. His most important book was his last, the invaluable *Sports and Pastimes of the People of England* (1801; enlarged by Cox, 1903). Other books were his *Regal and Ecclesiastical Antiquities of England* (1773); *Horde-Angel-Cynnan*, or a complete view of the Manners, Customs, Arms, Habits, &c. of the Inhabitants of England (1774-75-76); *Chronicle of England*, down to the Norman Conquest (1777-78); a *Biographical Dictionary of Engravers* (1785-86); and *Complete View of the Dress and Habits of the People of England* (1796-99). See Life by Miller-Christy (1898).

Struve, FRIEDRICH GEORG WILHELM, German astronomer, was born at Altona, April 15, 1793, educated at the university of Dorpat (Russia), and appointed to a post in the observatory of that place in 1813. He became director of the Dorpat Observatory in 1817, and in 1839 was placed at the head of the new observatory of Pulkova near St Petersburg. He retired in 1861, and died at St Petersburg on 23d November 1864. He directed his attention principally to the observation of double stars, and collected materials for three important works (1827, 1837, 1852) dealing with this branch of astronomy. He also carried out a number of important geodetic operations, such as the triangulation of Livonia (in 1816-19) and the measurement of an arc of the meridian in the Baltic Provinces (in 1822-27), which was subsequently (1828-56) extended by him, in conjunction with Hansteen (q.v.) and Selander, to the North Cape, and by General Tenner southwards to Ismail in Turkey. For this last gigantic undertaking, see Struve's *Arc du Méridien entre le Danube et la Mer Glaciale* (St Petersburg, 1857-60).

—His son, OTTO WILHELM STRUVE (in Russia Vassilievitch, as his father was Vassili), also an astronomer, was born at Dorpat, May 7, 1819, became his father's chief assistant and successor at Pulkova. He made many astronomical discoveries, including 500 new double stars and a satellite of Uranus, and published papers on the rings of Saturn, the periodic motions of double stars, &c. He died 14th April 1905.—One of Otto's sons became director of the observatory at Berlin, and another professor of Astronomy at Kharkoff.

Stry, or **STRYI**, a town of Eastern Galicia, on a tributary of the Dniester, 45 miles by rail S. of Lemberg, with sawmills and tanneries. Pop. 30,000, nearly one-half Jews. The town was almost wholly burned down in April 1886.

Strychnine, a poisonous drug, is named from the genus *Strychnos* (q.v.). The most notable species is *S. Nux-vomica*, so called from the name *Nux Vomica* given to its seeds, the source of strychnine. The tree and its seeds are described at **NUX VOMICA**. From various species of *Strychnos* are obtained the Clearing-nut (q.v.), the Curari (q.v.) poison, and Ignatius' Beans (q.v.); while one kind of Upas poison (*Upas tieute*) is made from a species of *Strychnos*.

Strychnine, $C_{21}H_{22}N_2O_8$, is an alkaloid occurring in crystals, has an intensely bitter taste, is colourless and inodorous, scarcely soluble in water, but easily soluble in boiling rectified spirit, in ether, and in chloroform. Pure sulphuric acid forms with it a colourless solution, which, on the addition of bichromate of potash, acquires an intensely violet hue, speedily passing through red to yellow. In nitric acid it ought, if pure, to form a colourless solution; if the solution is reddish it is a sign that brucine is also present. Strychnine combines with numerous acids, and forms well-marked salts, which give the same reactions as the base itself. *Nux vomica* seeds contain about .2 to .5 per cent. of it. *Brucine* (q.v.) is also present.

Strychnine and brucine occur not only in *nux vomica*, but in the seeds of *Strychnos Ignatii* (St Ignatius' beans) and in the seeds and other parts of several plants of the genus *Strychnos*. *Nux vomica* and its alkaloids are very poisonous to all kinds of animals. It is believed, however, that the bird called *Buceros rhinoceros* eats the nuts with impunity; and a peculiar kind of *Acarus* lives and thrives in the extract of the nuts. In small doses ($\frac{1}{16}$ th to $\frac{1}{8}$ th grain) it is largely used in medicine as a stimulant, as a tonic, and as a bitter. The official preparations are made from *nux vomica* and from strychnine. In poisoning with strychnine the symptoms depend on excessive stimulation of the spinal cord, and when fully developed consist in rigid tetanic convulsions. These are preceded by muscular twitchings, cramps, and jerking movements. Each spasm lasts one or two minutes, and is followed by a short remission, during which the person lies completely exhausted, but able to converse and swallow. The slightest touch, a noise, or even a draught of air will bring on a spasm. The mind generally remains quite clear. Death takes place within two hours from exhaustion, or from suffocation produced by the impossibility of breathing during the spasms. Death may occur in a few minutes, however; a quarter of a grain is the smallest fatal dose of strychnine recorded, but patients have survived much larger amounts.

The treatment, after emptying the stomach, consists in keeping the patient as quiet as possible, and in administering substances which will depress the spinal cord, and thereby allay the tetanic spasms. Chloral hydrate and bromide of potassium by the mouth or rectum have been found useful in this respect. But putting the patient deeply under the influence of chloroform is probably the most efficacious mode of treatment.

Strychnos, a tropical genus of trees and climbing shrubs, of the Loganiaceæ, several species of which produce edible fruits. Both the Dayaks of Borneo and the Indians of Guiana and Brazil get the poisons for their blowpipe-darts from this genus. See also **BRUCINE**, **CLEARING-NUT**, **CURARI**, **IGNATIUS' BEANS**, **NUX-VOMICA**, **STRYCHNINE**.

Strype, **JOHN**, a voluminous ecclesiastical historian, was born in London, November 1, 1643,

the same year as Burnet. He was educated at St Paul's School, whence he passed first to Jesus College, then to Catharine Hall, Cambridge. He was presented in 1669 to the perpetual curacy of Theydon-Bois in Essex, which he resigned a little later to become minister of Low Leyton in the same county. Later he received the sinecure of Tarring in Sussex and the lectureship of Hackney, which he resigned in 1724. He died at Hackney, December 11, 1737, aged ninety-four. His works fill thirteen folio volumes (27 vols., Clar. Press ed., 1821-43). The most important are *Memorials of Archbishop Cranmer* (1694); *Life of Sir Thomas Smith, Secretary of State to Edward VI. and Elizabeth* (1698); *Lives of Bishop Aylmer* (1701), *Sir John Cheke* (1705), *Archbishop Grindal* (1710), *Archbishop Parker* (1711), and *Archbishop Whitgift* (1718); *Annals of the Reformation* (vol. i. 1709, vol. ii. 1723, vol. iii. 1728, and vol. iv. 1731); *Ecclesiastical Memorials*, relating to religion and the Church of England under Henry VIII., Edward VI., and Queen Mary (3 vols. 1721). This last is his best work, forming, with Burnet's more readable *History of the Reformation*, a consecutive and full account of the reformed Anglican Church. Strype also published an enlarged edition of Stow's *Survey of London* (2 vols. 1720), with several sermons and pamphlets. As a writer he is heavy and unskilful in arrangement, but laborious and honest, and his transcriptions of the ancient papers he published may be trusted. A simple-minded but sincere man, he has left to posterity a series of works of the very greatest value despite their prolixity, irrelevant details, and tiresome repetitions.

Stsherbatsky, **FEDOR IPPOLITOVICH**, Russian scholar, born in 1867 at St Petersburg, studied philology, and in 1904 became professor of Indian literature at St Petersburg University. A profound student of Buddhism, he has made several authoritative contributions to learning, notably *The Theory of Knowledge and Logic according to the Later Buddhists* (1899), *The Central Conception of Buddhism* (1923), *The Conception of Nirvana* (1926).

Stuart. See **STEWART**.

Stuart, **GILBERT CHARLES**, American painter, was born at Narragansett, R.I., 3d December 1755. In his boyhood he went to Edinburgh with a Scots painter named Alexander, with whom he studied his art; but his master dying, he worked his passage home, and began to paint portraits at Newport. In 1775 he made his way to London, where he led for two years a Bohemian life; but his talent was recognised by his countryman, Benjamin West, who took him into his family, and soon he became a fashionable portrait-painter. In 1792, in the fullness of his powers and fame, he returned to America, and painted portraits of Washington, Jefferson, Madison, John Adams, and many of the distinguished men of the period, and was at work on a portrait of John Quincy Adams (afterwards finished by Sully) when he died at Boston, 27th July 1828. See a *Life* by G. C. Mason (New York, 1879).

Stuart, **JOHN**, LL.D. (1813-77), a Scottish antiquary, for twenty-four years attached to the Register House. His principal works were *The Sculptured Stones of Scotland* (2 vols. 1856-67) and *The Book of Deer* (see **DEER**). He contributed largely to the *Proceedings* of the Scottish Society of Antiquaries, of which he was secretary.

Stuart, **MOSES**, American divine and author, was born at Wilton, Connecticut, in 1780, and educated at Yale, where he remained for some time as a tutor. He began the study of law, but

abandoned it for theology, was ordained as pastor of a Congregational church at New Haven in 1806, and in 1810 was appointed professor of Sacred Literature at Andover, a position he filled till 1848. During this period he published Hebrew grammars without (1813) and with points (1821), a translation of Winer's Greek grammar, commentaries on Hebrews, Romans, the Apocalypse, Daniel, Ecclesiastes, and Proverbs; *Hebrew Chrestomathy* (1829-30); *Essays on Future Punishment* (1830) and on *Christian Baptism* (1833); *Hints on the Interpretation of Prophecy* (1842); *Conscience and the Constitution* (1850); and numerous translations and letters. He died January 4, 1852.

Stubbes, JOHN, was born about 1541, had his education at Corpus Christi College, Cambridge, and Lincoln's Inn, and died about 1600. He wrote an answer to Cardinal Allen's *Defence of the English Catholics*, but is known by *The Discoverie of a Gaping Gulf, wherein England is like to be swallowed up by another French Marriage* (1579), against the marriage of Elizabeth with the Duke of Anjou. For his patriotism both himself and Page his printer had their right hands struck off. —**PHILIP STUBBES**, his near kinsman, was author of the *Anatomie of Abuses* (1583): conteynyng a Discoverie or Briefe Summarie of such Notable Vices and Imperfections as now raigne in many Christian countreys of the World: but especialie in a very famous Ilande called Ailgna: Together with most fearful Examples of God's Judgements executed upon the wicked for the same as well in Ailgna of late, as in other places elsewhere. Wood tells us that he was 'a most rigid Calvinist, a bitter enemy to popery, and a great corrector of the vices and abuses of his time; and though not in sacred orders, yet the books he wrote related to divinity and morality.' A second part of his book appeared the same year (1583). In form it is a dialogue between Philoponus and Spudeus; the substance is a vehement denunciation of the luxury of the times, valuable in the highest degree to us for the light it throws on the dress and habits of the age of Shakespeare. Stubbes is, himself, really a bigoted and splenetic old fool, and he inveighs with curious passion against all extravagances of dress—'the great ruffs, puffed out doublets of the men; the curling, frizzling, and crisping of the hair of the women; their great ruffs and neckerchers of holland, lawne, camericke, and such cloth, lest they should fall down, smeared and smirched in the devil's liquor—starch.' In his blindness he saps the very foundations of morality by pouring out his wrath alike on the mere extravagances of fashion and upon breaches of the weightier matters of the law. The work was reprinted by W. B. D. D. Turnbull in 1836, and by F. J. Furnivall in the New Shakespeare Society's issues (1879, 1882).

Stubbs, WILLIAM, historian, was born at Knarborough, 21st June 1825, and was educated at Ripon grammar-school and Christ Church, Oxford, graduating with a classical first-class in 1848. He was at once elected to a fellowship at Trinity College, took orders, and became vicar of Navestock, Essex, in 1850. He acted as diocesan inspector of schools from 1860 till 1866, when he was appointed regius professor of Modern History at Oxford, with the year following a fellowship at Oriel. He was appointed librarian to Archbishop Longley at Lambeth in 1862, a curator of the Bodleian in 1868, rector of Cholderton, Wiltshire, in 1875, and canon residentiary of St Paul's in 1879. He was consecrated Bishop of Chester in 1884, was translated to the see of Oxford in 1889, and died 22d April 1901. Bishop Stubbs's historical work is marked by vast learning and rare

impartiality and sagacity; his style was usually somewhat dry, but he raised the standard of historical research in Britain. Of his many works the chief are *Registrum Sacrum Anglicanum*: an attempt to exhibit the course of Episcopal succession in England (1858); Mosheim's *Institutes of Ecclesiastical History*, thoroughly revised and brought down to the present time (3 vols. 1863); *Select Charters and other Illustrations of English Constitutional History*, from the earliest period to the reign of Edward I. (1870); the altogether invaluable *Constitutional History of England in its Origin and Development* down to the accession of the House of Tudor (3 vols. 1874-78); *The Early Plantagenets in 'Epochs of Modern History'* (1876); and *Seventeen Lectures on the Study of Mediæval and Modern History* (1886).

Besides these he edited, in the Records publications, of the reign of Richard I., the *Itinerarium* and *Epistole Cantuarienses* (2 vols. 1864-65); Benedict of Peterborough's *Gesta* of Henry II. and Richard I. (2 vols. 1867); Roger de Hovedon's *Chronicle* (4 vols. 1868-71); *The Historical Collections of Walter of Coventry* (2 vols. 1872-73); *Memorials of Saint Dunstan* (1874); the *Historical Works of Master Ralph de Diceto* (2 vols. 1876); the *Historical Works of Gervase of Canterbury*, covering the reigns of Stephen, Henry II., and Richard I. (2 vols. 1879-80); *Chronicles of the Reigns of Edward I. and Edward II.* (1882-83); William of Malmesbury, *De Regum Gestis Anglorum* (1887-89). The prefaces to these were separately published after his death. He began with the Rev. A. W. Haddan the *Councils and Ecclesiastical Documents relating to Great Britain and Ireland*, based on Spelman and Wilkins (3 vols. 1869-78). Further lectures, on European and on early English history, were published in 1904-8. He was a corresponding member of the Institute of France, and had honorary doctorates from several universities. His letters were edited by W. H. Hutton (1904), who wrote also a Life of him (1906).

Stucco, a term applied to work in plaster of Paris (sometimes mixed with other ingredients) used for coating walls or making casts of figures. See GYPSUM, PLASTERING, CAST.

Stucken, EDUARD, German man of letters, born 18th March 1865 at Moscow, was for a time a merchant, then studied in Berlin, where he eventually settled. As a dramatist Stucken stands in the forefront of the 'new romantic' movement in contemporary German drama, his most impressive production being the cycle of five 'mysteries,' *Der Gral* (1902-16), comprising *Gawdn*, *Lanwöl*, *Lanzelot*, *Merlins Geburt*, *Tristram* and *Ysolt*. A volume of verse, *Das Buch der Träume* (1916), was very well received, and his fame was further established by a long but clever novel, *Die weissen Götter* (3 vols. 1918-20). Since 1896, when his first play *Yrsa* appeared, Stucken has written ballads, elegies, romances, and many other plays.

Stud-book, a book containing the pedigrees of animals, especially horses. That for race-horses, edited by the officials of the Jockey Club, dates from 1808. There are stud-books for Clydesdale horses, cattle, &c., and even separate ones for collies, fox-terriers, St Bernard dogs, &c.

Stuffing. See TAXIDERMY.

Stuhlweissenburg (Hung. *Székes Fehérvár*, Lat. *Alba Regia*), a town of Hungary, and seat of a bishop, lies in a swampy plain, 39 miles SW. of Budapest. Here from 1027 to 1527 the kings of Hungary were crowned and buried. The town was in the possession of the Turks almost continuously from 1543 to 1688. It is now greatly decayed, but has celebrated horse-fairs. Pop. 36,500.

Stukeley, WILLIAM, antiquary, was born at Holbeach, Lincolnshire, 7th November 1687, and from the grammar-school there passed in 1703 to Corpus Christi College, Cambridge. Having taken his M.B. (1709) and studied at St Thomas

Hospital, he practised successively at Boston, London, and Grantham, meanwhile proceeding M.D., and being admitted an F.R.C.P. But in 1729 he took orders, and, after holding two Lincolnshire livings, in 1747 was presented to the rectory of St George the Martyr in Queen Square, London, where he died, 3d March 1765. His twenty works, published between 1720 and 1726, and dealing with Stonehenge, Avebury, and antiquities generally, enshrine a good deal that is curious, and have preserved much that might else have perished, but they are marred by a credulity and fancifulness which won for him the title of the 'Arch-Druid.' See his *Family Memoirs*, edited for the Surtees Society (3 vols. 1884-87).

Stupa. See TOPE.

Sturdee, Sir FREDERICK CHARLES DOVETON, British admiral (1917), born 1859, entered the navy in 1871, and wiped out a German squadron off the Falkland Islands, 8th December 1914. He died in 1925.

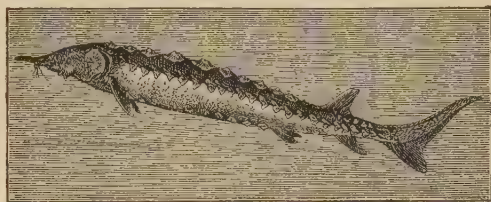
Sturdy, or the GID, affects young sheep, and sometimes young cattle, and is due to the presence within the brain of a Hydatid or bladder-worm, *Cœnurus cerebralis*, which is the asexual or cystic stage of the tapeworm *Tœnia cœnurus*, mostly found in dogs. The bladder or cyst, sometimes the size of a hen's egg, or even larger, consists of an enveloping membrane, and contains a watery fluid. Upon its internal surface the membrane bears numerous white dots in groups, the heads of the future tapeworm in various stages of development. If a dog should eat the bladder-worm, e.g. in eating the head of the dead sheep, the dots will develop in its intestine into tapeworms. The ripe joints of the tapeworm pass on to the grass with the fæces; they break up and liberate ova developing within resistant shells; if these are eaten by the sheep they hatch out in the stomach as microscopic hooked embryos. These bore their way into blood-vessels and get carried to various parts of the body. They develop into bladderworms only in the brain and spinal cord. An infected sheep cannot properly seek its food, loses condition, staggers when moved, turns stupidly round almost in one spot, and usually towards the side on which the hydatid lies. The parasite and its sac may generally be removed by placing the sheep, with its feet tied, on a table or bench, searching for the softened portion of the skull, which generally overlies the hydatid, laying back a flap of skin, and introducing the trochar and canula, and, when the sac is deep-seated, cautiously withdrawing it with the help of a small syringe. Protected by a leather cap and simple water-dressings, the wound may heal and the sheep recover.

Sture, a noble family of Sweden, which furnished three successive regents to that country during the period (1470 to 1520) of its nominal union with Denmark. The first of these was STEN STURE THE ELDER (died 1503), an enlightened and far-seeing statesman, who, relying upon the peasantry, combated the pretensions of both clergy and nobility, successfully withstood the Danes, and encouraged learning by founding the university of Uppsala, introducing printing into Sweden, and inviting thither learned men. He was succeeded by his nephew, SVANTE NILSSON STURE (died 1512), who also fought bravely against the Danes; and the third regent of the family was STEN STURE THE YOUNGER (died 1520), who was mortally wounded in battle against the Danes.

Sturgeon (*Acipenser*), a genus of Ganoid fishes of the family Acipenseridae, order Chondrostei. The Chondrostei are Ganoids without ganoid scales, the skin being either naked or with bony plates, as in the sturgeon. The skull is cartilaginous, but

covered externally with bony plates belonging to the skin. The tail is asymmetrical or heterocercal, and the gelatinous notochord persists in the centre of the vertebral column throughout life. Spiracles like those of sharks and skates are present in some genera. The distinguishing features of Acipenser are these: the body is long and narrow, and the skin is provided with five longitudinal rows of bony shields, each bearing a projecting keel. One row of these bony plates is along each side of the body, one along the back, and one on each side of the ventral surface. The skin between these rows of plates is naked, but contains minute scales which give it a rough surface. The head projects into a flat, pointed snout, provided with fleshy tentacles or barbels; and on the under surface of this snout, some distance behind its extremity, is the mouth, which is without teeth, and capable of protrusion. The gill-opening is wide. There are two pairs of fins, the pelvic being situated a long way back, close to the anus. There are two median fins, one dorsal and one ventral, both near the tail. The fin-rays are jointed and flexible. Spiracles are present behind the eyes. The air-bladder communicates with the gullet. There are many species of sturgeon, all confined to the northern hemisphere. They live in the sea and great lakes, and ascend the great rivers. All are of considerable size, and supply valuable commodities, for which they are regularly captured on a large scale. These commodities are their flesh, which is palatable and wholesome, their roe (Caviare, q.v.), and their air-bladders, from which isinglass is made. The eggs are small and numerous, like those of bony fishes; there is no copulation, the ova being laid and fertilised on the bottom of the upper parts of rivers, like those of the salmon. The food of sturgeons consists of worms, crustacea, and molluscs, which they seek by routing in the sea-bottom with their snouts.

The Common Sturgeon (*A. sturio*) is the only species which occurs in British seas and rivers.



Sturgeon (*Acipenser sturio*).

The specific characters distinguishing the species are minute, consisting in the number of the bony scales, position of the fins, length of the snout, &c. *A. sturio* is sometimes taken by trawlers at sea, more often in salmon stake-nets, and in estuaries, especially in the Severn. It enters the rivers in the early part of the year for the purpose of breeding. When adult it is from 6 to 10 feet long. It occurs in the Mediterranean, western and northern Europe, and on the Atlantic coast of America, but is absent from the Black Sea and Danube, and from the Caspian Sea. In England, as early as Edward II.'s reign, the sturgeon was a royal fish, belonging to the king when captured. The Sterlet (*A. ruthenus*) is a much smaller species, which is common in the Black and Caspian Seas, and ascends the Danube as far as Vienna. It is one of the principal objects of the sturgeon-fishery on the Volga. *A. huso* is the largest species, reaching 25 feet in length, and also belongs to the Black and Caspian Seas. *A. stellatus* is another species of these seas; it reaches 5 feet in length. Other species occur on the Atlantic and Arctic coasts of North America, in the great lakes of the St

Lawrence system, in California, and on the west coasts of the North Pacific, in China, and eastern Siberia. *A. brevirostris* belongs to the southern Atlantic coasts of the United States. The species of the great lakes of the St Lawrence is *A. rubicundus*. The species of California and the Pacific coast is *A. transmontanus*.

The most important sturgeon-fishery in Europe is that of the Volga and the Caspian Sea. The flesh of the fish is salted, and caviare and isinglass made on a large scale from the roes and air-bladder. In America sturgeon flesh is eaten fresh, and caviare is made both in Georgia and in San Francisco; but there is no great fishery in any particular district, and the manufacture of Isinglass (q.v.) does not receive much attention.

Sturlason. See SNORRI.

Sturm, JOHANNES, well known as an educational reformer, was born at Schleiden, near Aix-la-Chapelle, 1st October 1507. In his fifteenth year he was sent to Liège, where he attended a school of the Brothers of the Common Life—a school so admirably organised that in his own subsequent reform of the schools at Strasburg Sturm largely followed its model. Three years later Sturm continued his studies at Louvain, then the most enlightened centre of the higher studies north of the Alps, where shortly before there had been founded a college for the teaching of Latin, Greek, and Hebrew. Besides his zeal as an educational reformer Sturm all through life had the ambition to write a Latin style framed on the best models of antiquity. It was at this time, therefore, that he began the assiduous study of Cicero, whom to the end he never ceased to read with unabated zeal. He remained some five years in Louvain.

In 1529 he went to Paris, and at first gave himself to medicine, with a view to securing a settled competence. But his natural instinct again declared itself, and he returned to the study of Cicero, on whom he gave courses of lectures in the Collège Royal. Besides lecturing on Cicero he also taught dialectics, and had for one of his students Petrus Ramus (q.v.). As a sympathiser with the new teaching in religion, identified as yet only with the name of Luther, it was at some risk that Sturm made his home in Paris. Accordingly, when a request was made to him (1536) by the authorities of Strasburg to come to their assistance in re-organising the education of their town, Sturm willingly accepted their offer. By its position on the frontiers of France and Germany Strasburg played a part of the highest importance in the political and religious history of the 16th century. Both in the religion and politics of his time Sturm took a prominent part, and on different occasions was sent on missions to France, England, and Denmark. In religion he took sides with Zwingli against Luther, with whose followers in Strasburg he was in constant controversy, which embittered all the later years of his life.

Before Sturm's settlement in Strasburg its magistrates had shown an enlightened interest in public instruction; but guided and inspired by Sturm the town became one of the most important educational centres in Europe. Two years after his arrival (1538) a new gymnasium was established, with Sturm as its rector, and at the same time boarding-houses were erected for poor students with the object of suppressing the mediæval practice of mendicancy. Elementary and secondary education were thus provided for; but it was the ambition of Sturm that the higher studies should also be within reach of every youth of Strasburg. The divided councils of the town, however, and the outlay the organisation of such studies would imply delayed Sturm's scheme till as late as 1564.

In that year was founded the Strasburg Academy, which, together with the Gymnasium, supplied a complete course of instruction in all the learning of the time. Sturm's ideal in education was 'to direct the aspiration of the scholars towards God, to develop their intelligence, and to render them useful citizens by teaching them the skill to communicate their thoughts and sentiments with persuasive effect.' In carrying out this ideal, described in his favourite phrase *pietas literata*, Sturm showed his superiority by his judicious gradation of the course of study, and by his novel and attractive methods of instruction. It is his chief praise that beyond all his contemporaries he succeeded in correlating public instruction to the moral and intellectual development of his time. It was little to the credit of Strasburg, therefore, that in his last years he was forced to leave the town through the intolerance of Lutheran zeal. Eventually permitted to return, he died on 3d March 1589. He was a voluminous writer, but, except for the light they throw on the great questions of the 16th century, his works possess no independent value.

See Charles Schmidt, *La Vie et les Travaux de Jean Sturm* (Strasburg, 1855), and German works by Laas (1872) and Kückelhahn (1872).

Stürmer, BORIS VLADIMIROVICH (1849–1917), Russian politician, found his way into high society while a student at St Petersburg University. Among his numerous political appointments he counted the presidency of the Tver Zemstvo (1892), provincial governorships, prime ministry (1916), ministry for Foreign Affairs. He died in prison after the revolution.

Sturm und Drang. See GERMANY, p. 194.

Sturt, CHARLES, explorer, was born in Bengal Presidency, 28th April 1795, went as captain of his regiment to Australia, and between 1828 and 1845 headed three important expeditions (see AUSTRALIA), from the last of which he returned blinded by hardship and exposure. He held several colonial appointments, and in 1851 received a pension. He wrote two narratives of his explorations (1833 and 1848), and died at Cheltenham, 16th June 1869. See Life by Mrs N. G. Sturt (1899).

Stuttering. See STAMMERING.

Stuttgart, the capital of Württemberg, stands in a natural basin (817 feet above sea-level) surrounded by hills, which are studded with villas, vineyards, and gardens, and crowned with woods, about 2 miles from the Neckar, and 189 by rail WNW. of Munich, 127 SSE. of Frankfurt. Except the churches, most of the public edifices date from the 19th century, and are chiefly built in the Renaissance style. The centre of the place is the Palace Square, upon or near which stand the following buildings: the new palace (1746–1807), now used as museum, &c., the old castle (16th century), two or three other palaces of the former royal family, the Königsbau (shops, bourse, concert-rooms, &c.), the theatre, the railway station (one of the finest in all Germany), the post-office, the Akademie (formerly the Carl School; now library and guardhouse), and the jubilee column (1841), and statues of Schiller and Duke Eberhard. The Collegiate Church, St Leonard's, and the Hospital Church date from the 15th century. The last two, as well as the modern church of St John, are in the Gothic style. The other chief public institutions of Stuttgart are its famous Polytechnic (with 2000 students), the High School of Music, the *Landesbibliothek* (706,000 vols., with a fine collection of over 8000 Bibles), the 'Library of the World War' (1915), museums, picture-gallery, and other collections and educational establishments. Stuttgart ranks next after Leipzig as a centre of the German book-trade. It has, moreover, active industries

connected with textiles, beer, pianofortes, chemicals, chocolate, artists' colours, furniture, wood-work, and has celebrated fairs for books, hops, horses, and cloth. The newer portion of the town is to a large extent residential. North-east from the palace lies a picturesque park with some good statuary, extending almost all the way to Cannstatt (q.v.). The latter, a popular resort and spa, about 2 miles NE., was in 1904 incorporated in the city of Stuttgart. Hegel and Hauff were born at Stuttgart, and Schiller studied at the Akademie. Pop. (1875) 107,573; (1910) 286,218; (1925) 337,199. Stuttgart owes its name and origin to a stud-farm of the early Counts of Württemberg, and has been the capital since 1482.

Stuyvesant, PETER, governor of New York, was born in Holland in 1592, became governor of Curaçoa, and lost a leg in the attack on St Martin, and in 1646 was appointed captain-general of the New Netherlands. He proved a vigorous but arbitrary ruler, a rigid Sabbatarian, and an indignant opponent of political and religious freedom. Yet he did much for the commercial prosperity of the city, which received its name of New Amsterdam in 1653, and which he would fain have held against the English in 1664, when it became New York. He afterwards lived at his farm, the 'Great Bouwerie,' whose name survives in one of the older streets of the city which soon covered it; and there he died in 1672.

Stye. See EYE.

Style, OLD AND NEW. See CALENDAR.

Stylites, SIMEON, the earliest and most famous of the ascetics called Pillar-saints (Gr. *stylites*), had been a monk, and had lived, in the beginning of the 5th century, in extreme seclusion in his Syrian monastery for nine years, without ever moving from his narrow cell. Increasing in enthusiasm he withdrew to Telanessa, near Antioch, where he established himself on the top of a pillar 72 feet high, and only 4 feet square at the top. Here he spent thirty years. During the day he preached to the crowds who gathered at the foot of his pillar; and his admonitions to emperors and empresses were accepted with humility. The fame of his sanctity brought crowds of pilgrims from the most distant countries to see him; and the admiration of his fasting and other austerities is said to have converted many pagans to the church. He died on his pillar in 459, aged seventy-two, and was buried with the greatest pomp at Antioch. A disciple of Simeon, named Daniel, succeeded to his reputation for sanctity, and to his mode of life, which he maintained for thirty-three years, in the still more trying climate of the shores of the Bosphorus, about 4 miles from Constantinople. The emperor at length insisted on a covering being placed over the top of the pillar, and Daniel survived till the year 494. In Syria there were many pillar-saints as far down as the 12th century; but in the west Daniel is all but a solitary example. A monk named Wulfailich, near Treves, attempted the pillar-life in the 6th century, but the neighbouring bishops compelled him to desist and destroyed his pillar.

Styptics (Gr. *styptikos*, 'astringent') are agents employed in Surgery for the purpose of checking the flow of blood by application to the bleeding orifice or surface. See BLEEDING.

Styracaceæ, a family of dicotyledons close akin to Sapotaceæ and Ebenaceæ, distinguished from the former by absence of latex, from the latter by having hermaphrodite flowers. For Styrax, the principal genus, see STORAX.

Styria (*Steiermark*), a province of the Austrian republic, enclosed by the provinces of Carinthia,

Salzburg, Upper Austria, Lower Austria, Burgenland, and bordered on the south by Yugoslavia. Its area is 6323 sq. m., pop. 980,000. Styria is a mountainous country, traversed in all parts by ramifications of the Alps. The Mur flows eastward through the middle of the province to Bruck, then turns abruptly south to join the Drava; while the Enns skirts the north-west boundary. The climate is variable, but generally raw and cold in the northern and more mountainous portion, though milder in valleys. Forests of varied character cover half of the area; one-fourth is meadow and pasture; and the rest is mostly under cultivation, producing oats, maize, rye, potatoes, roots for cattle, flax, wine; very little is unproductive. Cattle are raised on the high grounds and horses bred in the Enns valley. The chief wealth of the country, however, lies in its mineral products, especially iron and lignite; the secondary minerals include salt, coal, graphite, zinc, magnesite, &c. The chief industries are connected with the production of iron and steel, and their manufacture into machinery, locomotives, agricultural implements, wire, and so forth. The ample water power allows of numerous electrical works. There are also manufactures of chemicals, paper, cloth, gunpowder, beer, tobacco, glass, &c. Styria was anciently divided between Noricum and Pannonia, and in the end of the 6th century was colonised by the Wends (Slavs). In 1056 it was separated from Carinthia and made a separate margraviate; and in 1192 it was joined to the Austrian crown, having a few years previously been made a duchy. The duchy was terminated in 1918. Styria became a federal province of the Austrian republic, but was much curtailed, its southern portion, amounting to 2300 sq. m. or about one-quarter of the whole, being allocated (1920) to Yugoslavia (see SERBIA).

Styx (Gr. *stygēin*, 'to hate'), one of the rivers of Hades—the tenth part of the waters of Oceanus—flowing round it seven times with dark and sluggish stream, across which Charon ferries the shades of the departed. The nymph of this stream was the daughter of Oceanus and Tethys, and she first, together with her children, came to the help of Zeus against the Titans. For this service they were taken to Olympus, and she herself became the goddess by whom the most solemn oaths of the immortals were sworn. When such an oath was taken Iris brought some of her sacred water in a golden cup, and whoso swore falsely by it lay speechless and breathless for a year, and was banished nine from the councils of the gods.—A rocky stream falling into the Crathis in the north-east of Arcadia bore this name, the scenery around it being fittingly weird and desolate.

Suabia. See SWABIA.

Suaheli. See SWAHILI.

Sua'kin, or more correctly SAWAKIN, a seaport of the Red Sea, stands on a small rocky island in a bay on its west side, and is the principal outlet for the commerce of Nubia and of the countries of the Sudan beyond. The island-town is connected with the settlement of El-Keff on the adjacent mainland by a causeway. There are industries in silver ornaments, knives and spear-heads, and leather-work. Here some 6000 or 7000 pilgrims embark every year for Mecca. The Egyptians occupied this port when they extended their power over the Sudan; and in its vicinity several battles were fought between the allied Egyptians and English against the fanatical followers of the Mahdi. The railway to Berber, opened in 1906, connects with the Khartum line. Pop. 8000.

Suarez, FRANCISCO, a philosopher and divine of the Roman Catholic Church, was born at Granada on 5th January 1548. As a youth he was

so backward that he had considerable difficulty in gaining admission to the order of the Jesuits. But his mind ripened rapidly and developed in some respects unusually high qualities. During the course of his career he taught theology at Segovia, Valladolid, Rome, Alcalá, Salamanca, and Coimbra. His theology was a modification of that of Molina (q.v.); he held that in the case of the elect there is a peculiar grace granted, specially adapted to their several individual natures. In formal scholastic philosophy he steered a middle course between realism and nominalism. The most notable of his books were what may be termed the earliest foreshadowing of the modern doctrine of international law (*Tractatus de Legibus ac Deo Legislatore*) and a treatise condemning the extravagant pretensions to kingship put forward by James I. of England. This latter (*Defensio Catholice Fidei*) was written in 1613 at the command of the pope. Suarez died at Lisbon on 25th September 1617. His works were published in 23 vols. at Mainz and Lyons in 1630 *et seq.*, and in 29 vols. at Paris in 1859. There is a Life of him by Deschamps (Perpignan, 1671), and another by Werner (2 vols. Ratisbon, 1861).

Subahdar was, under the Mogul government, the title of a governor of a province. It now designates a native officer in the army in India, holding a rank equivalent to that of captain, but subordinate to the European officers.

Subiaco (anc. *Sublaquerum*, i.e. below the lakes of Nero's villa, which was situated in the wild Anio gorge opposite to the monasteries), a city of Italy, lies embosomed in hills beside the Anio, 47 miles E. by N. from Rome, and was the cradle of the Benedictine order and the place where the printing-press was first set up in Italy (1465). There are two monasteries dating from the 6th century, founded by St Benedict himself, one of which (Santa Scolastica) contains a small but valuable library, and has fine cloisters in the Cosmatesque style, whilst the other was built into and over the cave in which St Benedict lived, and contains interesting and important paintings of the 13th-15th centuries, including a contemporary portrait of St Francis of Assisi. The city was greatly favoured by Pope Pius VI.: he enlarged its castle (built 1068), erected a church, &c. Pop. 9000.

Subinfeudation. See LAND LAWS.

Subject. See OBJECT.

Sublapsarian. See PREDESTINATION.

Sub-lieutenant. See LIEUTENANT.

Sublimation is a chemical process similar to distillation, but differing from it in the nature of the substances to which it is applied. While in distillation *liquids* are converted by the agency of heat into vapour, which is condensed in the liquid form usually by the cooling action of water, in sublimation *solid* bodies are reduced by heat to the state of vapour, which reassumes the solid form on cooling. Sublimation is usually conducted in a single vessel of glass or iron, the product being deposited in the upper part of it in a solid state, while the impure residue remains at the bottom; but in the case of sulphur the vapour is condensed on the walls of a large chamber. Iodine affords a good example of sublimation. On gently heating the lower part of a Florence flask containing a little of this substance a purple vapour rises, which almost immediately condenses in small brilliant dark purple crystals in the upper parts of the flask, while any impurity that may be present remains at the bottom. Amongst the substances obtained by this process, and employed in the Pharmacopœia, are arsenious acid, benzoic acid, corrosive sublimate, and sublimed sulphur.

Submarine Forests. See FOSSIL, PEAT, and POSTGLACIAL AND RECENT SYSTEM.

Submarine Mines. See MINES (MILITARY).

Submarine Navigation. When the Diving-bell (see DIVING) had shown that air for respiration can be supplied to persons in adequately arranged vessels under water, ingenious men began to speculate on the possibility of navigating closed ships or boats in similarly exceptional circumstances. The first submarine boat on record was constructed in the beginning of the 17th century by a Dutchman named Cornelius Drebell, or Drebbelle. She was propelled by oars, and was tried in the Thames by order of James I. She carried twelve rowers, besides passengers. This vessel is alluded to in Robert Boyle's *New Experiments, Physico-Mechanicall, touching the Spring of the Air, &c.* (Oxford, 1660). Pages 363-365 of this curious work contain an account of Drebell's experiment, and state that he accounted his chief secret to be 'the composition of a liquid that would speedily restore to the troubled air such a proportion of vital parts as would make it again for a good while fit for respiration.' The composition of this liquid for enabling the same air to be used again and again was never made public. Bishop Wilkins, who also favoured some other whimsical projects, devoted a whole chapter of his *Mathematicall Magick* (1648) to a dissertation 'Concerning the possibility of framing an Ark for Submarine Navigation.' He here recites the difficulties of the scheme, but evidently considers them not insurmountable; and afterwards he enlarges upon its advantages, in privacy, security from pirates, storms, ice, &c., in naval warfare, philosophical experiments, discoveries, &c. In 1774 an inventor named Day lost his life in an experimental descent in Plymouth Sound in a vessel of about 50 tons burden. One of the most successful machines contrived for submarine navigation was that of Bushnell of Connecticut, which was projected in 1771, and completed in 1775. Bushnell's chief object appears to have been the introduction of submarine warfare. His vessel was propelled by screws, somewhat resembling those now in use for steam-vessels, and there was sufficient air to last for half an hour. In 1800 Robert Fulton, also an American, while residing in France constructed a submarine boat, of which he made many trials, some of them at the expense of the French government, on the Seine, at Brest, and at Rouen. Compressed air was used for respiration, and he remained at a depth of 25 feet for four hours, propelling the boat in any direction; he also successfully attached a torpedo containing gunpowder to the bottom of an old vessel lying in Brest harbour, and blew her up. The vessel patented in 1859 by Mr Delaney of Chicago was egg-shaped in transverse section, and diminished nearly to a point at each end. It had two iron tanks in the interior; one had air pressed into it by an air-pump; the second contained water. The engineer of the boat, by pumping water into or out of the second tank through the action of the air in the first, could raise or lower the boat to different depths in the water. In 1863 the Confederates in Charleston made use of a submarine boat against the blockading Federal squadron. This boat, called a 'David' after her inventor, was built of boiler-plates and propelled by hand by eight men at a maximum speed of four knots; two side-rudders were used for sinking and raising the boat when in motion; she was cigar-shaped, and when advancing to attack her top was just on a level with the surface of the water; three trial trips were made, and each time she sank and failed to rise, the crews perishing before they could be rescued; the fourth trial, however, was successful, and passing out of

the harbour she succeeded in blowing up the *Housatonic*, but could not get clear, and was carried down by the *Housatonic*. Several of these 'Davids' were afterwards constructed by the Confederates, but none of them again succeeded in inflicting any serious damage upon the Federal ships.

Nordenfelt's boats, tried in 1886-87 at Stockholm, Constantinople, and Southampton, seemed at first to promise well; but to France belongs the credit of making submarine boats a real factor in naval warfare. In 1881 M. Goubet designed a small submarine boat, and in 1885 an improved *Goubet* which was 16 feet 5 inches in length, the motive power being electricity. Submersion was effected by admitting water into tanks, which could be expelled again by means of a pump, while an attached safety weight could be immediately released. A torpedo was carried outside, and the speed attained was about six knots. Successful experiments led the French Admiralty to have the *Gymnote* constructed at Toulon in 1888; she was 56 feet 5 inches long, with a displacement of 30 tons, her motive power being electricity stored in accumulators, which gave her a radius of 32 miles at 8 knots. Her trials decided the French authorities to have more vessels built, and by 1901 there were some eleven completed.

In 1901 the English Admiralty took action, and gave orders to the firm of Vickers, Maxim, and Sons, of Barrow, to construct five of the *Holland* type, so called after their designer, an American engineer, who constructed several for the U.S. government. These first five boats were 63 feet 4 inches long, with a beam of 11 feet 9 inches. Their displacement, when submerged, was 120 tons (salt water); their surface speed, with the engine developing 190 i.h.p., was about 12 knots; the submerged speed with 70 electric i.h.p. was from 7 to 8 knots, and they had a sufficient petrol storage to give a radius of action of about 350 miles. The surface motive power was derived from a 4-cylinder gasoline engine; when submerged, and for diving, the dynamo used for charging the accumulators became the motor, and was driven by the electricity previously stored in the accumulators. In addition to the propelling screw, the boats were fitted with two horizontal rudders, by the manipulation of which the boat was made to dive. The armament consisted of one torpedo-tube in the bow, five torpedoes being carried. When a torpedo was discharged, 'compensating tanks' were automatically flooded with water to exactly the same weight, so that the poise of the vessel was preserved. The later pattern boats have a displacement of 1800 tons, with a surface speed of 24 knots and a submerged speed of 9½ knots.

There are two distinct types of submarine vessel—the submarine proper and the submersible. The latter type is used universally by the navies of the world, and during the Great War the Germans relied almost exclusively on their submarine warfare to compel the British to make peace. The submarine campaign was energetically carried out against the allies, and the losses sustained by them were enormous.

Submersibles are forced under water: their surface buoyancy is reduced to almost a minimum by means of water, which is admitted into ballast-tanks, and they are then dived by means of hydroplanes and diving rudders. The thrust of these blades accomplishes and maintains the state of submersion, assisted by the under-water motive power, which is electricity stored in accumulators.

The submersible has two distinct motors—the gasoline or steam engine for surface-running, and electric motors for submerged running. The original disadvantage of the submersible—namely, its inability to submerge quickly—has been com-

pletely overcome, and in the British E type these boats were able to submerge in under a minute when running at 12 knots on the surface.

The under-water endurance of a submarine is limited by the capacity of its electric accumulators and, to a certain extent, the purity of the air. In the Great War, patrolling submarines were submerged, during the summer months in the North Sea, about twenty hours out of twenty-four, the hours of darkness being used for charging the electric batteries.

By constant practice a high standard of efficiency can be maintained, ensuring thereby a large percentage of hits by torpedoes fired from submarines, such difficulties as defective periscopes and torpedoes having been overcome in recent years.

The aim of every submarine commander is to deliver his attack unseen; but this is extremely difficult in calm weather, when the wash of the periscope is easily distinguishable at 1500 yards. With the vast improvements that have been introduced in recent years both in the construction of submarines and torpedoes, the submersible has proved itself to be a very strong weapon in the hands of the weaker naval power.

The damage inflicted by Germany on the allied trade during the Great War was accomplished almost entirely by submarines and submarine minelayers, these latter being constructed about a year after the war had commenced.

Submarine construction advanced tremendously during the Great War; and, previous to the signing of the armistice, the British Admiralty produced a submarine of 1600 tons surface displacement, with a speed of 16 knots, and mounting a 12-inch gun.

The German government produced two submarines for commercial use, named the *Bremen* and *Deutschland*, these being employed running cargoes to American ports before the United States entered the war. Though *Deutschland* made two voyages, it was not a commercial success; *Bremen* was lost on her first voyage, but later more were built. These were converted into submersible cruisers, with 6-inch B.L. guns.

During the Great War, 1914-18, loss of tonnage due to enemy action was mostly due to submarines: British, 9,031,828 tons; foreign, 6,021,958 tons—total world loss, 15,053,786 tons. As to submarines themselves, the British lost about 57; the Germans about 220. Towards the close of the war the British anti-submarine arrangements were so much improved that the German submarines were much demoralised.

Subotica (Hung. *Szabadka*, Ger. *Theresiopel* or *Maria-Theresiopel*), formerly a royal free town of Hungary, now a frontier town of Yugoslavia, stands in the Bačka region on the plain that lies between the Danube and the Theiss, 106 miles S. by E. of Budapest by rail. It is an important railway junction and the centre of a rich agricultural district, with a trade in wheat, cattle, skins, wool, fruit and tobacco. A Law School was founded in 1920. Pop. (1881) 61,367; (1921) 101,857.

Subpoena, in English law practice, means the writ or process by which the attendance of a party or witness in a court of justice is compelled. It is a writ in the king's name commanding him to lay aside his business and all excuses, and attend at the time and place indicated, under a penalty. If the person summoned do not attend and has not a good legal excuse, such as dangerous illness, he may be sued in an action of damages or committed to prison.

Subsidence. See UPHEAVAL.

Subsidies. See CUSTOMS DUTIES, EDWARD I.

Substance is a term which has played a great part in philosophical and theological discussion.

It occurs first in the Aristotelian enumeration of categories, where *ousia* is in a manner opposed to the other nine categories of attribution and relation. This contrast is expressed in the correlation of the Latin terms substance and accident. Substance is defined as that which exists *per se*, whereas attributes or accidents exist *in alio*. The substance, in other words, is regarded as an independent existence, a permanent subject of which the accidents are predicated, and to which they belong as its qualities or states. Individual things were thus treated by Aristotle and the scholastics as existing *per se*; they are, in the Aristotelian phrase, 'the first substances.' To the objection which readily occurs that God alone is in this sense substance—i.e. truly self-subsistent—they replied by the distinction between *per se* and *a se*. If the world is not to be resolved into a flux of accidents, created substances must exist *per se*; but God alone exists *a se* or absolutely. The same distinction—between created substances and God as the one absolutely independent substance—reappears in Descartes, but is repudiated by Spinoza, who thus reaches his completely pantheistic doctrine of the *unica substantia*. In English philosophy the aspect of substance made most prominent is that of an underlying 'substratum' (the Greek *ὑποκείμενον*) or unknown 'support' of the qualities we know. Locke, like Descartes, believed in two classes of substances, material and spiritual; but the negative criticism of Berkeley was brought to bear against the first class, while Hume directed the same battery against the spiritual substances which the bishop had spared, and thus pulverised the world into unsupported accidents. All our perceptions, Hume declares, 'may exist separately, and have no need of anything else to support their existence.' The criticism, however, which is valid against the peculiar form which the doctrine of substance had assumed in Locke ignores the really indispensable character of the conception. The notion of substance as something over and above the qualities—an inaccessible somewhat, hidden behind the qualities instead of being revealed by them—is undoubtedly false. But a pure phenomenalism can yield no theory of knowing or being. The world, as it has been said, is not a flight of adjectives; qualities do not fly loose; they are necessarily unified in a substance or subject. In recent philosophy the misleading idea of a substratum reappears in the Kantian theory of the unknowable thing-in-itself, which in turn develops into the characteristic doctrine of modern agnosticism.

Succession, a term used technically in Roman and Scots law (but not in English law) to denote the taking of property by one person in place of another. The order of succession in Roman and Scots law differs in several respects from that in English law. See HEIR, KIN (NEXT OF), EXECUTOR, HUSBAND AND WIFE, LEGITIM. For legacy and succession duties, see LEGACY and DEATH DUTIES. For APOSTOLIC SUCCESSION, see under that heading.

Succession Acts. From a comparatively early period in English history parliament occasionally exercised the power of limiting or modifying the hereditary succession to the throne. The first instance of such interference occurred in the case of Henry IV.; and parliamentary interposition was subsequently exercised in the case of Henry VII. and in regard to the immediate successors of Henry VIII. The respective rights of James I., Charles I., and Charles II. were acknowledged by parliament. The revolution of 1688 was founded on the so-called abdication of the government by James II. The Convention

bestowed the crown on William and Mary for life, and regulated the claims of Anne. In view of the impending extinction of the Protestant descendants of Charles I. the crown was settled by 12 and 13 Will. III. chap. 2, in the event of the death of William and Anne without issue, on the next Protestant line, according to the regular order of succession—viz. the descendants of the Electress Sophia of Hanover, granddaughter of James I.; and it was at the same time enacted that whoever should hereafter come to possession of the crown should join the communion of the Church of England as by law established (see GEORGE I., HANOVER). This is the latest parliamentary limitation of the crown; but the right of parliament to limit the succession was secured by 6 Anne, chap. 7.

Succession Wars is the general name given to contests which took place in Europe during the 18th century on the extinction of certain dynasties or ruling houses. Four such wars are usually enumerated—that of the Spanish succession (1701–13), of the Polish succession (1733–38), of the Austrian succession (1740–48), and of the Bavarian succession (1777–79). The first and third alone are of sufficient general historical interest to be noticed here.

(1) **WAR OF THE SPANISH SUCCESSION.** Charles II., king of Spain, having died without direct descendants in November 1700, claims were raised to the vacant throne by the husbands of his two sisters, Louis XIV. of France, who had married the elder, and the Emperor Leopold I., who had married the younger. Both these monarchs were also themselves grandsons of Philip III. of Spain; but neither desired the Spanish crown for his own head. Louis put forward his grandson Philip of Anjou; whilst Leopold advocated the claims of his second son, the Archduke Charles. The Electoral prince Joseph of Bavaria, grandson of the Emperor Leopold, was the heir originally designated in King Charles's will, but he died in the beginning of 1699. Both Louis XIV. and his wife had nine years before solemnly renounced the crown of Spain for themselves and their heirs; nevertheless, after Joseph of Bavaria died the agent of Louis XIV. induced Charles of Spain to nominate Philip of Anjou as his successor. Three months after the Spanish monarch's death the French prince entered Madrid, and was crowned as Philip V.; and his accession was at first recognised by all the European powers except the emperor. Louis, however, soon provoked the United Netherlands and England, and they joined Austria for the purpose of armed opposition to France.

Hostilities were begun by Prince Eugene in Italy in 1701; and in the following year the conflict raged not only in Italy but also in the Netherlands and in Swabia. At first the allies were victorious all along the line: Marlborough took the fortresses on the Meuse and overran the electorate of Cologne; and the Margrave of Baden had the good fortune to drive back the most redoubtable of the French commanders, Villars, who had crossed the Rhine from Alsace. But the aspect of things was altered in 1703 by Villars, in conjunction with the Elector of Bavaria, penetrating as far as Tyrol and capturing Passau, whilst the imperialists in Italy were more than held in check by Vendôme. But in the campaign of 1704 Marlborough and Eugene, acting in concert, inflicted a crushing defeat upon their opponents at Blenheim (q.v.) and drove them back into France. Two years later the forces of Louis were compelled to withdraw from the Netherlands owing to Marlborough's great victory of Ramillies and his capture of the principal Flemish towns. At the same time Eugene and his relative the Duke of Savoy routed the French near Turin

and swept them out of North Italy. Meanwhile the war had extended to the Iberian peninsula. The king of Portugal declared for the allies, and Archduke Charles made himself master of Catalonia, and even for a time held possession of Madrid. The English captured Gibraltar in 1704; but they and the Portuguese sustained a severe defeat from the Duke of Berwick (commanding the French forces) at Almanza in 1707. In this latter year Louis, feeling the severity of the strain, opened negotiations for a settlement. But the allies, having the upper hand, thought to humble him yet more, and the war went on.

An attempt of Vendôme and the Duke of Burgundy to reconquer the Spanish Netherlands in 1708 was frustrated by Marlborough and Eugene, who routed them at Oudenarde; and in the next year they defeated at Malplaquet the hitherto invincible Villars. Yet just when the fortunes of Louis seemed to be at their worst, circumstances intervened in his favour. In England the Whigs were supplanted by the Tories, who voted for peace; and in Austria the Emperor Leopold died, and was succeeded by the Archduke Charles. Accordingly the war languished, and, Philip V. having pledged himself that the crowns of Spain and France should not be united, all the allies, except the emperor, signed the treaty of Utrecht (q.v.) on 11th April 1713. The emperor, too, was brought to terms after Villars had overrun the Palatinate and Baden, and he signed peace at Rastatt (7th March 1714), whereby he acknowledged Philip as king of Spain, and became himself the ruler of the Spanish Netherlands, Naples, Milan, and Sardinia.

See Mahon, *History of the War of the Succession in Spain* (1832); Colonel the Hon. Arthur Parnell, *The War of Succession in Spain* (1888); Courcy, *La Coalition de 1701 contre la France* (2 vols. Paris, 1886); Von Noorden, *Der Spanische Erbfolgekrieg* (3 vols. Düsseldorf, 1870-82); Arneth, *Prinz Eugen von Savoyen* (3 vols. Vienna, 1858); and the articles EUGENE, MARLBOROUGH, PETERBOROUGH, VILLARS, &c. in this work.

(2) WAR OF THE AUSTRIAN SUCCESSION. The Emperor Charles VI. died in 1740, leaving his hereditary dominions—Bohemia, Hungary, and the archduchy of Austria—to his daughter Maria Theresa. She was at once beset by enemies, eager to profit from the presumed weakness of a feminine ruler. The Elector Charles Albert of Bavaria, who had refused his signature to the Pragmatic Sanction (q.v.), demanded the imperial crown as the descendant of the Emperor Ferdinand I., and he was backed up by France and Spain. Augustus of Saxony and Poland advanced his claim as being the husband of the eldest daughter of the Emperor Joseph I. Frederick the Great of Prussia seized the opportunity to wrest Silesia, which he greatly coveted, from the crown of Austria. The Bavarians and the French (under Belleisle) invaded Bohemia, and crowned the elector king of that country at Prague on 19th December 1741. About two months later he assumed the imperial crown at Frankfort-on-Main; yet on the very next day his own capital (Munich) was occupied by the Austrian general Khevenhüller, who, assisted by the high-spirited Hungarians, had advanced up the Danube, and now speedily overran Bavaria. A few months later the empress-queen bought off her most dangerous antagonist, Frederick, by giving up to him Silesia. At this time, too, Augustus of Saxony, who had at first made common cause with the French and the Bavarians, withdrew from the contest and made peace with Maria Theresa. In the end of 1742 the Austrians were forced out of Bavaria and the French evacuated Bohemia. The English, who from the first paid a substantial subsidy to Austria, took up arms on her behalf in this same year, and in 1743 defeated the French

at Dettingen in Bavaria. In this year the Austrians repossessed themselves of the Elector Charles Albert's dominions. Saxony now joined the allies and took the field against his former associates. On the other hand, Frederick renewed hostilities and invaded Bohemia; but after a short interval he was once more willing to make peace. About this juncture Charles Albert died, and his son and successor abandoned his father's pretensions to Maria Theresa's dominions. This left France to carry on the struggle alone. But whilst Austria had the better of the war in Italy, Marshal Saxe captured several of the Flemish fortresses, won the victories of Fontenoy (1745), Rocoux (1746), and Lawfeldt (1747), and reduced the Austrian (formerly Spanish) Netherlands. Peace was at length concluded at Aix-la-Chapelle on 18th October 1748, things remaining pretty much *in statu quo*, except that Frederick was allowed to retain Silesia.

See Arneth, *Geschichte Maria Theresias* (10 vols. Vienna, 1863-79); and MARIA THERESA, SAXE, &c.

Succinic Acid derives its name from its having been originally found in amber (Lat. *succinum*). Succinic acid occurs as a natural constituent not only in amber, but also in the resins of many of the pine tribe, in the leaves of the lettuce and wormwood, in unripe grapes; and in the animal kingdom it has been detected in the fluids of hydatid cysts and hydrocele, in the parenchymatous juices of the thymus gland of the calf, and of the pancreas and thyroid gland of the ox. Succinic acid is convertible into tartaric acid, and conversely.

Succory. See CHICORY.

Succoth. See PITHOM.

Succubus, Succuba. See DEMONOLOGY.

Succulent Plants, a descriptive phrase applied to the Crassulaceæ, Cactaceæ, Aizoaceæ, some Euphorbiaceæ, Liliaceæ, &c.—xerophytes that store water in their leaves or stems. See ECOLOGY.

Suchet, LOUIS-GABRIEL, Duc d'Albufera, and marshal of France, was born, son of a silk manufacturer, at Lyons, 2d March 1770. At twenty-two he volunteered into the cavalry of the Lyons national guard, next fought in Italy, and by his conspicuous courage and ability at Lodi, Rivoli, Castiglione, Arcola, and a hundred battles, had risen by 1798 to be general of brigade. He added to his reputation in Egypt and again in Italy, served as general of division under Joubert in 1799, and the year after was second in command to Masséna. He covered himself with glory by checking a vastly superior Austrian force under Melas (1800), and so preventing the invasion of the south of France. He took a distinguished part in the campaigns against Austria (1805) and Prussia (1806), and was subsequently (April 1809) appointed generalissimo of the French army in Aragon—his first independent command. By marvellous tact no less than military skill he reduced this stubborn province to complete submission within two years. He conquered at Mavia and Lerida, and took Tortosa and Tarragona, for which he was rewarded with a marshal's baton. In 1812 he destroyed the army of Blake at Sagunto, and on the 9th January of that year captured Valencia, earning the title of Duke of Albufera. The details of his five Spanish campaigns have been well given by him in his *Mémoires sur ses Campagnes en Espagne* (2 vols. Paris, 1829-34). He was created a peer of France by Louis XVIII., but joined Napoleon after his return from Elba, and was charged with the defence of the south-west frontier. Deprived of his peerage after the disaster of Waterloo, he did not return to court till it was restored in

1819. He died at the château of Saint-Joseph, near Marseilles, 3d January 1826. O'Meara and Las Cases tell us that of his generals Napoleon ranked Masséna first and Suchet second.

Sucking-fish, a name sometimes given to the Remora (q.v.) or Echeneis, which has a dorsal sucker, and to other fishes which have a sucker formed by the union of the ventral fins—e.g. *Cyclopterus lumpus*, the Lumpsucker (q.v.). To the members of the carp-like Catostomidae, almost exclusively confined to the rivers of North America, the name sucker is also applied, in allusion to their mode of sucking up their food, which consists of small aquatic animals.

Suckling, SIR JOHN, poet, was born at Whiston in Middlesex, and baptised February 10, 1609. He was of good family on both sides, and his maternal uncle, Sir Lionel Cranfield, became Earl of Middlesex; his father held office as a secretary of state and comptroller of the household under James I., and was made privy-councillor by Charles I. Suckling may have been at Westminster, as Aubrey says, but certain it is that in 1623 he entered Trinity College, Cambridge, five years later went on his travels abroad, and served for some time in Germany under Gustavus Adolphus. He returned about 1632, and soon became 'the darling of the court,' distinguished before all by his wit and prodigality. An inveterate gambler, he spent his days and nights at cards and bowls, his intervals divided betwixt gallantry and verse-making. In April 1635 he appeared before the Star-chamber for breaking the statute passed in the eighth year of Charles to require all landowners to spend some time on their estates. To aid the king against the Scots he raised a troop of 100 horse, and equipped them so handsomely that it is said to have cost him about £12,000. They rode north with the king, but shared the shame of the rout before the Scots at Duns. The lampoon by Sir John Mennes has commemorated the cowardice of Suckling and his gay cavaliers, but in reality they behaved no worse than the rest of the royal army. Suckling was returned to the Long Parliament for Bramber, joined in the abortive plot to rescue Strafford from the Tower, and in more desperate plots still against the liberties of the kingdom by means of French and Irish troops, and his schemes being discovered he fled for safety to the Continent. Impoverished and disgraced, he is believed to have poisoned himself at Paris before the close of 1642. The works of Suckling consist of four plays, *Aglaure*, *The Goblins*, *Brennoralt*, and *The Sad One*, now utterly forgotten; a prose treatise entitled *An Account of Religion by Reason*; a few Letters, written in an artificial style; and a series of miscellaneous poems, beginning with *A Sessions of the Poets*, published in 1637, which is original in style, and happily descriptive of the author's contemporaries. But the fame of Suckling rests on his songs and ballads, which at their best are inimitable for ease, gaiety, and grace. The well-known *Ballad upon a Wedding* is an exquisite masterpiece of sparkling gaiety and felicity of phrase; and his lyrics 'I prithee send me back my heart,' 'Why so pale and wan, fond lover?' are amongst the triumphs of English verse.

See the Rev. Alfred Suckling's *Selections, with a Life* (1836), reproduced by W. C. Hazlitt, with a few additions (1874); also the Memoir prefixed to F. A. Stokes's edition (New York, 1885); and A. H. Thompson's edition of the *Works in Prose and Verse* (1910).

Sucré. See CHUQUISACA.

Sucré, ANTONIO JOSÉ DE (1793–1830), born in Cumana, Venezuela, was Bolívar's lieutenant and first president of Bolivia (1826).

Sucrose. See SUGAR.

Sudamina, or MILIARY ERUPTION, one of the vesicular diseases of the skin, is associated with profuse sweating, though it occasionally occurs in a dry skin; the second name refers to the size of the vesicles, which do not exceed those of a millet-seed. The vesicles, most abundant on the neck and trunk, and sometimes attended with itching, almost always occur in association with febrile disorders, particularly acute rheumatism, but give rise to little irritation.

Sudan, or SOUDAN, the Arabic equivalent (*Beled es-Sudan*—i.e. 'Land of the Blacks') of Negroland or Nigritia, a geographical term which in its widest sense embraces the vast region of Africa that stretches from the Atlantic to the Red Sea and the Abyssinian highlands, and from the Sahara and Egypt proper in the north to the Gulf of Guinea, the central equatorial regions, and the Albert and Victoria Nyanzas in the south. This is the home of the true Negro race, though there are various other pure and mixed elements in the population derived principally from Hamitic and Semitic (Arab) stocks. The Sudan in this sense falls naturally into three divisions: (1) *Western Sudan*, comprising the basins of the Senegal, Niger, Benue, and other rivers draining to the Atlantic, and including the political regions known as the French Sudan (see SENEGAMBIA), Sokoto (q.v.), and others; (2) *Central Sudan*, including the basins of the rivers draining into Lake Tsad, and covering the countries of Bornu (q.v.), Bagirmi (q.v.), Kanem, Wadai; (3) *Eastern Sudan*, the rest of the Sudan area east of Wadai, mainly the basin of the Middle and Upper Nile; and this region, also called the Egyptian or Anglo-Egyptian Sudan, has since the events of 1882–98 so largely monopolised English attention as to be, quite unhistorically, called *the Sudan*. The Sudan extends southwards from the frontier of Egypt to Uganda and the Belgian Congo, a distance of 1270 miles, and stretching from the Red Sea to Wadai in Central Africa, with an area of 985,000 sq. m. and a pop. (which under the Mahdi declined from 9,000,000 to 2,000,000) estimated at nearly 6,000,000. Massowah, formerly Egyptian, now belongs to the Italian colony of Eritrea. Harrar has been given to Abyssinia, while Zeila and Berbera are included in British Somaliland. The chief towns are Khartum, the capital, Halfa, Berber, Suakin, Kassala, Atbara, and El'Obeid.

All the regions actually watered by the Nile and its great tributaries possess highly fertile soil, capable of yielding immense quantities of cotton, durra, indigo, sugar, rice, maize, tobacco, fruits. Cotton, first introduced experimentally in 1911, promises to be the great staple of the Sudan. Irrigation is successfully practised, especially in the Gezira and north-eastern districts. The Sennar Dam was completed in 1925. The central and southern provinces are well suited for rain-grown cotton, which promises to become of very great importance. Ivory, ostrich-feathers, rubber, salt, cloth, gums, iron, gold, honey, wax, and hides are also articles of internal traffic and foreign trade. There is a railway from Khartum to Wady Halfa; and from Atbara, near Berber (on the other line), to Port Sudan, 30 miles north of Suakin (1905). A line (1925), 215 miles long, connects Kassala with Haiya, a point on Atbara-Port Sudan line. A convention between the British and Egyptian governments in 1899 placed the administration of the Sudan in the hands of a governor-general appointed by Egypt with the approval of Great Britain. Since 1910 he has been aided by a council. The country is divided into fifteen provinces under governors. The High Court of Justice

sits at Khartum, and there are minor courts in the provinces. There are also Mohammedan law courts for administration of Moslem religious law, and native chiefs' courts.

The Egyptians established themselves at Khartum in 1819, and during the next fifty years gradually extended their power over the provinces lying west and south of that city, and were more especially active during the third quarter of the century. In 1874 Dar-Fâr was conquered with help of Zebehr Pasha, a noted slave-hunter, who, not receiving the reward he expected, provoked insurrections there and in the Bahr-el-Ghazal province (1877-79), which were successively crushed by Gordon and Gessi. But in 1882 the Mahdi (q.v.) again raised the flag of revolt, and preaching a religious crusade, overpowered the distant Egyptian garrisons, annihilated the Egyptian forces led by Hicks Pasha, surrounded Emin Pasha (see SCHNITZER) in the Equatorial Province, and shut up Gordon (q.v.) in Khartum; while his lieutenant, Osman Digna, after defeating the Egyptian army commanded by Baker Pasha, prevented the English from penetrating into the interior from Suakin and the Red Sea. Gordon's mission ended in disaster, and with the fall of Khartum, Egyptian influence in the Sudan seemed at an end. Anarchy prevailed, the Sheikh Senussi (q.v.) became a power, and to the Mahdi succeeded the Khalifa. But, after the English reorganisation of Egypt, in 1896 an Anglo-Egyptian army forced its way to Dongola; and in 1898 Kitchener (q.v.) completed the reconquest of the Sudan by totally defeating the Khalifa's forces at Omdurman and occupying Khartum. The discovery that Kodok (then called Fashoda) had been occupied by Major Marchand with a French force caused strained relations between Britain and France; but the question was amicably settled by the departure of Marchand in November 1898. Lord Kitchener as Sirdar was in January 1899 appointed Governor-general of the Sudan, and was succeeded by Sir Reginald Wingate, under whose administration (1899-1916) the prosperity of the country grew rapidly. During the Great War Ali Dinar, a Dar-Fâr chieftain, led a revolt (1915-16), but was overcome. Risings due to Egyptian influences and directed against the British administration took place in 1924 at Omdurman, Khartum, Port Sudan, Atbara, and other places. The disaffection culminated in the assassination of the Governor-general and Sirdar, Sir Lee Stack, in the streets of Cairo in November 1924. Disciplinary measures were at once adopted by the British government, the purely Egyptian troops being removed from the Sudan, and a Sudanese Defence Force created in their stead. Sir Geoffrey Archer became Governor-general in January 1925.

See works by Speke, Russeger, Schweinfurth, Nachtigal, James, Felkin and Wilson, Junker; Wingate, *Mahdism and the Egyptian Sudan* (1891); Ohrwalder, *Ten Years' Captivity in the Mahdi's Camp* (1892); Khalifah (1898); Stevens, *With Kitchener to Khartoum* (1898); Count Gleichen, *The Anglo-Egyptian Sudan* (2 vols. 1906); Sir E. A. Wallis Budge, *The Egyptian Sâdân, its History and Monuments* (2 vols. 1907); *By Nile and Tigris* (1920); P. F. Martin, *The Sudan in Evolution* (1921); A. Chapman, *Savage Sudan* (1921); H. A. MacMichael, *A History of the Arabs—The Sudan* (2 vols. 1922); Major A. A. R. Dugmore, *Egypt and the Sudan* (Official Dispatch, 1924), *The Vast Sudan* (1924). See also the articles EGYPT, NUBIA, NILE, FULAHs, HAUSSA, KHARTUM, MAHDI, SCHNITZER, and for French Sudan, SENEGAMBIA.

Sudbury, a municipal borough (till 1843 also parliamentary) of Suffolk, on the Stour at the Essex boundary, 16 miles S. of Bury St Edmunds. It has three old churches, mainly Perpendicular in style, a town-hall (1828), grammar-school (1491);

rebuilt 1857), corn exchange (1841), and manufactures of coconut matting, silk, and bricks. The famous woollen industry of the Flemings has died out. Gainsborough was a native. Pop. (1851) 6043; (1901) 7109; (1921) 7046.

Sudbury, a village of Ontario (pop. 8600), 60 miles NW. of Lake Nipissing, with extensive and very rich nickel deposits. See NICKEL.

Sudd, or SADD, the floating masses of water weeds which, consolidating into large blocks (sometimes a mile long and 20 feet thick), obstruct the navigation of the White Nile and other African rivers. It consists mainly of *Cyperus Papyrus*, *Herminiera elaphroxylo*, water-lilies, water-nuts, pond-weeds, and rushes.

Sudermann, HERMANN, poet and novelist, was born 30th September 1857 at Matzicken in East Prussia, studied at Königsberg and Berlin, and while acting as domestic tutor, and as editor of a small newspaper, produced tales, tragedies, and poems that were unheeded. But the drama *Ehre*, on somewhat realistic lines, was produced in 1888, and made him famous; and his novels, *Frau Sorge* (1888; Eng. trans. *Dame Care*, 1892), *Der Katzensteg* (1889; trans. *Regina*, 1898), *Im Zwielicht*, *Iolanthes Hochzeit* (1892), *Es War* (1894), *Das hohe Lied* (1908), and *Litauische Geschichten* (1919), have been widely read. The censor forbade the representation of the tragedy *Sodoms Ende* (1890). Other dramas were *Heimat* (1893), *Die Schmetterlingsschlacht* (1896), *Das Glück im Winkel* (1896), *Morituri* (1897), *Stein unter Steinen* (1905), *Strandkinder* (1909), *Der Bettler von Syrakus* (1911), *Die Lobgesänge des Claudian* (1914), *Die entgötterte Welt* (1919), *Die Raschhoffs* (1920). See (for his early years) *Das Bilderbuch meiner Jugend* (trans. W. Harding, *The Book of my Youth*, 1924).

Sudetic Mountains, in SE. Germany, divide Prussian Silesia and Lusatia from Bohemia and Moravia, and through the Erzgebirge connect the Carpathians with the chains branching from the Fichtelgebirge. They do not form a continuous chain except in the middle, in the Riesengebirge (q.v.) and Isergebirge.

Sudorifics, or DIAPHORETICS, remedies to excite the secretions of the skin. The simplest of all diaphoretics are baths, which may be warm baths of water or of vapour, either simple or medicated (see BATHS). The most powerful of all, however, as regards educing perspiration is probably the Turkish bath, which consists essentially in the use of a sweating process by means of air heated to a temperature of 140° F., or even more. The following remedies, used internally, are powerful diaphoretics: antimony, ipecacuanha, opium (these three either singly or in combination); nitrites; the acetate of ammonia (spirit of mindererus), phenacetin and other coal-tar derivatives; and, most active of all, pilocarpine, the chief active principle of jaborandi. On most of these substances special articles will be found. A favourite formula is Dover's Powder (q.v.), consisting of a grain of opium, and a grain of ipecacuanha in each ten grains of the powder. This in doses of from five to eight grains, followed by warm drinks and plenty of blankets in bed, usually produces copious perspiration, and is very soothing and useful in many commencing inflammatory and febrile complaints. James's powder (antimonial), in doses of from three to five grains, is often added to the above in domestic prescriptions; but neither of these medicines should be used rashly, as in certain states of the system they may prove dangerous; and they should never be given to very young children.

Sûdra. See CASTE.

Sudreys, or SUDOREYS. See MAN (ISLE OF).

Sue, MARIE-JOSEPH-EUGÈNE, a master of melodramatic fiction, was born at Paris, 10th December 1804. The son of an army surgeon, he himself served as such in Spain and at Navarino, and worked up his experiences into the Byronic and absurd novels, *Kernock le Pirate*, *La Salamandre*, &c., as well as the unhistorical *Histoire de la Marine Française* (5 vols. 1835-37) and *Histoire de la Marine Militaire chez tous les Peuples* (1841). In 1829 his father died leaving him a handsome fortune, which enabled him to give himself seriously to literature. His first hit was the too famous *Mystères de Paris* (10 vols. 1842), which first appeared in the columns of the *Journal des Débats*. Its successor, *Le Juif Errant*, which appeared in the *Constitutionnel* (10 vols. 1845), was no less successful. Later works were *Martin, l'Enfant Trouvé* (12 vols. 1846), *Les Sept Péchés Capitaux* (16 vols. 1847-49), and *Les Mystères du Peuple* (16 vols. 1849), the last condemned by the law-courts of Paris as immoral and seditious. Sue was elected deputy for Seine in 1850, and attached himself to the Extreme Left. The *coup d'état* of December 1851 drove him into exile. He lived at Annecy in Savoy, and there died 3d August 1859. Sue possesses undeniably the power of holding a reader fast in his story; but his novels are hardly to be taken seriously as works of art.

Suess, EDUARD (1831-1914), the founder of the 'new geology,' was born in London, educated at Prague and Vienna, in 1857-1901 was professor of Geology at Vienna, sat for more than twenty years in the Austrian Lower House, and in 1897 became president of the Imperial Academy of Sciences. His greatest work, *The Face of the Earth* (1885-1909; trans. 1904-24), is but one of those that explain his views of the formation of continents and mountain-ranges, the dynamics of earthquakes and volcanoes, and the constitution and movements of the earth's crust. See *Nature*, May 1905.

Suet is a variety of solid fatty tissue, which accumulates in considerable quantity about the kidneys and the omentum of several domestic animals, especially the ox and sheep. Beef suet is extensively used in cookery, while purified mutton suet under the name of *Sevum Præparatum* occurs in the Pharmacopœia, and is obtained by melting and straining the internal abdominal fat. It consists of a mixture of the ordinary animal fats, with a great preponderance of the most solid of them—viz. stearin, which constitutes about three-fourths of the whole. The pure suet of the Pharmacopœia is 'white, soft, smooth, almost scentless; and is fusible at 103° (39.4° C.).' It is used as an ingredient in plasters and ointments. Ordinary melted suet is frequently employed in the same manner as lard, to preserve potted meats, fish, &c., from the action of the air. See **FATS**.

Suetonius. CAIUS SUETONIUS TRANQUILLUS, grammarian, critic, and chronicler, was contemporary with Domitian, Trajan, and Hadrian, having been born (birthplace and parentage unknown) under Vespasian. Of his manhood we find some traces in the letters of the younger Pliny, who, when appointed by Trajan proconsul of Bithynia, took Suetonius with him. Pliny's friendship, manifested in bringing him under the emperor's notice as 'probiissimum, honestissimum, eruditissimum virum,' procured him means and leisure enough for literature, of which he was a professed votary. After Pliny's death he was befriended by C. Septicius Clarus, prefect of the prætorians, to whom he dedicated his best-known work, in eight books, *The Lives of the First Twelve Cæsars*. He became Hadrian's private secretary, a post he long held till, compromised in a court intrigue, he forfeited it, to devote himself entirely to literature. He was then

about fifty years of age, but no further incident of his life is known to us.

In the compilation of his *Lives* Suetonius must have had before him the Annals and Histories of Tacitus; perhaps (according to some scholars) the *Lives* of Plutarch. But he has neither the dramatic power of the Roman nor the philosophy of the Greek. The Augustan historian Vopiscus praises him as a 'most finished and impartial writer' (*emendatissimus et candidissimus scriptor*)—merits which later criticism still allows him. His method, indeed, is of the simplest. After detailing the emperor's family history, he describes his youth and manhood till he assumes the purple; after this he abandons the chronological order and dwells on the character of his subject, as shown in public and private, according to virtues and vices, irrespective of periods of life; next he reverts to the order of time in relating the portents of death, the mode of death itself, and the terms of the emperor's will. Ever anxious to exclude uncertainty from his narrative, he deals with ascertained fact and does nothing by interposed discussion to bias the reader's judgment one way or another. With no affectation of epigram, his brevity is masterly, and probably no writer ever compressed so much that is interesting into so brief a space. He had many imitators (St Jerome among them) in antiquity and in the middle ages. His other works, *De Illustribus Grammaticis* (of which a complete copy existed in the 15th century) and *De Claris Rhetoribus*, need only be mentioned here, as also the fragmentary lives of Terence, Horace, Persius, Lucan, Juvenal, and Pliny.

After the *editio princeps* (Rome, 1470), those of Casaubon (1596 and 1610), F. A. Wolf (1802), Roth, with admirable prolegomena (1857), and Reifferscheid (1860), may be mentioned; and among translations those of Philemon Holland (1606; ed. J. H. Freese, 1923), and of J. C. Rolfe (with text, 1914).—For Suetonius Paulinus, the Roman governor of Britain, see **BOADICEA**.

Suevi. See **SWABIA**.

Suez, a town of Egypt, is situated at the southern extremity of the Suez Canal and on the Gulf of Suez, a northern arm of the Red Sea. Close beside the town the Peninsular and Oriental Steamship Company have extensive storehouses and magazines; there is a large English hospital; and the sweet-water canal from Ismailia terminates here. The railway from Ismailia runs through the town on to the spacious harbour 2 miles beyond. Suez has not a very large trade of its own; most of the commerce passes through it without making halt. Pop. (1917) 30,996. The town is surrounded by the desert. At more than one period in the past this place was the seat of a flourishing trade, as for instance in the time of the Ptolemies, when it was called Arsinoë; under the first Moslem rulers of Egypt, who called it Kolzum, the Greek name being then Clysma; and from the 16th to the 18th century, when it formed an important *étape* in the European trade with India; but by the beginning of the 19th century it was again quite decayed. It began to revive when the overland mail route between England and India was opened in 1837, and has improved yet more since the completion of the canal. For the Suez Canal, see **CANAL**.

Suffioni, name given to the exhalations of hot sulphurous vapours, which are common in volcanic regions. See **VOLCANO**.

Suffocation. See **ASPHYXIA**, **RESPIRATION**, **STRANGULATION**.

Suffolk, the easternmost county of England, is bounded on the N. by Norfolk, E. by the German Ocean, S. by Essex, and W. by Cambridgeshire. In length from east to west it measures 57 miles,

and the mean breadth from north to south is about 30 miles. Area, 1475 sq. m.; pop. (1801) 210,431; (1831) 296,317; (1861) 337,070; (1911) 394,060; (1921) 400,058, whereof 291,073 were in the administrative county of East Suffolk, 108,985 in West Suffolk. Though no hills of any notable character rise within its confines, Suffolk is not by any means flat. Bordering on the seacoast, it is low and skirted by banks of shingle, except near Lowestoft and Southwold, and again at Dunwich and Felixstowe, which all rest on sandstone cliffs; adjoining and running parallel with these last stretches an almost continuous series of light sandy heath-lands, glorious in summer with gorse and heather; and inland the country is undulating, well-watered, and for the most part well wooded, the scenery in places—e.g. at Yoxford, aptly called the garden of Suffolk, and in the vale of the Gipping—being very picturesque. More than two-thirds of the county consists of heavy land, a stiff clay prevailing in Mid (or as it is locally termed 'High') Suffolk, whilst the western part lies upon chalk, terminating at its north-west corner with a tract of peaty fen-land. The Wave-ney, Alde, Deben, Orwell, and Stour, all flowing eastwards, are the principal rivers. Many of the rivers are navigable for a considerable part of their course. The Suffolk Crag, or white crag, is one of the divisions of the British Pliocene System (q.v.); and Coprolites (q.v.) are got in the region between Ipswich and Woodbridge, gun-flints wrought at Brandon. Agriculture forms the staple industry. The soil is not rich and is very varied, so that agriculture in Suffolk is a matter of great skill. Extensive afforestation schemes are in progress in some parts where the land is useless for agriculture. A red polled breed of cattle, of which the cows are deservedly held in high esteem, is peculiar to the county; and its pigs, some black and others white, are also widely known. Horse-breeding too, apart from the racing establishments at Newmarket, is a specialty, a large export trade being carried on in both riding and cart horses; and immense quantities of lambs—blackfaced, and a cross between the Norfolk-horned and the South-down—are raised. The chief products are cement, whitening, bricks, lime, gun-flints, corn, malt, flax. Herring and mackerel fishing is important on the coast. The manufactures are noticed under Ipswich (the capital), Beccles, Stowmarket, and Sudbury, these being with Bury St Edmunds, Lowestoft, and Woodbridge, the most important towns. Formerly divided between the dioceses of Norwich and Ely, Suffolk was made a bishopric in 1913, with its cathedral at Bury St Edmunds. Its parliamentary divisions are five, each returning one member, and it has two county councils for the administrative counties of East and West Suffolk. The assizes are held alternately at Ipswich and Bury St Edmunds.

The history of Suffolk, presumably from its lying somewhat off the beaten track, presents but few facts deserving of special mention; prior to the Conquest it was in common with the rest of East Anglia (of which it formed part) oftentimes overrun and pillaged by the Norsemen, whilst of incidents of later date it will suffice to mention the descent of Flemish mercenaries under the Earl of Leicester in 1173 in support of the claims of Henry II.'s eldest son, culminating in their defeat at Fornham, near Bury St Edmunds; and the sea-fights off Lowestoft (1665) and Southwold (1671). In antiquities the county is especially rich, and amongst them may be noted the ruins of the castles of Burgh (Roman), Framlingham, Orford, and Wingfield (the last the place of Charles d'Orléans' imprisonment); the gatehouse of Butley Priory (Norman); earthworks at Fornham,

Haughley, Nacton, and Snape; the fine flint-work churches scattered throughout the county, of which perhaps the best examples are those of Blythburgh, Lavenham, Melford, Southwold, Stoke-by-Nayland, and Walberswick; and the old halls (many of them moated) of Helmingham, Parham, Hengrave, Rushbrooke, Ickworth, Somerleyton, Giffords, and West Stow. Of Suffolk worthies (exclusive of those named under Ipswich and Bury St Edmunds) the best known are Bishops Grosseteste, Aungerville, and Bale; Archbishop Sancroft; Chief-justices Glanvill and Cavendish; George Cavendish (Wolsey's biographer); Lydgate, Nashe, Crabbe, and Robert Bloomfield (poets); Sir Simonds D'Ewes; the Earl of Arlington, Roger North, Capell (the Shakespeare commentator); Gainsborough, Frost, Constable, and Bright (artists); Bunbury (the caricaturist), Edwards (the etcher), Woolner (the sculptor), Lord Chancellor Thurlow, Arthur Young, Clara Reeve, Mrs Inchbald, Kirby (the naturalist), John Hookham Frere, Crabb Robinson, Sir Philip Broke, William Johnson Fox, Professor John Austin and his brother Charles, Admirals Fitzroy and Rous, Dr Routh, Professors Maurice and Cowell, Edward Fitzgerald, Sir J. D. Hooker, Sir Henry Thompson, Agnes Strickland, and Miss Betham Edwards.

See works by Kirby (2d ed. 1764), Callum (1813), Gage (1838), Page (1844), Suckling (2 vols. 1846-48), Glyde (1858 and 1866), Baynes (2 vols. 1873), Taylor (1887), White (new ed. 1891), Raven (1896), A. H. Cooper and W. G. Clarke (1921), and D. Maxwell (1926); *Excursions in the County of Suffolk* (1818-19); W. M. Hind, *Flora of Suffolk* (1889); Copinger's *County of Suffolk* (6 vols. 1904-7), and *Manors of Suffolk* (7 vols. 1905-11); the Victoria History (1907 et seq.); V. B. Redstone, *Memorials of Old Suffolk*.

Suffragan, in England a coadjutor who assists a bishop in the administration of some part of his see: such bishops cannot succeed to the see in which they have been suffragans. The name also, and originally, belongs to all bishops in a province, in relation to the metropolitan.

Suffrage. See PARLIAMENT, REFORM.

Suffren. Pierre André de Suffren Saint-Tropès, a French naval hero, was born a younger son of a good Provence family, July 17, 1729. At fourteen he entered the navy, and first saw fire in the indecisive action with the English off Toulon in 1744. He took part in the unsuccessful attempt to recapture Cape Breton (1746), was captured by Hawke in the Bay of Biscay the next year, but soon exchanged, and after the peace went to Malta and served for six years amongst the Knights Hospitallers. Again in the French service, he took part in the action off Minorca (May 1756), was again captured in Boscawen's destruction of the Toulon fleet (1759), after the peace of 1763 cruised in the Mediterranean for the protection of trade, and took part in the bombardment of Salée in 1765. Commander in 1767, he served four years in the service of Malta, and returned to France to the rank of captain in 1772. Early in 1777 he sailed to America, and his ship began the indecisive battle of Grenada on 6th July 1779. He next served with the allied fleet blockading Gibraltar, and early in 1781 was placed in command of a squadron of five ships for service in the East Indies. After an action at the Cape Verd Islands, he outsailed Commodore Johnstone to the Cape, and so saved the colony for the time. Sailing to Madras, he fought a hard but indecisive battle off Sadras, and soon after, in a bloody two days' battle off Providien on the coast of Ceylon, proved himself a consummate master of naval tactics. But he had to struggle against scurvy, want of supplies, and, still worse, the disaffection and cowardice of his

senior officers. Having captured Trincomalee, he two days later stood out of the harbour with fifteen ships against the English twelve, and fought a hard but irregular battle. His last fight (June 1783) was also indecisive. Suffren arrived in Paris early in 1784, and was received with the greatest honours, and created vice-admiral of France. He died suddenly at Paris, 8th December 1788, most probably of apoplexy, to which his extreme corpulence made him subject. Frenchmen give the Bailli de Suffren (he had been made Bailli of the Order of Malta) the most exaggerated praises, and Sir J. K. Laughton styles him 'one of the most dangerous enemies the English fleets have ever met, and without exception the most illustrious officer that has ever held command in the French navy.' See Laughton's *Studies in Naval History* (1887), and Austin Dobson in the *National Review* for June 1912.

Sufism, a form of mysticism within Islam. The Koran is unfavourable to mysticism, for it tells of a God perfectly distinct from the world and from the souls of men, who has decreed from all eternity the lot of every person, and who is to be pleased with outward rites and conduct. Sufic mysticism has come into Islam through Persia, where, under the influence of Indian Buddhism, its pantheistic ideas existed before the Mohammedan conquest. Sûfis claim as their founder the woman Râbia, whose grave on a hill east from Jerusalem drew many pilgrims in the middle ages. But that distinction rather belongs to Abû Saïd ibn Abî-l-Chair, a Persian of Khorasan, who, notwithstanding the saying of Mohammed that there is no monkery in Islam, founded a monastery about 815. His followers were called Sûfis or Woollers from their ascetic garb. A contemplative life soon naturally sought in Pantheism that rest for the heart which it could not find in the distant, unsympathetic God of Islam. Thereafter Sufism divided itself. Some with the Persian Bestâmî, who died in 875, professed openly that man is God. Others with Jonaid, who died in 909, a Persian too, though born in Bagdad, were of like faith, but cautious and orthodox in their language. The favourite watchword of Islam, the Unity of God, meant with them that God is all. The object of all Sufism was to deliver the soul from the sway of the passions by destroying human nature and the power of the flesh, and so to make the soul merely spiritual, uniting it by love with God, from whom it had emanated as a ray emanates from the sun. Cautious Sûfis were often revered as saints, while sometimes the incautious became martyrs. Many, like Jonaid's pupil Hallâj, who was executed by Hâmid, the vizier of the khalif Al-Môqtadir at Bagdad in 922, were alternately adored and persecuted. In Sufism the devotee must choose a teacher, and strive toward development through degrees, of which there are commonly reckoned three. First is the Law, wherein the Sûfi is merely a Muslim, blameless in all ordinances of morality and of Islam; but the only motive to worship or obedience is not fear of punishment nor hope of reward, but love. Second is the Way or Method, wherein he practises asceticism, fasts, watches in silence and solitude, studies Sufistic lore, drives away other thought, rises into an occasional ecstatic state, Hâl, which when permanent is called a position, Makâm. Positive religion, needful for the weak, is now needless for him. The final degree is Certainty; the transcendental objective God has now become subjective; the Sûfi is now consciously God; all religion is vain. The first great Sûfi poet was the Persian Ferîd eddîn Attar, who died c. 1220. The greatest Sûfi poet was another Persian, Jelâl eddîn Rûmî (1207-73). But Sufism, the dream of the least and the most cultured alike,

has been the religion of Hâfiz and Sâdi and of nearly all the great Persian poets. Their luscious language of love and beauty's charms, of intoxication and the wine-house, is strongly sensual or spiritual according as it is taken. Of the Safîdes, who reigned over Persia from 1499 to 1736, the first was Ismael the Sûfi. In 1777 a famous Sûfi, Mîr Maqûm Ali Shah, came from India to Shirâz, and raised a great Sûfi fervour, against which a very severe persecution was started by church and state in 1782, and lasted many years. Yet the influence of Sufism in Persia and eastward is rather increasing than waning; and in all orthodox lands this most fatal dissolvent of Islam is welcomed. There are many sects in Sufism. In Persia when the 19th century began there were at least a quarter of a million of Sûfis. There are more now; but with the majority the name means not pantheist but freethinker. In this sense the Sûfis or Wise may include half of the Persian middle class.

Sugar, a term applied generally to any of the members of a pretty numerous natural group of substances, for the most part of vegetable origin, connected with glycerol and the glycols on the one side and with the dextrins and with bodies of the starchy class on the other. They are, as a rule, crystallisable, soluble in water, less soluble or insoluble in alcohol, and insoluble in ether and in other solvents which are immiscible with water; they have a sweet taste. Most sugars possess the property of causing rotation of the plane of polarisation of light, and this optical activity serves as a means of estimation of very great value to the analyst. The sugars are divided according to the views entertained as to their constitution into two main classes: the *monosaccharoses* and the *disaccharoses*. The *monosaccharoses* have the general formula $C_6H_{12}O_6$. Glucose or dextrose, fructose, and mannose closely resemble one another, reduce Fehling's solution, readily ferment (except the last) with yeast, rotate the plane of polarisation, and when oxidised yield saccharic acid. Galactose closely resembles fructose, but has a feebleness of action on Fehling's solution, and yields mucic acid under the influence of oxidants. Some, such as sorbinose, do not ferment with yeast, but are acted upon by the lactic and butyric bacteria.

Glucose (synonyms dextrose, grape-sugar) is the most important sugar of the monosaccharose class. It occurs in the anhydrous condition as transparent prismatic crystals, and in warty masses having the composition $C_6H_{12}O_6 + H_2O$, which lose all their water below $100^\circ C$. It melts at $146^\circ C$, is less soluble in water and in alcohol than cane-sugar, and dissolves in boiling water in all proportions. Glucose has a dextro-rotatory action upon polarised light, and reduces Fehling's solution. It is not affected by moderate boiling with dilute acids, nor does it readily char under the influence of strong sulphuric acid, but forms with it an acid ethereal salt decomposed by water. It also forms analogous compounds with many other acids. It is rapidly decomposed on boiling with caustic alkalis or caustic lime. Glucose is found ready formed in the grape to the extent of 15 per cent, and in many other fruits. It may be prepared by decomposing the glucosides and by the hydrolysis of starch, dextrin, cane-sugar, &c., by means of dilute acids, diastase, or invertase, also by the action of sulphuric acid upon cellulose. In honey and in many fruits it occurs in association with fructose (or lævulose), a monosaccharose which bears a great resemblance to it, but is distinguished by having a greater sweetness and a lævo-rotatory power. Fructose is said to be even sweeter than cane-sugar.

The *disaccharoses*, with the general formula $C_{12}H_{22}O_{11}$, are the most important sugars, inas-

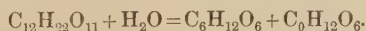
much as ordinary sugar, malt-sugar, and sugar of milk are members of this class. They may be regarded as condensation products of the monosaccharoses, and derived from two molecules by elimination of the elements of water. The saccharoses are, with the exceptions of malt-sugar (maltose) and milk-sugar (lactose), incapable of reducing Fehling's solution. They are fermented by yeast only after previous conversion into monosaccharoses by the agency of an enzyme (or enzymes), invertase, secreted by that organism. The disaccharoses are charred by strong sulphuric acid.

Sucrose (cane-sugar) is a solid crystallising in the form of monoclinic prisms—generally with hemihedral faces—which are transparent, colourless, and have a sweet taste, a specific gravity of about 1.6, a melting-point of about 160° C. It strongly rotates the plane of polarisation to the right. Sucrose is soluble in about half its weight of cold water and in boiling water in all proportions; it is nearly insoluble in absolute alcohol and soluble in dilute alcohol, the solubility increasing with the dilution in an ascending ratio. Ether, chloroform, carbon disulphide, oil of turpentine, petroleum spirit, and liquids immiscible with water generally, have no solvent action upon this sugar. Sucrose melts at about 160° C., and assumes on cooling the condition known as 'barley-sugar.' On further heating, water is given off, and the mass begins to blacken with evolution of fumes having a characteristic odour; and at about 200° C. caramel, a mixture of caramelan, $C_{12}H_{18}O_9$, caramelen, $C_{36}H_{50}O_{25}$, and caramelin, $C_{96}H_{109}O_{51}$, is obtained. Caramel is largely used for the colouring of wines, beer, vinegar, &c. Alkaline hydroxides in the cold have little or no action on sucrose, but when fused with caustic potash this sugar yields oxalate and acetate of potassium.

Solutions of sucrose possess the property of dissolving the oxides of the alkaline earths, with which the sugar forms compounds of definite composition. The *Liquor Calcis Saccharatus* of pharmacy is a solution of lime in syrup, and with baryta sucrose forms the compound $C_{12}H_{21}(BaOH)O_{11}$, which falls as a precipitate when syrup is mixed with a concentrated solution of barium hydroxide. With strontia sucrose forms the compound $C_{12}H_{20}(SrOH)_2O_{11}$ as a precipitate, and this reaction is employed commercially for the separation of crystallisable sugar from molasses. The precipitate is granular, easily separates, and after being washed with hot water is decomposed with carbonic acid.

Sucrose in the solid condition, or in the form of a strong syrup, is decomposed in the cold by concentrated sulphuric acid, with formation of a spongy carbonaceous mass, and evolution of sulphur dioxide and other volatile products. Nitric acid acts upon sucrose, forming nitro-sucrose, saccharic acid, oxalic acid, or carbonic acid, according to the concentration of the nitric acid; the fuming acid in the cold produces nitro-sucrose. Sucrose, like all the members of the disaccharose group, is hydrolysed when heated in solution with dilute acids; in the case of sucrose a mixture of glucose and fructose results, the change consisting in the assimilation of the elements of water and bisection of the sucrose molecule, thus:

Sucrose. Water. Glucose. Fructose.



This action is termed 'inversion,' because the solution after the action of the acid rotates the plane of polarisation to the left, but the term is now applied generally to the hydrolysis of disaccharoses by acid. Inversion takes place slowly even in the cold with hydrochloric or sulphuric acid, and with

dilute solutions of sucrose, but at 70° C. the change is very rapid; acetic, tartaric, citric, and the other weak acids have much less power in this respect. The process of inversion is of value in analysis of mixtures of various sugars.

Sucrose is a strong reducing agent, which is another way of saying that it is readily oxidised. It quickly decolorises solutions of potassium permanganate even in the cold, and on boiling with it yields oxalic and carbonic acids. When heated with solutions of silver or mercury it causes separation of the metal, and it precipitates gold from the chloride. When boiled with cupric salts in presence of alkaline hydroxides there is no separation of cuprous oxide, but after continued ebullition a partial reaction occurs. After undergoing inversion by dilute acids or invertase it quickly and completely reduces alkaline solutions of copper (see end of article).

The behaviour of sugar under the influence of living ferments is of great interest theoretically, and of importance from a practical point of view. See FERMENTATION; also ALCOHOL, BEER, YEAST.

Besides sucrose the only disaccharoses of practical importance are lactose and maltose. Lactose is the natural sugar of milk. It is a solid substance of sweetness inferior to sucrose, crystallising in hard, white, semi-transparent masses, having the composition $C_{12}H_{22}O_{11} + H_2O$, soluble in water, but insoluble in alcohol or ether. When boiled with dilute sulphuric or hydrochloric acid it is converted into the two monosaccharoses, glucose and galactose. It is not fermented by yeast alone, but in contact with yeast and putrefying casein it ferments, yielding alcohol and lactic acid. Koumiss is a product of such fermentation acting upon the milk of mares. Lactose reduces Fehling's solution and rotates the plane of polarisation to the right.

Maltose, $C_{12}H_{22}O_{11}$, occurs in fine crystalline needles, soluble in water and in alcohol, but to a less extent than sucrose. This sugar reduces Fehling's solution, and has a dextro-rotatory polarisation. It derives its chief interest and importance from the fact that it is the principal ingredient in beer worts, in which it owes its presence to the action of an enzyme, diastase, possessing the power of hydrolysing starch, and forming from it maltose and dextrin, but not glucose, as was formerly supposed. It is probably not directly fermentable by yeast, but is rapidly inverted by that organism and converted into alcohol and carbonic acid.

Sources of Sucrose.—Sucrose occurs very widely in the vegetable kingdom. It is found in the sugar-cane (*Saccharum officinarum*), of which a number of varieties are known and cultivated; in many other grasses; in the sap of many forest trees; in certain roots; in numerous seeds; in most sweet fruits, usually in association with invert sugar; and in the nectar of flowers. The sugar-cane was the source from which sugar was originally prepared, and the East first learned its use. The early classical writers, especially Herodotus, Theophrastus, Seneca, and Strabo, make undoubted references to sugar, which they speak of as 'honey of canes,' or 'honey made by human hands'; and at about the date of the Christian era it had become pretty generally known under the name of *sakcharon* or *saccharum*. The term candy, applied to sugar in large crystals, took its origin from the Arabic and Persian *kand* or *kandat*. It is believed that Bengal was the region in which cane-sugar in a dry granular state was first prepared. The Chinese admit that they first gained their knowledge of sugar-making from India, somewhere about 766 to 780 B.C. We have evidence that in the 9th century of our era, sugar was grown in Persia, and the Persian physicians of the 10th

and 11th centuries first introduced it into medicine. The Arabs cultivated the cane in many of their Mediterranean settlements, and as early as 961 A.D. the plant flourished in the Iberian peninsula. Soon afterwards sugar of Egyptian origin formed a staple of trade between the merchants of Venice and of London, wool, which then constituted the great wealth of England, being largely exported in exchange for it.

The sugar-cane has been introduced into almost all tropical and subtropical countries; the East and West Indies, the southern United States, Central America, Brazil, Peru, Chile,



Sugar-cane (*Saccharum officinarum*).

Mauritius, the Malayan Archipelago, Egypt, northern Australia, South Africa, and many islands of the Pacific may be mentioned as illustrating the wideness of its range, although the list is by no means exhaustive. The cane seems to have been introduced by Jesuits into the southern United States from the West Indies about 1750; but sugar culture was neither an important nor prosperous industry when Louisiana was ceded to the United States in 1803. This state soon became and still is a great sugar-producing state; the cane is grown in all the Gulf states on both sides of the Mississippi (though in all these states it sometimes suffers from frost). In Europe it is or has been grown a little in Sicily and in Andalusia.

The cane, which may be described as a gigantic grass, thrives best in a warm, moist climate, with prevalent sea-breezes and moderate intervals of hot, dry weather. Many descriptions of cane exist, and these are regarded as varieties of one species, although some botanists have raised a few to the rank of distinct species. The stem, which varies from 6 to 14 feet in height, is from 1 to 1½ inch thick, and jointed at intervals of from 3 to 6 inches; its pith, of open cellular structure, contains the sugary juice. The tops and lower joints are not crushed; the outer skin contains much silica. The 'arrow' or flowering stem is without joints, and bears a panicle of soft, silky flowers. The

cane suffers much from the ravages of rats (to check which the mongoose or ichneumon has in some places been successfully used), from white ants, and several boring insects. It is propagated from the eyes or buds which grow on the stems, as it generally fails to ripen its seed; and the 'stoles,' or portions remaining in the ground, throw up fresh canes, called ratoons, for several seasons—sometimes twenty years—after which replanting is necessary. The young cuttings are planted in rows 3 feet apart, and at intervals of 2 feet from plant to plant. Seedlings have been known since 1888, and are used to improve the race. The cane requires a fertile, marly soil, not too heavily charged with common salt or other saline ingredients. The most suitable manure is farmyard dung or night-soil; superphosphates and the various artificial fertilisers are considered to be less advantageous, but the presence of lime is of primary importance. Potash is useful.

The beet-sugar industry was first stimulated by Napoleon I., especially during the period when France was deprived of sugar by the English blockade, and has assumed immense proportions owing in great measure to the scientific skill that has been expended upon it. The Beet (q.v., *Beta vulgaris*) is indigenous to Europe, and many varieties of this plant, as of the sugar-cane, are known. The juice of the root contains from 12 to 18 per cent. of crystallisable sugar associated with various salts, such as the phosphates, oxalates, malates, and chlorides of potassium, sodium, and calcium, besides albuminous, pectinous, and other substances. The plant thrives best in a deep, friable 'turnip loam,' neither too stiff nor too light, and manuring with phosphatic manures gives the best results; peaty and moorland soils and farmyard manure are less suitable. The seed is usually sown in April, and the crop gathered in autumn before the incidence of early frosts.

Sucrose is also made in America from the sugar-maple (*Acer saccharinum*) and the melon (*Cucumis Melo*); in America and elsewhere from different varieties of sorghum (see DURRA) and from maize (*Zea Mays*); and in various tropical countries from many species of palm.

Manufacture.—While differing in details, the extraction of sugar from cane and beet is on the whole the same in its main outlines. The cane is crushed to express the juice. Sometimes before the final crushing it is macerated in water. Beet-root is cut in slices and the sugar extracted by diffusion, for it will pass through an unbroken cell-membrane (see OSMORE). The same can be done with short lengths of sugar-cane, and on the other hand pressing and maceration have been used in the past with beet. So long as the juice remains within the plant-cells it does not ferment, but when it is liberated fermentation soon begins. Therefore without loss of time the juice or solution is heated with milk of lime to neutralise acids and coagulate proteins. Excess of lime is precipitated by carbon dioxide. The liquid is decolorised with animal charcoal, and filtered. Then follows evaporation in a vacuum pan heated with steam. Crystals form in the concentrated syrup, and are separated from it by a centrifugal machine and purified by recrystallisation from water. The molasses still contains much sucrose which refuses to crystallise; most of which can be got by adding strontium hydroxide, as has already been explained. The strontium carbonate being removed, the filtrate is evaporated to a syrup, and sucrose crystallises out.

Palm-sugar is derived from the juice which flows from incisions made in the trunk of the tree. This is very pure, containing less non-saccharine matter than cane-juice, and far less than beet-juice, and the sugar is obtained by simple evaporation in

open pans. Sorghum-sugar is extracted and fabricated by processes that are almost identical with those employed in making sugar from the cane, but the machinery is usually constructed on a much smaller scale. Maple-sugar is manufactured by simple evaporation in iron or copper pans of the sweet sap draining from auger holes made in the trunk during spring.

In former years, before the beet industry assumed its present enormous proportions, and when the cane was the chief source of supply, sugar was to a great extent consumed in the condition in which it arrived from the producing country. This, which was possible and even pleasant with the sweet and fragrant cane muscovadoes, became impossible when raw beet-sugar with its unpleasant vegetable flavours was introduced, and the practice of refining all sugars became established. The hogsheds of muscovado, bags of beet, mats of jaggery (as most of the sugar from the East is called), or other packages, are discharged, the sugars mixed, and dissolved in hot water to a syrup. The syrup flows through filter-bags, of which a large number are required, owing to the slimy nature of the suspended matter, and is then caused to gravitate down large iron cylinders packed with granulated animal charcoal, which can be 'revived' many times (see CHARCOAL). The first syrup running from the char-cisterns is quite colourless, and is collected apart and boiled for the production of crystals (loaf-sugar being almost obsolete). The last portions of syrup yield the 'pieces' or yellow moist sugar. The boiling is effected in vacuum-pans, and a small quantity of sulphurous acid is added to the pan and greatly improves the colour of the 'pieces.' In boiling this class of goods the object is to form a 'false grain'—i.e. an aggregation of small grains having the appearance of larger particles; in this way a soft-looking sugar of primrose complexion and carrying a large quantity of syrup, which pleases the eye much more than a gray-looking 'piece' sugar of bolder grain, is obtained. The thick mass from the pan is discharged through an opening in the bottom into centrifugal machines, which, with the aid of a little wash water, separate the crystals from the syrup. This operation of 'machining,' it should be mentioned, is frequently applied to hard grainy beet-sugars in the initial stage of refining, and the resulting ill-smelling impure syrup treated apart from the grayish white and comparatively pure crystals left upon the machine.

Lump sugar is made by draining a very stiff masse-cuite of small grain in moulds, and afterwards drying the concreted loaves; for the production of cube sugar moulds of peculiar shape are used, which when filled are placed in centrifugal machines to facilitate the removal of the syrup. The slabs are then cut by machinery into cubes.

Analysis.—Three estimations are chiefly necessary for the analysis of raw sugar, the determination of polarising value, of glucose, and of ash or mineral matter. The polarimeter is an instrument by which the rotatory power of sucrose (or other sugars) upon a ray of polarised light is made available for purposes of quantitative measurement. Those instruments are the best that require the use of the yellow light of the sodium ray. The two Nicol's prisms of the polarimeter being crossed and the vernier at zero, a filtered solution of sugar containing a known weight of the sample in unit volume is introduced into a tube 20 centimetres long and placed between the prisms. The result is a transmission of light requiring for its suppression the rotation of the analysing prism, the one nearest to the eye. From the angular degrees of this rotation the polarising value of the sample is deduced.

In actual instruments an ingenious device is made use of for the sake of gaining delicacy. This consists in covering one-half of the optical field with a half-wave plate of quartz or of mica; the field in these instruments is always more or less bright, but the slightest movement of the prism in either direction from the neutral point causes an unequal shadowing of the two half-disks, and very sharp observations can be made. The presence of glucose in sugar, and the amount, are ascertained by *titration* with standard Fehling's solution made by dissolving in every litre 34.64 grams of crys. sulphate of copper, 70 grams of caustic soda, and 180 grams of Rochelle salt. This liquid is not affected by sucrose, but when a solution of a sample containing glucose (also maltose, lactose, &c.) is delivered into a known volume of the copper solution diluted with water, and kept at the temperature of boiling, the copper is precipitated as red suboxide, and the supernatant liquid becomes colourless. The volume of the solution of sugar required to effect this result is a measure of the glucose present. The ash of sugar is ascertained by burning 1 gram of the sample in a platinum capsule at a red heat; but, owing to the difficulty of obtaining a white ash from the fusible salts, it is usual in technical practice to add two or three drops of strong sulphuric acid before ignition, and to deduct one-tenth for the extra weight thus introduced.

Sugar of Lead. See LEAD, p. 564.

Suggestion. See HYPNOTISM.

Suhl, a town of Prussia, standing in a romantic valley on the south-west side of the Thuringian Forest, 32 miles by rail SW. of Erfurt. It has long been celebrated for its manufacture of fire-arms, both military and sporting, and from the middle ages down to the 18th century was no less celebrated for its swords and war-armour. There are also iron and machine works, potteries, and tanneries. Pop. 15,000.

Suhm, PETER FREDERIK (1728-98), a Danish historian, was born and died at Copenhagen.

Suicide (a word coined in England on a French model, but of Latin elements), according to English law, is a Felony (q.v.). A person found *felo de se* (guilty of self-murder) by a coroner's jury was formerly buried at a cross-road with a stake driven through his body, but this barbarous practice (a survival probably of the vampire superstition) was abolished in 1823. A person is *felo de se* if he commits any felonious act which results in his own death; a person who shoots at another with a gun which bursts and kills himself, a woman who dies of poison taken to procure miscarriage are both guilty of self-murder. If two agree to assist one another in committing suicide, and one survives, he is guilty of murder. Policies of life insurance are usually so framed as to be void if the insured dies by his own act, whether he is of sound mind or not. In Scotland suicide involves 'single escheat' or forfeiture of the movable estate of the deceased to the crown; but this rule is never in ordinary cases put into force. In the United States the constitutions of several states provide that the property of suicides is not to be forfeited.

The question of the moral justification of suicide has exercised the minds of ethical philosophers from the days of Plato, Marcus Aurelius, and Seneca down to the present time. Some schools of thought, notably Stoics and their adversaries the Epicureans, defended suicide under proper conditions; Christianity has always refused to admit any justification for self-destruction, and the Roman and Anglican churches deprive of ecclesiastical burial those who have without doubt wilfully committed self-murder.

From the medical point of view suicide is in the majority of cases a symptom of disease of the brain. It is not now denied, however, by any competent medical authority that sane men may and do commit suicide. The brain constitution of some persons is such that when they are under the immediate influence of alcohol they always become suicidal. The next kind of case in which suicide is attempted is one on the borderland of disease. It is the man intellectually sound and not emotionally depressed who simply loses for the time his normal love of life, ceases to have any fear of death, suffers from the *tedium vite* of the ancients, and for trivial causes or for no outward cause at all, attempts his life. Some such men are in Hamlet's frame of mind: 'To be or not to be? That is the question.' A man in this state, which is often a hereditary one, cannot always be reckoned insane, and yet he is in an abnormal state of brain and mind. The mass of suicides are committed or attempted by persons either insane or on the verge of insanity. The two forms of insanity in which suicidal impulses are most frequent are melancholia and alcoholic insanity. Four-fifths of all patients suffering from melancholia have suicidal feelings, and two-fifths of them make actual attempts on their lives. It is a risk that should be considered and provided against in every case of melancholia and in every case beginning to suffer from alcoholism or alcoholic insanity. The tendency to suicide is very hereditary. Suicide may be carefully contrived and planned for months, or it may be done through a momentary morbid impulse. It may be done, and commonly is done, from insane delusions, such as that the patient is going to be killed and tortured, that he is going to be tried, that his food is poisoned, that he is too great a sinner to live and must make expiation, that he is the cause of evil to all around him, that he cannot recover, &c. Physicians especially guard against suicide with patients who are very much afraid they are to be put to death, and who therefore might be supposed to be too much afraid of dying to do any harm to themselves. Prolonged sleeplessness will sometimes lead to suicidal feelings through brain exhaustion. Suicidal feelings are sometimes the very first symptom of insanity, before anything mentally wrong is suspected and before any watching or precautions are therefore taken. Attempts at suicide are sometimes made while the patient is quite unconscious or in a state of altered consciousness, so that there is no recollection of it afterwards. Sometimes it is suggested by the sight of a weapon or water or any such means of destroying life. When the suicidal desire is strongly present it is a mistake to suppose that the patient's former religious sentiments, or his sense of duty, or his obligations to those dependent on him, or any other rational motive can be depended upon to prevent his committing the act.

The modes of committing suicide vary in different countries, in the two sexes, and in different professions. Suicide is much more common among men than among women, being in the proportion of 3 or 4 to 1; and this applies to all countries and races. As to age, 'suicide augments in the two sexes in direct ratio with age,' at least up to the seventieth year; there are instances of suicide at five years of age, and also over ninety. The critical periods of life, adolescence, the climacteric, pregnancy, parturition, nursing, and senility all increase the tendency to suicide, just as they increase the tendency to insanity. Suicide in all civilised countries is becoming more common year by year. Physical diseases, notably those that are very painful and those that are slow and chronic, increase the

number, as does increased consumption of alcohol, especially spirits. The religion of a people seems to exercise a marked influence on the number of suicides. There are more in Protestant than in Roman Catholic countries. But the social circumstances of each country need to be taken into consideration. Suicide is most common among the widowed and least frequent among the married. The military profession furnishes much the largest proportion. It is commoner among town-dwellers than in the country.

See the articles *INSANITY*, *EUTHANASIA*, *HARA-KIRI*, and *SUTTEE*. The suicide of Scorpions (q.v.) and snakes, often asserted, has been proved to be impossible.

Suidæ, a family of even-toed, non-ruminant Ungulates, including pigs, hogs, or boars, the Babiroussa, and the wart-hogs (*Phacochoerus*). The snout is mobile but truncated; the feet have four toes, of which two reach the ground; the upper canine teeth curve more or less outwards or upwards; the molars bear rounded tubercles; the stomach is almost simple. In distribution they are entirely confined to the Old World, the American pigs or peccaries belonging to the family *Dicotylidæ*.

Suidas, the reputed author of a *Lexicon*, though when he lived, or who he was, or whether he was even called Suidas, no one can say; but it is customary to place him about the 10th or 11th century. The *Lexicon* bears unmistakable evidence of having gone through many hands; and though we can fix the date when several of the articles *must* have been written, it is impossible to ascertain whether they are the composition of the first compiler or of a later editor. The work is a sort of cyclopædia, giving an explanation of words, and notices of persons, places, &c., in alphabetical order. It possesses almost no literary or critical merit, but is valuable for its numerous extracts from ancient writers, whose works in many cases have perished. The first edition appeared at Milan (1499); since then the best editions have been those of Küster (3 vols. 1705), Gaisford (3 vols. Oxf. 1834), Bernhardy (2 vols. Halle, 1834), and I. Bekker (1854).

Sui Juris, in Roman law, the condition of a person not subject to the *Patria Potestas*. The paterfamilias was the only member of a family who was *sui juris*, all the rest being *alieni juris*, including sons, unmarried daughters, the wife, and the wives and children of the sons of the paterfamilias. A son or unmarried daughter became *sui juris* on the death of the paterfamilias. In his father's lifetime a son could only become *sui juris* by emancipation.

Suir, a river of Ireland, flowing 85 miles southward and eastward, chiefly along the boundary of the counties of Tipperary, Waterford, Kilkenny, and Wexford, past Clonmel, Carrick, and Waterford, till it meets the Barrow, and immediately afterwards falls into Waterford Haven. It is navigable by barges as far as Clonmel.

Suite, a series of dances arranged for instruments in the same or relative keys, and usually preceded by a prelude.

Sukhum Kale, a fortified seaport town of the Caucasus, on the east coast of the Black Sea, 70 miles N. by W. of Poti. It stands on the site of the ancient Milesian colony of Dioscurias, and since 1809 has been alternately in the hands of the Turks and the Russians; the latter held it from 1877. It is now capital of Abkhasia, within the republic of Georgia.

Sukkur, a town on the right bank of the Indus, 28 miles by rail SE. of Shikarpur; it is connected by rail also with Karachi (Kurrachee), and is the terminus of the Bolan Pass Railway to Afghanistan. The river is crossed by a magnificent

cantilever bridge (1889), or rather by two bridges (one with a span of 820 feet), resting upon the fortified island of Bukkur in the middle of the channel. New Sukkur, which grew up after the British occupied (1839) the fort on Bukkur, has considerable trade in silk, cloth, cotton, wool, opium, saltpetre, sugar, brass utensils, piece-goods, metals, wines and spirits. Pop. (1834) 4000; (1872) 13,318; (1921) 42,759. Old Sukkur, about a mile away, has a good many old tombs in its immediate vicinity. One of the largest irrigation projects ever attempted is now being executed at Sukkur. It includes the construction of a barrage across the Indus, and of new canals on each side of the river. The work is expected to occupy about 12 years and to cost over £13,000,000. The scheme when completed will enable some 3½ million acres of waste land to be added to the area under cultivation, to the great benefit of the people of Sind.

Suleiman Pasha, Turkish general, was born in Rumelia in 1838, entered the Turkish army in 1854, fought in Montenegro, Crete, and Yemen between that date and 1875, and in the intervals of peace taught in the Military Academy at Constantinople, and finally presided over it as director. He greatly distinguished himself as a corps commander against the Serbians in 1876, and was in 1877 nominated governor of Bosnia and Herzegovina. When the Russians declared war (1877) against Turkey Suleiman checked them at Stara Zagora, and destroyed his army in heroic but vain attempts to force them from the Shipka Pass. In October he was appointed commander-in-chief of the army of the Danube, but failed to accomplish anything, retreated behind the Balkans, and suffered defeat near Philippopolis (January 1878). He was condemned to be degraded and imprisoned for fifteen years. The sultan pardoned him, and he died at Bagdad 11th August 1892. Personally brave, he seems to have been a corrupt and designing traitor.

Suliman or **SULAIMAN HILLS**, a mountain-range upwards of 350 miles in length, running in a straight line from north to south, and forming the boundary between Baluchistan and the Punjab. The highest summit of the range, Takht-i-Sulaiman (Solomon's Throne), 11,295 feet high, was first ascended by a European, Major Holdich, in 1883. The general appearance of the range is rocky, precipitous, and bare of trees.

Sulina, one of the lower branches of the Danube (q.v.), in Rumania. The town of Sulina, on its south bank and near its mouth, is a great transshipping port and naval base, with 10,000 inhabitants. It was bombarded by the Russians in 1877.

Suliot, a tribe who inhabited the valley of the ancient Acheron, in Epirus, included in Greece since the war of 1912-13, are a mixed race, being partly of Hellenic and partly of Albanian origin. They are the descendants of a number of families who fled from their Turkish oppressors to the mountains of Suli (whence they derive their name) near Parga during the 17th century. In this corner of the Turkish empire they prospered, and towards the close of the 18th century numbered 560 families, inhabiting 90 hamlets. For several years they heroically resisted the attempts of the Turks to deprive them of their independence. But vanquished at length (1803), they retreated to the Ionian Islands, where they remained till 1820, when Ali Pasha, finding himself hard pressed by the Turks, invoked their aid. The Suliot, eager to return to their home, threw in their lot with him, but were ultimately forced to surrender their stronghold of Suli to the Turks, and again to flee

from their country. About 3000 of them took refuge in Cephalonia, though large numbers preferred to skulk in the neighbouring mountains. Though they took a glorious part in the war of Greek independence, their country was not included by the treaty of 1829, nor by the extension of 1881, within the Greek boundary line. Nevertheless most of them established themselves in Greece, where their leaders were raised to important offices. See Perriaebos' *History of Suli and Parga* (1815; Eng. trans. 1823).

Sulla, **LUCIUS CORNELIUS**, surnamed by himself **FELIX**, a scion of the illustrious house of the Corneli, was born in 138 B.C. His limited patrimony was sufficient to secure him a good education, and his youth was spent not more in the pursuit of pleasure than in the study of the Greek and Roman authors. The liberality of his step-mother increased his slender means, and enabled him to aspire to the honours of the state. As quaestor in 107 under Marius in Africa he crowned a series of important successes by inducing Bocchus, the Mauritanian king, to surrender Jugurtha, whom he brought in chains to the Roman camp (106). The war of the Cimbric and Teutonic (104-101) saw Sulla again serving under Marius, whose jealousy, however, drove him to take a command under the other consul, Quintus Catulus. In 93 he was praetor, and in 92 propraetor in Cilicia, where the senate sent him with special orders to restore Ariobarzanes to the throne of Cappadocia, from which he had been expelled by Mithridates. After achieving a complete success, Sulla returned to Italy in 91. The private hatred of Marius and Sulla began now to take on a political aspect, as the aristocratic tendencies of the latter grew prominent. Their long-smouldering animosity was on the point of bursting forth, when the breaking out of the Social War hushed all private quarrels for the time. The aged Marius had now the deep mortification of finding his military achievements thrown into the shade by the brilliant successes of his rival. The expectations of Marius were dashed to the ground when the senate bestowed on Sulla, after his consulship in 88, supreme command in the Mithridatic war. Marius rushed headlong into treason and civil strife. Then followed the expulsion of Sulla from Rome, his triumphant return at the head of his devoted legions, the overthrow of the Marian party, and the first proscription. By the beginning of 87 Sulla was able to embark for the East. During the four years he spent there he won the victories of Chaeronea (86) and Orchomenus (84) against Archelaus, the general of Mithridates. Next he crossed the Hellespont, crushed Fimbria, who had obtained the command of the army sent out by the Marian party (which, in Sulla's absence, had again got the upper hand in Italy), forced Mithridates to sue for peace, then sailed for Italy and landed at Brundisium (83). The victory over the Samnites and Lucanians at the Colline Gate brought the struggle to a close (82), and Sulla was now master of Rome and Italy. Then followed his dictatorship, and the period of the proscriptions (81)—a virtual reign of terror, in which of senators were slain perhaps from one to two hundred, of knights between two and three thousand. During the next two years several very important constitutional reforms were carried, mostly reactionary, and tending to increase the authority of the senate. The restoration of the *judicia* to the senate, the abolition of the functions of the *comitia tributa*, the withdrawal from the tribunes of the right to summon the *comitia*, the doubling of the number of the senate, the annual election of twenty quaestors, the enactments that no man should be praetor without having been quaestor, or consul without having been praetor,

and that *tribuni plebis* should be eligible for no other office, the institution of *questiones* without appeal confined to special classes of crimes—these were some of the provisions of a legislation, with a few exceptions, doomed to fall within ten years. In 79 Sulla resigned the dictatorship and retired to his estate at Puteoli, where, surrounded by buffoons and dancers, he indulged to the last in every sensual excess of which his exhausted frame was capable. He died in 78, at the age of sixty. His monument in the Campus Martius bore an inscription, attributed to Sulla himself, which said that none of his friends ever did him a kindness, and none of his foes a wrong, without being largely requited.

See Oman's *Seven Roman Statesmen* (1902).

Sullivan, SIR ARTHUR SEYMOUR, was born in London, 13th May 1842. He studied music under Sterndale Bennett and Goss, and at Leipzig, and had his music to *The Tempest* performed at the Crystal Palace in 1862. He then produced the cantata *Kenilworth* in 1864, the overtures *In Memoriam* (1866), *Marmion* (1867), and *Di Ballo* (1869), the oratorios *The Prodigal Son* (1868) and *The Light of the World* (1873), a Festival Te Deum for the Prince of Wales's recovery in 1872, and at Leeds in 1880 and 1886 *The Martyr of Antioch* and *The Golden Legend*. To the general public, however, he is better known by his hymn tunes, his songs, and still more his tuneful and popular operas and operettas. The latter began with *Cox and Box* in 1866, and include the long list given already in the article on W. S. Gilbert (q.v.); they are notable for an orchestration full of subtle and humorous touches that render his operas of special interest to musicians. The fertility and technical resource squandered on these productions were devoted to higher work in the grand opera of *Ivanhoe* (1891). He was the first principal (1876–81) of the National Training School for Music, was made Mus. Doc. of Cambridge in 1876 and of Oxford in 1879, received the Legion of Honour in 1878, and in 1883 was knighted. He died 22d November 1900, and was buried in St Paul's.

Sullivan, BARRY, tragedian, born at Birmingham in 1824, first appeared at Cork in 1840, played at Edinburgh and elsewhere, and at the Haymarket in London as Hamlet in February 1852. He visited America in 1857–60, and Australia in 1861–66. He was afterwards for a while lessee of the Holborn Theatre; but he was more popular in the provinces, especially in Ireland and the west of England. He died at Brighton, 3d May 1891.

Sully, MAXIMILIEN DE BÉTHUNE, DUC DE, the famous minister of Henry IV. of France, was the second of the four sons of François, Baron de Rosny, and was born at the château of Rosny near Mantes, 13th December 1560. At an early age he was committed to the care of Henry of Navarre, head of the Huguenot party, narrowly escaped the St Bartholomew massacre (1572), and accompanied Henry in his flight from court (1576). He took an active part in the war, had command of the artillery at Coutras (1587), and helped materially to decide the victory. He reached Ivry but an hour and a half before the battle, but was fortunate enough, though severely wounded, to capture the white standard with black crosses of Mayenne. He approved of the king's politic conversion, and throughout the whole of the reign remained his most trusted counsellor. His first task was to repair the ruinous finances of the realm, and to this gigantic labour he gave himself with an energy and persistence that entitle him to rank with Richelieu and Colbert among the few great ministers of France. Before his time not half the nominal sum raised from taxes

reached the treasury, the whole administration being an organised system of pillage; but Rosny made a tour through the provinces armed with absolute authority, personally examined the accounts, discovered the actual delinquents, and dismissed or suspended them, besides compelling them to disgorge their ill-gotten gains into the treasury. All this he effected with iron rigidity and persistence, heedless of the clamour and hatred of all the army of dishonest tax-gatherers and revenue-farmers, however high in station. In 1596, according to Henri Martin, the disposable revenue of the state was but nine millions of livres; in 1609 it was no less than about twenty millions, with a surplus as great in the treasury, and the arsenals and fleet besides in an excellent state of equipment. He brought actual order out of chaos, and would have done yet more for France but for the vast expenditure of the pleasure-loving king and his mistresses. Yet Sully was no far-seeing or philosophical financier, but only a dexterous master of expedients. He made no great innovations, but, if not a genius of creation, he was undoubtedly one of order. He distrusted manufactures as a source of prosperity, his main economic ideas summed up in his well-known aphorism, 'Labourage et pâturage sont les deux mamelles qui nourrissent la France.' His own honesty has been impugned by hasty writers, but, even if he himself grew rich in his years of office, there is absolutely no proof that he ever robbed his master.

In February 1601 he became grand-master of the artillery, and in March 1606 he was created Duke of Sully. After the assassination of his master he was forced to resign the superintendence of finance, but was allowed to retain the care of the woods and the artillery, and was even presented by Marie de Médicis with a reward of 300,000 livres. But his reign was at an end, and ere long he retired to his estate, surviving till December 22, 1641. In his retirement his Memoirs were compiled by his secretaries, and submitted to him, being actually composed in the awkward and tedious fashion of a narrative addressed to himself. Here naturally his own actions are put in the most favourable light; yet, although the judicious student will by no means accept the whole as completely historical, the work remains a document of priceless value for the reign of Henry IV. Chapter vi., treating of the remorse of Charles IX. after St Bartholomew, was copied from an earlier MS., doubtless entirely Sully's own work, and is an admirable example of direct and vigorous writing. The first and second folio volumes were printed under Sully's own eye (undated, but really in 1634); the third and fourth volumes were printed at Paris in 1662. These last contain the famous anticipation of the League of Nations (see PEACE and INTERNATIONAL ARBITRATION). The scheme was no doubt Sully's rather than Henry's, although it may well be that its germ may have been found in the careless talk of the king with his trusted minister as they paced together the broad walk of the Arsenal gardens.

Sully was a harsh and unamiable man, of vast self-esteem and little humour; but his unpopularity was a natural enough fruit of his inflexibility of principle. His devotion to the interests of France and the person of the king it is absolutely impossible to gainsay.

The full title of his work is its best description: 'Mémoires des sages et royales Économies d'État, domestiques, politiques et militaires de Henri le Grand, l'exemplaire des rois, le prince des vertus, des armes, et des lois, et le père en effet de ses peuples français; Et des Servitudes utiles, obéissances convenables et administrations loyales de Maximilian de Béthune, l'un des plus confidents familiers et utiles soldats et serviteurs du grand Mars des Français; Dédiés à la France, à tous les bons soldats et tous peuples français.'

Marbault, secretary of Sully's chief rival, Du Plessis-Mornay, wrote a severe criticism on the *Mémoires*—the foundation of the unhistorical and calumnious article on Sully in the *Historiettes* of Tallemant des Réaux. The singular form in which the *Mémoires* was cast proved so intolerable to the 18th century that the Abbé de l'Écluse in 1745 re-edited the whole in ordinary form of narrative, but modernised and spoiled the work. The original text may be found in the collection of Michaud and Poujoulat (vols. xvi.-xvii.). See Sainte-Beuve's *Causeries du Lundi*, vol. viii.; also the books by Legouvé (1873), Gourdauld (3d ed. 1877), Bouvet de Cressé (1878), Dusieux (1887), and Chailley (1888); also Ritter's study of the Memoirs (Munich, 1871).

Sully-Prudhomme, RENÉ FRANÇOIS ARMAND (1839–1907), a great French poet, was born at Paris, and after the early death of his father was brought up by his uncle, a notary, for his own profession. He studied the sciences, law, and philosophy, but soon devoted himself entirely to letters, and in 1865 published his first volume of poems, *Stances et Poèmes*, which had the good fortune to gain and to deserve the praises of the veteran critic Sainte-Beuve. One poem, the 'Vase brisé,' at once became widely popular. Later volumes, *Les Épreuves*, *Croquis Italiens*, *Les Solitudes*, *Impressions de la Guerre*, *Les Destins*, *Les Vaines Tendresses*, *La France*, *La Révolte des Fleurs*, extended his fame as a poet of great delicacy of feeling, as well as subtlety and depth of thought. His finest poems are steeped in a serene but penetrating melancholy, and almost all reveal sincerity of inspiration, nobility of aims, and austere beauty of form. But he was ever a thinker wrapped in a poet's robe, and the things nearest his heart were the graver questions of life and death, of good and evil. Masterpieces of analytic subtlety are his didactic poems *La Justice* (1878) and *Le Bonheur* (1888). Other works are an accurate but somewhat harsh metrical translation of the first book of Lucretius (new ed. 1886); *L'Expression dans les Beaux Arts*, a contribution to the history of art; and *Réflexions sur l'Art des Vers* (1892). His *Œuvres Complètes* appeared in five volumes, 1882–88. He was elected to the Academy in 1881.

See Brunetière, *Poésie Lyrique et Littérature Contemporaine* (1894–95); Jules Lemaitre, *Les Contemporains* (1896); Gaston Paris, *Penseurs et Poètes* (1897); and studies by Hémon (1907) and Zyromski (1907).

Sulmona, the ancient Sulmo, a city of the Paeligni, lies 75 miles E. of Rome direct (107 by rail). It stands 1322 feet above sea-level, and has a cathedral of 1119, and some interesting mediæval churches and other buildings, but no Roman remains are preserved. Here were born Ovid and Pope Innocent VII. The ruins of the hermitage of Pietro di Morrone (afterwards Pope Celestine V.) lie on the mountain-side a few miles out of the town, adjacent to those of a Roman villa wrongly attributed to Ovid; and below is the former mother monastery of the Celestines (q.v.), now a prison. Pop. (1921) 18,797.

Sulphates. See SULPHURIC ACID; for sulphides and sulphites, SULPHUR.—SULPHITE PULP is wood-pulp prepared with a solution of a sulphite by an alkaline earth that contains an excess of sulphurous acid, important in paper-making.

Sulphocyanates. See THIOCYANATES.

Sulphonal, a synthetical hypnotic now largely used, of complex composition, with the formula $(\text{CH}_3)_2\text{C}(\text{SO}_2\text{C}_2\text{H}_5)_2$. It forms colourless tasteless crystals, very slightly soluble in cold water. For sleeplessness it is given in doses of 15 to 45 grains, but opinions differ as to the place it will ultimately take in medicine.

Sulphonic Acid. See DYEING.

Sulphur is one of the most important of the non-metallic elements; S, atom. number 16, atom. wt. 32.06, sp. gr. of rolled sulphur 1.98, and of amorphous sulphur 1.957; sp. gr. of vapour 6.617 at 482° C., and 2.2 at 1040° C., atmospheric air being the unit of comparison for the vapour. At ordinary temperatures it exists as a solid, brittle, tasteless, and inodorous body, of a characteristic yellow colour, and insoluble in water. A piece of solid sulphur, heated to a temperature of 239° (115° C.), fuses into a thin yellow liquid; while in closed vessels it may by further heat be distilled, the boiling-point being about 836° (446° C.), and at this temperature it yields a deep yellow vapour of sp. gr. 6.617. When the sulphur-vapour comes in contact with cold air it condenses in the form of a fine yellow powder, known as *Flowers of Sulphur*. If fused sulphur be rapidly cooled it solidifies into a compact mass, of a granular crystalline texture; and if, in its liquid state, it be allowed to run into cylindrical wooden moulds, we obtain the ordinary roll-sulphur, or common brimstone. If allowed to cool slowly, it crystallises in long, glistening, deep yellow, oblique prisms, with a rhombic base, which, however, soon lose their most characteristic properties. As native sulphur is frequently met with in yellow crystals, whose form is derived from the octahedron with a rhombic base, it is obviously a dimorphous substance. Sulphur exists in several allotropic forms, red, black, or brown. When sulphur is heated it melts and forms a mobile amber-coloured liquid, which, by continued heat, gradually darkens, at the same time becoming more viscid, until a temperature of 356° (180° C.) is reached. Even though the heat be still continued, the temperature remains stationary for a time, but eventually it rises gradually to 500° (260° C.), the melted sulphur becoming less viscid. If at this stage it is poured into cold water it forms a tenacious ductile mass, which can be drawn out into threads having a certain amount of elasticity. In the course of a few hours these become brittle, and are seen to be crystalline in structure and in no way different from the original sulphur.

Sulphur is a bad conductor of heat, and the mere heat of a warm hand often causes it to crackle or even to fall to pieces, from the unequal expansion. It is an insulator of electricity, and becomes negatively electric by friction. It is slightly soluble in alcohol, ether, and the fatty oils; its best solvents being the bisulphide of carbon and chloride of sulphur. When it is heated in the air it takes fire at about 470° (243° C.), burning with a blue flame, and becoming converted into sulphur dioxide, whose pungent suffocating fumes are characteristic of sulphur. This element is second only to oxygen in its powerful affinity for other elements, with most of which it unites, and often in several proportions. With most of the metals it combines very readily, and in some cases with a development of light and heat; thus, silver and copper burn in sulphur-vapour just as iron-wire or zinc-foil burns in oxygen. In consequence of its power, with the aid of heat, of forming sulphurous acid with the oxygen of the air, and thus rendering the latter incapable of supporting combustion, burning sulphur may be usefully employed for the extinguishing of fire—as, for example, in chimneys.

Sulphur occurs very widely distributed in the mineral kingdom, partly free and partly combined with other elements. The free sulphur is either found pure in regularly formed crystals, or intimately mixed with earthy matters. Sulphur is usually plentiful in volcanic districts; most of what is used in Europe has been obtained from Sicily, but of late large quantities are recovered from the waste of soda manufacture, and sulphur has been actually exported from Newcastle

to Italy (see SODA, p. 500). Sulphur is found in many parts of the United States, and some Californian deposits have been utilised to a small extent, but have been unable to compete with Sicilian sulphur. In the form of sulphide, sulphur occurs abundantly in combination with iron, copper (iron and copper pyrites), lead (galena), zinc (blende), &c., the bisulphide of iron (or iron pyrites) furnishing most of the sulphur that is employed in the manufacture of sulphuric acid. Many of the metallic sulphides occur native, and form highly valuable ores. They are all solid at ordinary temperatures, and, with the exception of those of potassium, sodium, calcium, strontium, barium, and magnesium, are insoluble in water; they are, moreover, conductors of electricity. Many of them, especially of those that occur native, exhibit very brilliant and characteristic colours. The same metal may have several sulphides, and in general there is a sulphide for each oxide. The sulphides are, however, sometimes the more numerous. Sulphur is still more extensively distributed in the form of sulphates, as in the sulphates of lime, magnesia, baryta, &c. In the vegetable kingdom sulphur is a constituent of Albumen (q.v.), and of the volatile irritant oils of mustard, garlic, asafoetida, &c.; moreover vegetable juices contain it in the form of certain sulphates. In the animal kingdom it is not only a constituent of the albuminous, fibrinous, and gelatinous tissues, but of the hair, saliva, bile, urine, &c.

The grosser impurities of sulphur are removed by crude processes of fusion and distillation at or near the place from whence it is obtained. What is called refined sulphur is purified by distillation in a large cast-iron still, and condensed in a receiver kept cool. When the vaporised sulphur is condensed in a large chamber it is obtained in the form of sublimed sulphur, or flowers of sulphur; but as the walls get hot it melts and collects on the floor, and is run into cylindrical wooden moulds, from which, when cool, it is taken out as roll or stick sulphur. The residue left in the retort is a mixture of sulphur with various impurities. Under the name of black sulphur, or *Sulphur vivum*, it is used in veterinary medicine, and for the purpose of dressing mouldy hops. Sulphur is thrown down from certain of its compounds (as from a strong solution of a polysulphide of calcium, sodium, or potassium) by dilute hydrochloric acid; it falls as a grayish-white, very fine, light powder, known in *Materia Medica* as milk of sulphur, or precipitated sulphur. The most common impurities met with in ordinary commercial sulphur are selenium and realgar (bisulphide of arsenic). Flowers of sulphur frequently exhibit a slight acid reaction, in consequence of a little sulphurous acid clinging to them. By rinsing them with water this impurity is at once removed.

Sulphur is extensively employed in the arts and manufactures, as in the manufacture of some matches, gunpowder, &c. When converted into sulphurous acid it is employed as a powerful bleaching agent, as also for the destruction of insects, fungi, &c.; but its chief consumption is in the manufacture of sulphuric acid.

The eight compounds of sulphur and oxygen, when combined with water, present the characters of acids. These acids have this composition:

Hyposulphurous acid.....	H_2SO_2
Sulphurous "	H_2SO_3
Sulphuric "	H_2SO_4
Thiosulphuric "	$\text{H}_2\text{S}_2\text{O}_3$
Disulphuric "	$\text{H}_2\text{S}_2\text{O}_6$
Trithionic "	$\text{H}_2\text{S}_3\text{O}_6$
Tetrathionic "	$\text{H}_2\text{S}_4\text{O}_6$
Pentathionic "	$\text{H}_2\text{S}_5\text{O}_6$

We shall here notice the most important members of this group—the second, third, and fourth; the

third, *Sulphuric Acid*, is discussed in a special article. (The last four derive the essential part of their name from the Greek *theion*, 'sulphur.')

Sulphurous Anhydride, or *Sulphur Dioxide*, SO_2 , occurs under the ordinary relations of temperature and pressure as a colourless gas, possessing the suffocating odour of burning sulphur. In its concentrated form it is quite irrespirable, and in a diluted state it excites cough. It not only is incapable of burning, but it rapidly extinguishes the flame of burning bodies; it supports the combustion of some metals. It is very freely soluble in cold water, which at 32° (0° C.) takes up nearly 69 times its volume of the gas, while at 75° (24° C.) it only takes up 32 volumes; the solution known as *Aqueous Sulphurous Acid* having at first the same smell and taste as the gas, but soon absorbing oxygen from the air, and becoming converted into sulphuric acid. By the action of cold sulphurous acid may be condensed to a colourless transparent limpid liquid, which freezes at -105° (-76° C.), forming a transparent crystalline solid. The specific gravity of the gas is 2.247 (atmospheric air being the unit), and that of the liquid is 1.49 (water being the unit), the solid being considerably heavier. Although dry sulphurous acid gas and dry oxygen when mixed exert no action on one another, there are many conditions under which sulphurous acid rapidly absorbs oxygen, and is converted into sulphuric acid—e.g. if the gas be dissolved in water; a similar action takes place under the influence of hydrated nitric acid, iodic acid, and certain metallic oxides. Hence sulphurous acid is a powerful reducing or deoxidising agent. This gas is a common and abundant product of volcanic action, and is occasionally met with in solution in the springs in volcanic regions. It may be prepared artificially by simply burning sulphur in the air or in oxygen gas, or by heating in a flask 4 parts of flowers of sulphur mixed with 5 parts of powdered black manganese, sulphurous acid and sulphide of manganese being the products, as shown by the equation $\text{S}_2 + \text{MnO}_2 = \text{SO}_2 + \text{MnS}$. In consequence of its solubility in water this gas should be collected over mercury. In addition to the uses of sulphurous acid as a bleaching agent, it is valuable both as a disinfectant agent and as a powerful antiseptic. But by far its most important use is in the manufacture of sulphuric acid. In combination with bases this acid forms the *sulphites*—a class of salts which, apart from the sulphite of soda, are of little importance, except for their power when moist of extracting oxygen, and thus acting as reducing agents. The salts of the sesquioxide of iron are reduced by them to salts of the protoxide.

Thiosulphuric Acid, $\text{H}_2\text{S}_2\text{O}_3$, formerly called Hyposulphurous Acid, is, as yet, only known in a state of combination with bases; for on attempting to separate the acid from the base the former becomes decomposed into sulphur and sulphurous acid. The most important of its salts is the *Hyposulphite of Soda*, $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$, described in the article SODIUM. This and other soluble hyposulphites may be easily recognised by the facility with which they dissolve the haloid salts of silver, forming a solution of an extremely sweet taste, and containing a double hyposulphite of silver and soda, with an admixture of chloride, iodide, or bromide of sodium. It is this power of dissolving those salts of silver which are insoluble in water that renders the hyposulphite of soda useful in photography.

With hydrogen sulphur forms two compounds: (1) *Persulphide of Hydrogen*, an oily liquid, having the smell and taste of sulphuretted hydrogen; (2) *Sulphuretted Hydrogen*, H_2S , known also as Hydro-sulphuric Acid and Sulphydric Acid, a natural gaseous constituent of many Mineral Waters (q.v.).

as for instance Harrogate and Strathpeffer in Great Britain. It is formed spontaneously wherever organic compounds containing sulphur undergo putrefaction, as in stagnant sewers and cesspools and in waters charged with organic matter and sulphates.* By acting on sulphide of iron with dilute sulphuric acid, sulphate of iron is produced and sulphuretted hydrogen liberated.



Sulphuretted hydrogen is a poisonous colourless gas, with the nauseous odour of rotten eggs. By pressure it may be liquefied and solidified. It is soluble in one-third of its volume of water; but the solution does not keep well unless preserved from contact with air. It is readily combustible, burning with a blue flame, and forming water, sulphurous acid, and usually a little sulphur. It has a weak acid reaction, but combines readily with bases forming sulphides. It is very poisonous, birds perishing in air containing $\frac{1}{1000}$ part, and dogs in air containing $\frac{1}{800}$ part of the gas. Owing to its presence in illuminating gas silver becomes tarnished in rooms where gas is burned, while librarians find the bindings of their books become corroded by the sulphuric acid eventually produced by the combustion of the gas. From its property of forming insoluble sulphides with most metals, sulphuretted hydrogen is the sheet anchor of the analytical chemist. These insoluble sulphides again are some of them produced in an acid solution, and some only in an alkaline one. It follows that by first acidifying the solution to be analysed and then adding the sulphuretted hydrogen certain metals will be removed as insoluble precipitates, while others will have been unaffected. On now adding an alkali a second portion will be removed, and so a working method of separating the metals can be devised. The simplest test for sulphuretted hydrogen at the mouth of a drain is the use of blotting-paper soaked in solution of acetate of lead. This rapidly turns brown in presence of the gas.

Sulphur combines with carbon to form *Bisulphide of Carbon*, CS_2 , a colourless, inflammable liquid, heavier than water, and having a disagreeable odour and taste. It is soluble in alcohol, but not in water, and it is a powerful solvent of fats, sulphur, phosphorus, and india-rubber. Owing to its high refractive power it is used in the construction of prisms. It may be obtained by heating fragments of charcoal to bright redness in a porcelain tube, and passing sulphur vapour along it. Its vapour when freely inhaled exerts an anæsthetic action similar to that of chloroform and ether. Workmen in caoutchouc or other manufactures in which bisulphide of carbon is used as a solvent suffer from prolonged exposure to its vapour, which produces headache, loss of appetite, impairment of vision and hearing, and causes general derangement of health by its deleterious action on the nervous system.

Sulphur combines with chlorine in several proportions, the most important of these compounds being the *Dichloride of Sulphur*, SCl_2 , and the *Chloride of Sulphur*, S_2Cl_2 . Both of them are liquids, and are formed by the direct action of the combining elements. The chloride is a yellow liquid which is decomposed by contact with water—sulphur, hydrochloric, and other acids being produced. It is capable of dissolving about 67 per cent. of sulphur at an ordinary temperature, and, like bisulphide of carbon, is extensively employed in vulcanising india-rubber. The dichloride of sulphur is formed by saturating the chloride with chlorine; a deep-red liquid, resembling the previous compound in most of its properties; it is decomposed by the sun's rays into the chloride and free chlorine.

Sulphur seems to have been known from the earliest times, and sulphuric acid was most probably known to the Arabians; the English manufacture of sulphuric acid dates, however, only from the 18th century. Sulphur is used for various purposes in medicine. It is given internally either as sublimed sulphur (flowers of sulphur) or as precipitated sulphur (milk of sulphur), in somewhat large doses, as a mild cathartic—generally combined with jalap and cream of tartar. The *Confection of Sulphur* of the Pharmacopœia is composed of sulphur, cream of tartar, and syrup of orange-peel rubbed together—the dose being from half an ounce to an ounce, or from one to two tablespoonfuls. In small doses sulphur is of great value in cases of atonic gout and chronic rheumatism. The external use of sulphur in the form of ointment has been already noticed in the article *ITCH*. It is also used externally in other cutaneous disorders, particularly in lepra and psoriasis; its application in the form of vapour is often of service.

Sulphuric Acid, H_2SO_4 , is the chemical name of the liquid commercially known as *Oil of Vitriol*—so called from its having been first produced by the distillation of green vitriol (sulphate of iron). It is an odourless, dense, oily-looking liquid, sp. gr. 1.842. When pure it is colourless, but usually it is of a straw to brown colour, derived from impurities which have fallen into it and been charred. It has all the properties of a typical acid, being intensely corrosive and changing vegetable colours. Exposed to the air it absorbs water, and when mixed directly with water great heat is evolved, the liquids contracting in bulk. It does not evaporate at ordinary temperatures, and dilute solutions spilt on cloth gradually become stronger till the acid begins to destroy the fibres of the cloth. Oil of vitriol is not the only hydrate of sulphuric acid. Three others are known to exist. When the fuming oil of vitriol of Nordhausen is exposed to a low temperature a white crystalline substance separates, which is a hydrate, pyrosulphuric acid, containing half as much water as the common liquid acid; its formula is $\text{H}_2\text{SO}_4\text{SO}_3$, and its fusing-point is 35°C . Again, a mixture of 49 parts of the strong liquid acid and 9 parts of water freezes at 8.3°C . and crystallises into splendid rhombic prisms, from which property it is often termed *glacial sulphuric acid*, with sp. gr. 1.780. Lastly, when a very dilute acid is concentrated by evaporation *in vacuo*, at $212^\circ (100^\circ \text{C})$, till it ceases to lose weight, there will be a resulting compound, consisting of 40 parts of the real acid and 27 of water, and represented by the formula $\text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$. The compound formerly known as *anhydrous sulphuric acid* possesses none of the characteristic properties of an acid; see **SULPHURIC ANHYDRIDE**.

Sulphuric acid in its free state is a very rare natural product; although in combination with bases it is common in the animal and vegetable, and abundant in the inorganic kingdom. In plants it exists in the juices, and in animals in the blood and its derivatives chiefly in the form of sulphates of the alkalies; while in the mineral kingdom it occurs as gypsum (sulphate of lime), heavy spar (sulphate of baryta), celestine (sulphate of strontia), &c. It may be prepared on a small scale by boiling sulphur in *aqua regia* or in nitric acid, the sulphur becoming gradually oxidised into sulphuric acid. As a general rule, however, the commercial acid is employed even for laboratory experiments. In order to obtain the acid in a pure form, suitable for medical use or medico-legal analysis, it must be redistilled with sulphate of ammonia in a retort containing a few slips of platinum foil, the first and last portions being rejected. The distillation is attended with violent

concussions, partly owing to the high specific gravity of the acid, and partly owing to its high boiling-point, and this convulsive action is moderated mechanically by the platinum slips. Sulphuric acid thus prepared according to the directions of the British Pharmacopœia may be regarded as perfectly pure, presuming arsenic is not present. Strong sulphuric acid has comparatively little action on the metals except at a high temperature, when it dissolves them, and at the same time undergoes partial decomposition; the metal being oxidised by a portion of the acid which becomes decomposed into oxygen and sulphurous acid, and then uniting with a portion of undecomposed acid to form a sulphate. Silver, copper, mercury, arsenic, antimony, bismuth, tin, lead, and tellurium are thus acted on. Gold, platinum, rhodium, and iridium are not affected by the acid even at a boiling temperature. The more oxidisable metals, such as zinc, iron, nickel, and manganese, are readily soluble in the dilute acid, water being decomposed and hydrogen liberated, while the oxygen of the water unites with the metal; and the metallic oxide, at the moment of its formation, combines with the sulphuric acid to form a sulphate.

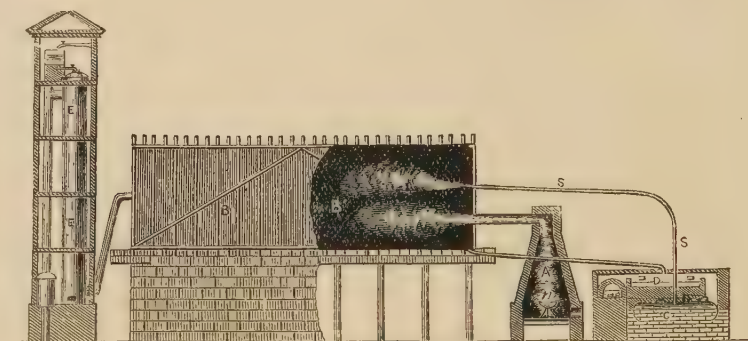
The *sulphates*—or salts formed by the combination of sulphuric acid with a base—are generally composed, as in the case of green vitriol, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, of 1 equivalent of acid and 1 of metallic oxide, with or without water of crystallisation. With the alkalis this acid also forms acid salts, as bisulphate of potash, and in a few cases—copper, for example—it forms basic salts. The insoluble sulphates, such as that of baryta, may be obtained by precipitating a soluble salt of the base by a soluble sulphate; thus, nitrate of baryta and sulphate of soda yield an insoluble sulphate of baryta and nitrate of soda, which remains in solution. The soluble sulphates may be prepared by dissolving the oxide or carbonate in dilute sulphuric acid, in those cases in which the metal itself is not readily attacked by the acid. Sulphuric acid and the soluble sulphates are easily detected by their yielding, with a solution of a baryta salt, a white precipitate of sulphate of baryta insoluble in acids.

Sulphuric acid is prepared on a large scale by three distinct processes—viz. by the distillation of green sulphate of iron—the original process of Basil Valentine (15th century); by the oxidation of sulphurous acid through the agency of nitrogen peroxide; and by the contact process. The first process is chiefly employed at Nordhausen in Germany. The sulphate of iron is distilled in earthen retorts, and the acid passes over into a receiver containing a little ordinary sulphuric acid, forming a brown fuming oily liquid, of about sp. gr. 1.900. This acid is known in commerce as Nordhausen acid, and is chiefly used for dissolving indigo.

The second method is that mainly followed in Great Britain, the germs of which were likewise discovered by Valentine. He observed that when the fumes of burning sulphur were collected under a bell jar, slightly moistened with water, a small quantity of liquid was deposited. This liquid, which was simply sulphuric acid, on being concentrated from its solution by boiling was long sold

as oil of sulphur at prices as high as 2s. 6d. per ounce. About the year 1740 the French chemists Lefèvre and Lémery suggested that, by the use of nitre along with the sulphur, the operation might be conducted in close vessels, and a much greater quantity of acid might be produced. This idea was acted on in England by Dr Ward, who established works at Twickenham and Richmond, conducting his manufacture by burning the mixed sulphur and nitre in large stoppered glass receivers, into each of which a small quantity of water was first introduced. The substitution, in 1746, by Dr Roebuck of Birmingham, of lead chambers in place of the glass vessels may be regarded as essentially the establishment of the process of manufacture followed at the present day.

The first stage in the manufacture of sulphuric acid is the preparation of sulphurous acid by the burning of sulphur or of iron pyrites. Previous to the year 1838 Sicilian sulphur was almost exclusively used in the manufacture, but in that year



A, sulphur-burner, or furnace; B, lead chamber, shown in section at B'; C, steam-boiler; D, leaden pan; E, coke tower; S, steam-pipe; n, nitre pot.

the establishment of a monopoly of the sulphur trade by the Sicilian government, and its consequent increase in price, diverted the minds of manufacturers to the employment of iron pyrites (sulphide of iron). Iron pyrites is now much more used than sulphur, and the only hindrance to its universal adoption is the presence of foreign matter in the pyrites, the most deleterious being arsenical compounds; and it has hitherto been found impracticable to free the sulphuric acid wholly from the arsenious acid which renders it inapplicable for many purposes.

When sulphur is the material used for producing the sulphurous acid it is burned in an oven or 'burner' (A) of brickwork, having a sole or bottom of iron, termed the 'burner-plate.' Under this a small fire is at first lighted, which is allowed to go out after the sulphur has ignited. A little above the sulphur a small pot, called the nitre pot, n, is either placed on a stand or hung from the roof, filled with a quantity of either nitrate of soda or nitrate of potash, with sulphuric acid sufficient for its decomposition—8 or 10 lb. of the nitre with 5 or 6 lb. of sulphuric acid being allowed for every cwt. of sulphur. The decomposition of the nitre by the action of heated sulphuric acid furnishes nitric acid fumes, which go over into the chamber along with the sulphurous acid. The sulphurous acid readily abstracts from the nitric acid the additional oxygen required for its conversion into sulphuric acid, reducing the nitric acid to nitric oxide, NO. Nitric oxide in its turn quickly converts itself into nitric peroxide, by the abstraction of additional oxygen from the air that is constantly entering the chamber through the burners. Again, in the presence of moisture which is supplied by a

jet of steam from the boiler, C, sulphurous acid readily deprives the nitric peroxide of oxygen, and thus forms more sulphuric acid, and again liberates nitric oxide; which is ready once more to seize upon the oxygen of the air, and would continue so acting and reacting *ad infinitum*, were it not carried forward and out by the chimney.

The chamber is an immense box or room of lead, bound together with a strong framework of timber, and generally raised on arches several feet above the ground. Chambers vary in size from 60 to 140 feet in length, and from 20 to 40 feet in width and height. Curtains of lead proceeding alternately from the bottom to near the top, and *vice versa*, are very frequently used; they serve to retard the progress of the gases, and thus ensure the transformations desired. The floor of the chamber is covered with water, into which the sulphuric acid falls as it is formed; and when this solution attains a certain strength it is tapped off for concentration. When the gases reach the chimney, on account of the reactions of the nitrous compounds already explained, a large amount of nitrous acid would not only be wasted, but would also be deleterious to the neighbourhood, were steps for its recovery not adopted. This recovery is usually effected by means of a tower filled with coke, E, down which a constant stream of strong sulphuric acid trickles, the acid absorbing the nitrous fumes in their way upwards. Instead of a single chamber, curtained off or not as the case may be, sometimes three or five distinct chambers, connected by pipes, are employed, those communicating directly with the burners being termed working chambers, and the others receiving chambers, the last either acting as or communicating with a condenser or chimney.

When iron pyrites is used as the source of sulphuric acid suitable burners are used. In England these are arched chambers about four feet each way, on plan with furnace-bars placed a little above the ground. There are also the necessary doors and air-holes. The pyrites is broken into pieces and spread in layers on the bars, which are previously heated to redness, and the heat evolved by the burning sulphur is thereafter sufficient for the fresh charges. The exhausted ore is frequently sufficiently rich in copper for its extraction; indeed, when there is as little as 2½ per cent. present in pyrites it is now recovered. In consequence of strong sulphuric acid absorbing both sulphurous acid and nitrous acid, the acid requires to be drained off from the chamber while the solution is comparatively weak, at which strength—viz. of a specific gravity of about 1·4—it is used for some purposes in the arts under the name of 'Chamber Acid.' This is concentrated by evaporating in lead pans, D, till it reaches the specific gravity of 1·6, then boiling in a platinum retort, on which strong acid does not act, even at high heat, or in large flint-glass retorts. In the process introduced in 1859 by Mr Glover the gaseous sulphuric acid from the sulphur or pyrites burners is not conducted direct to the lead chamber, but is first passed through a Glover's or denitrating tower, and there purified of nitrogen compounds, which are saved for use in the lead chamber.

The contact process consists in passing a mixture of air and sulphur dioxide over heated platinum; the platinum acts as a catalyst and brings about the union of the sulphur dioxide and oxygen forming sulphur trioxide, and by the action of water sulphuric acid is formed.

The manufacture of sulphuric acid is a very extensive industry; immense quantities of it being consumed in the manufacture of Soda (q.v.), in that of bleaching-powder, in calico-printing and dyeing, and in fact in most chemical operations

both in the manufactory and the laboratory. In medicine, a dilute sulphuric acid formed by gradually mixing the strong purified acid with water, or aromatic sulphuric acid (known also as *elixir of vitriol*) prepared by mixing sulphuric acid, rectified spirit, tincture of ginger, and spirit of cinnamon, is almost always employed. In doses of from ten to thirty minims, properly diluted, these preparations exert a strong astringent power, and are serviceable in all forms of passive hæmorrhages, and in checking inordinate discharges when they arise from debility. Poisoning with this and other irritant acids is noticed at POISON.

Sulphuric Anhydride, SO_3 , is obtained by distilling fuming Nordhausen sulphuric acid, a fibrous mass of silky crystals being deposited in the receiver. It may also be prepared by the distillation of anhydrous bisulphate of soda or by direct union. It is a tough solid, melting at $18\cdot3^\circ \text{C}$., and possessing none of the properties of an acid, not even affecting the skin. In contact with moisture much heat is developed, and it then possesses the corrosive properties of sulphuric acid. There are two forms of this compound, the α form, a liquid, and the β form, a solid.

Sulphuric Ether. See ETHER.

Sulphurous Acid. See SULPHUR.

Sulphur-root, a plant of the Umbelliferae, *Pencedanum officinarum*, with small yellow flowers, long stamens, and linear leaflets. A rare inhabitant of the salt marshes of Essex and Kent, it was once highly esteemed as a medicinal plant, like *P. Ostruthum* (masterwort), which grows in moist meadows, and has white flowers and ornate leaflets. Another rare British species is *P. palustre*. See also PAR-SNIP, DILL.

Sulpicians, an order of priests for training young men for the church, founded in 1645, and named from the church of St Sulpice (q.v.) in Paris.

Sulpicius Severus (363–410), a Christian historian, born in Aquitaine, who wrote a *Historia Sacra* from the Creation downwards, and a *Life of St Martin* (q.v.) of Tours.

Sultan (Arab., Turkish, and Persian *Sultán*), a Mohammedan ruling prince, as of Morocco, Zanzibar, or Egypt. The word was especially used of the Sultan of Turkey, who called himself Sultan of Sultans. The name of *Sultana* is given to the mother, wife, or daughter of a sultan. The old English form of the word was Soldan or Sowdan.

Sulu Islands, an archipelago stretching from Borneo north-eastwards to the Philippines. The 300 islands, most of them mountainous and all covered with luxuriant vegetation, have a total area of above 1000 sq. m. and a total pop. of 173,000. The inhabitants, Malays by race and Mohammedans by religion, were the terror of the neighbouring seas, owing to their bold piracy, until the Spaniards conquered them in 1876. The Spaniards evacuated Sulu in 1899, and by the 'Bates Agreement' the sultan of Sulu recognised the sovereignty of the United States. For a number of years the Americans were regarded with unconcealed hostility, but in 1913 the U.S. Philippine Commission created Sulu a civil department with Mindanao, and careful policy seems to have established peace. In 1920 Sulu and Mindanao came under the bureau of non-Christian tribes. The capital is the town of Sulu, officially called Joló, a picturesque town enclosed by a wall. The chief occupations are agriculture, fishing, and stock-raising, and there is a considerable production of sugar. The adjacent pearl-beds are very prolific, and pearls and the Sulu pearl-shell (Manila pearl) are sold in great quantities to European buyers.

Much hardwood is cut, including teak, and fruit is grown in abundance. Copra, dried fish, and abacá are exported, and rice, textiles, petroleum, iron, flour, &c. imported. See S. Y. Orosa, *The Sulu Archipelago and its People* (1923).

Sumach (*Rhus*), a genus of small trees and shrubs of the family Anacardiaceæ. They have small inconspicuous flowers in panicles or in corymbs, and the fruit a small, nearly dry drupe. The species are numerous, and are diffused over almost all parts of the world, except its coldest regions and Australia; some of them are useful in the arts and in medicine, and some are remarkable for their poisonous properties. Venetian Sumach (*R. Cotinus*), known also as Wig



Sumach (*Rhus Cotinus*), showing leaves, flowers, and fruit.

Sumach, or Wig Tree, is a native of the south of Europe and west of Asia, and is often planted in Britain as an ornamental shrub. It has simple leaves, and hairy corymbs of fruit, which have a sort of resemblance to periwigs. The twigs and leaves dye yellow (see FUSTIC), and are used in tanning. The bark has been used as a substitute for Peruvian Bark. The seed resembles the almond in flavour. The very acid fruit of the Sicilian or Elm-leaved Sumach (*R. Coriaria*)—a native

of the countries around the Mediterranean, with pinnate leaves, not unfrequent in British shrubberies—has been used as a condiment, and the seeds and the leaves medicinally as tonic and cooling. This species is also used for tanning and dyeing. Similar to this in its properties is the Virginian Sumach, or Stag's-horn Sumach (*R. typhina*), a native of eastern North America, and common in British shrubberies, which has the branches curiously crooked, and covered when young with a soft velvety down. It has pinnate leaves, with numerous leaflets, and is valuable as an astringent and refrigerant. The milky juice which exudes from incisions made in the bark affords a varnish. The flowers supply abundance of honey. The Smooth-leaved Sumach (*R. glabra*), a very similar species, also North American, has very acid leaves, and this species is sometimes troublesome as a weed. Of the acid and poisonous species the most important is the Poison Ivy (*R. Toxicodendron*) of North America, a shrub from 1 to 3 feet high (when it is also called Poison Oak), or a climber, with leaves of three leaflets, and a milky juice, which becomes black on exposure to air. The leaves have been used in medicine as a stimulant of the nervous system. Similar to this in properties are the Poison Sumach (*R. venenata*), with from 7 to 13 leaflets, also known as Poison Elder and Swamp Dogwood, and other North American species, the juice of which is very acid; even the emanations are injurious to some persons, who, from standing close to these plants, or from handling them, experience a cutaneous eruption with violent itching. The Varnish Sumach (*R. vernicifera*), a native of the mountains of Sze-chuan and Hupeh, yields a varnish much used in Japan for lacquer-work. *R. Metopium*

yields in great abundance a gummy resin, which in a pure state is yellow in colour, and of a hard brittle consistence. *R. succedanea*, a native of Japan, yields a tallow used instead of beeswax. See WAX.—The name Tanners' Sumach is given to the unrelated *Coriaria myrtifolia*, a shrub of the south of Europe. All parts, especially the sweet fruits, are extremely poisonous. *Coriaria* by itself forms the widely distributed family *Coriariaceæ*, related to *Empetraceæ*.

Sumatra (so called probably from the ancient town of Samudera in the north) is the largest of the Great Sunda Islands, and, after Borneo, of the Malay Archipelago, having an area not much less than that of Spain, calculated on very imperfect data at 163,000 sq. m. (or, including the numerous and important islands off the coasts, 178,000 miles). Towards the middle it is crossed by the equator, and it extends from 5° 40' N. lat. to 5° 59' S. lat., and from 95° 16' to 106° 3' 45' E. long. The greatest length is 1115 miles, the greatest breadth 275. An imposing mountain-system—the Bukit Barisan, or Chain Mountains, consisting of several more or less parallel ranges (7000 to nearly 12,000 feet high), with intervening plateaus and valleys—forms the framework of the island, which has a bold and frequently precipitous coast towards the west, but has been carried eastward by the formation of vast expanses of alluvial ground. Slates and clay-schists of high antiquity, with granite not so frequently visible, form the original kernel of Sumatra, which has been subsequently modified by Carboniferous strata, long afterwards by Tertiary breccias, sandstones, marls, and coal-beds, and still further by very extensive Post-tertiary deposits. Volcanoes have played a large part in embossing the surface. Of the numerous cones along the Bukit Barisan ranges about a dozen are still active, including Indrapura (the culminating peak of the island, 11,800 feet), Merapi (the most restless), Pasaman or Mount Ophir. In 1883 the southern end of the island was involved in the Krakatao (q.v.) eruption. The mountain-lakes, which are characteristic of the island, are largely of volcanic, and more especially of craterial origin; of these the most important are the Singkarak, the Korintji, the Ranau, and the Tobah. Towards the west the rivers of Sumatra are of necessity short and rapid, but several of the eastward streams, the Rokan, Siak, Indragiri, Djambi, and Palembang or Musi, grow to imposing rivers in their passage through the plains, and, being navigable for considerable distances, are important means of internal communication. The rivers are fed by an abundant rainfall; the average precipitation at Deli, for example, is 83 inches per annum. The clouds descend much lower than in other islands of the archipelago. The division of the seasons is of course quite opposite in the two halves of the island, lying respectively north and south of the equator. The N.W. monsoon is the prevailing wind over the southern portion; in the north the winds are varied. Hailstorms are not infrequent in the higher regions of the island. The Sumatra flora is exceptionally rich. Vast areas of the mountain regions are covered with virgin forest, a striking contrast to the vast prairies of alang (or lalang), that vigorous grass which seizes on every clearing not occupied by human industry. Though it only explored a small portion of the western side of the island, the Dutch expedition of 1877–79 collected 400 varieties of timber. The vegetation-contours of the island descend much lower than those of Java. In Java, for instance, the oaks do not grow below an altitude of 4500 feet; in western Sumatra they come down to within 500 or even 100 feet of sea-level. The humid climate and volcanic soil produce ideal conditions for agriculture. Rice,

sugar (from cane and the Arenga palm), coffee, pepper, coconuts and copra, sago, maize, sweet potatoes, yams have long been among the principal cultivated products. Introduced in 1863, the tobacco of the Deli district, grown by Dutch planters with coolie labour from China and Java, has become favourably known both in European and American markets. Since the beginning of the 20th century rubber-growing has become an industry of first importance, the climate being very suitable; the area under rubber, excluding extensive native plantations, is nearly half a million acres. Other recent introductions are the oil-palm (*Elæis guineensis*) and Tea (q.v.); and there are a number of cinchona-tree estates. Other products are gums, mangrove bark, gambier, nutmegs, timber, rattan, fibres, and vegetable oils and fats. Boring for petroleum, especially in the districts of Perlak, Djambi, and Palembang, has come to be by far the most important mineral industry. There is an important coal-mining centre at Ombilin. It is a government undertaking, and was united with the west coast by rail in 1891. The iron deposits known to exist in the SE. are undeveloped. Tin is mined on several islands off the coast, notably at Banka, Billiton, and Singkep. Other minerals—gold, silver, precious stones, &c.—are found, but are of little importance, and the manufacturing industry is negligible. The chief town on the east coast is Medan (pop. 45,000), a town of rapid growth, with its port at Belawan-Deli. Padang (38,000), on the west coast, has its port at Emmahaven. There are railways in the west and north-east, with a total length (including light railways and steam tramways) of 950 miles.

The Sumatran fauna is of peculiar scientific interest, and is clearly separated from that of Java. The birds and snakes are in the main Bornean. The Bornean forms, however, are almost entirely confined to the eastern side of the island; as soon as the naturalist crosses the Barisan Mountains he finds himself in a new region. The Orang-utan (of limited range and not abundant) and the *bru* (Malay name) or Meester Kees (Dutch), employed by the natives to gather their coconuts, are the most noteworthy of the numerous apes. The true tiger, the bruang or Malay bear, the much-hunted rusa deer, the dainty kanchil deer, the panther, the Malay hog, the tapir, the two-horned Sumatran rhinoceros, the Sumatran elephant, and the Sumatran hare are characteristic forms. Among the commonest birds are Argus pheasants, hornbills, goatsuckers, and grakles (one species of the latter largely kept in cages for their parrot-like powers of speech). Both the python (15 to 20 feet long) and the cobra are of frequent occurrence, and the crocodile swarms towards the coast and ascends the rivers as far as the foot of the mountains. Sumatran butterflies are famed for their size and beauty.

Sumatra is peopled in the main by tribes of the Malay stock, differing very markedly, however, in degree of civilisation, custom, and language. An earlier non-Malay element is more or less distinctly represented. The chief races to be found are the Malays, the Battas (q.v.) or Bataks, the Lampongs, Redjangs, Lebongs, Achinese, &c. All these have their own languages, although generally Malay is understood all over. Hindu influences, which have left their mark in ruins of temples, religious customs, language, alphabets, &c., began to tell on Sumatra at a period prior to the 7th century. In the 13th Mohammedanism was introduced. The island became known in 1508 to Europeans through the Portuguese Lopez de Sequeira, whose fellow-countrymen were not long in founding trading stations on the coasts. The Portuguese were ousted by the Dutch towards the close of the

16th century. Begun in 1620 by their East India Company, the permanent Dutch occupation was not completely carried out round the coast till 1881, and much of the interior is still semi-independent and unexplored. The Dutch possessions were in the hands of the British between 1811 and 1816, and portions down till 1825. The residency of the East Coast was established in 1873; the government of the West Coast in 1819; and the residencies of Bencoele, Palembang, and Lampong respectively in 1824, 1825, and 1857. Atjeh, or Achin, (q.v.), only subdued after a long war (1875-79) and not pacified for many years later, was formed into a government in 1881. The total population of Sumatra in 1920 was 5,852,135 (Achin, 736,000; West Coast, 1,522,000; East Coast, 1,197,000; Bencoele, 257,000, &c.). Among the more important centres of population are Padang (38,000), Bencoele (9000), Palembang (74,000), Medan (45,000), and Djambi (11,311).

For literature on Sumatra, see *Aardrijkskundig Woordenboek van Ned. Ind.* (1869); Kan in *Tijdschrift van het K. Ned. Aard. Gen.* (1889). See especially Marsden's classical work, *The History of the Island of Sumatra* (1783); the Memoir of Sir Stamford Raffles; Veth, *Midden-Sumatra* (1882); Kielstra, *Atjeh Oorlog* (1885-86); Wallace, *Malay Archipelago*; Forbes, *A Naturalist's Wanderings in the E. Archipelago* (1885); Hagen, 'Die Pflanzen und Tierwelt von Deli auf der Ostküste Sumatras,' in *Tijds. van het N. Aard. Gen.* (1890); D. G. Stibbe (ed.), *Encyclopedie van Nederlandsch-Indie* (1922); A. Cabaton, *Java and the Dutch East Indies* (trans. 1911); A. S. Walcott, *Java and her Neighbours* (1914).

Sumbawa, one of the chain of the Sunda Islands to the east of Java, lies between Lombok (on the west) and Flores (on the east). Area, including the adjacent islands, about 5200 sq. m.; pop. about 75,000. The Sumbawan natives are of Malay race, but there are also Buginese and Macassar immigrants, and wild mountain tribes. They are divided between four native rulers, who owe allegiance to the Dutch governor of Celebes. The islands are mountainous but fertile, and yield rice, tobacco, cotton, sandalwood, &c. In 1815 an eruption of Tambora, the loftiest peak on the island, whereby the altitude was decreased from 14,000 to 7670 feet, depopulated the kingdoms of Tambora and Papekat, 12,000 lives being lost, and great damage done to the whole island by the ashes.

Sumer, Sumir. See BABYLONIA.

Summer Isles, a group of twenty rocky islets off the west coast of Scotland, near the entrance of Loch Broom, an inlet in the north-west of Ross-shire. The largest, Tanera, measuring $1\frac{1}{2}$ by $1\frac{1}{2}$ mile, rises 406 feet.

Summer Time, a device first adopted by Act of Parliament in 1916 and now governed by an act of 1925, whereby during the summer months the time throughout the country is advanced one hour beyond Greenwich Mean Time. The legal duration of Summer Time is from 2 A.M. on the day next following the third Saturday in April (or, if that day is Easter Day, then one week previous) to 2 A.M. on the day next following the first Saturday in October. The same limits for Summer Time are in use in France and Belgium. The measure was at first one of war emergency, calculated to save light and fuel by bringing an extra hour of daylight into the ordinary working day. Its success, however, in spite of much opposition, mostly from agricultural interests, justified its continuance as a regular institution. Although only adopted in this country in 1916 the scheme—or a similar one—was suggested in 1907 by William Willett (1856-1915), a Chelsea builder, and even got to the stage of a Parliamentary Committee, before being abandoned.

Summons, in English law, means generally a writ or order directed to a party to appear and answer some complaint before a court or judge. All actions in the High Court now begin with the issue of a writ of summons. A summons is usually the first step in summary proceedings before magistrates. In Scotland the first writ in an action is called a summons; and the term is also in use in the colonies and in the United States.

Sumner, CHARLES, an American statesman conspicuous from 1845 onwards till his death, was born in Boston, January 6, 1811. The founder of the family in America was William Sumner, a native of Oxfordshire in England, who settled in Massachusetts about 1635. Charles Pinckney Sumner, of whose nine children Charles and his twin-sister Matilda were the eldest born, held the post of sheriff of Suffolk county from 1825 till shortly before his death in 1839, and was highly respected for his probity and independent spirit, despite his stiff and formal manners and his outspoken anti-slavery sentiments at a time when such opinions were generally unpopular and were rarely expressed by persons in official station. Educated at the Boston Latin School and at Harvard College, where he graduated in 1830, Charles Sumner entered the law-school in the following year, and in 1834 was admitted to the bar. An enthusiastic student of the principles of law, he had little taste for the ordinary routine of office work, and hence, though occasionally engaged in important cases, he failed to secure a remunerative practice or to acquire reputation as a pleader. He found more congenial employment as a lecturer on legal topics and a contributor to law journals and compilations. In private life he was greatly esteemed for his sincerity and earnestness, his general cultivation, his stainless character, and his cheerful and kindly demeanour, though too devoid of humour, wit, and playful fancy to become a favourite in ordinary social circles. In December 1837 he went to Europe, where he remained till May 1840, pursuing with his habitual assiduity the study of jurisprudence at the Sorbonne and elsewhere, widening the general range of his knowledge, and cultivating the acquaintance, especially in England, of the most eminent men, of whom his letters at this period, published since his death, give many graphic sketches and lively anecdotes. On his return to Boston he resumed his professional practice, but with even less liking for the drudgery of its details than he had before evinced. Abstract discussion had stronger attractions for him, and he first came into prominence by a civic oration, on July 4, 1845, which, under the title of 'The True Grandeur of Nations,' was simply a vehement denunciation of war, as 'utterly and irreconcilably inconsistent with true greatness.'

It was because the current of events was then bringing to the front a subject involving the deepest moral considerations that Charles Sumner was drawn into the vortex of political life. A member of the Whig party by descent and associations, he took but a languid interest in politics until the threatened extensions of negro slavery over newly-acquired territory awakened a spirit of resistance in the free states. Despite the efforts to stifle agitation by party leaders and all who feared for the results, the growth and preponderance of the slave power, with the foundations on which it rested, became the absorbing question of the day, entering like a wedge into established political combinations and thrusting aside all other issues. Sumner was at one with the Abolitionists in asserting the inherent and total sinfulness of slavery; but unlike them he maintained that the constitution did not recognise property in man, and that slavery, a purely

sectional institution, could be combated in the political arena, and so crippled by legislation that it would necessarily dwindle and become extinct. In 1848 he joined with others holding similar views in the formation of the Free Soil (q.v.) party, in which his abilities, learning, high character, and social standing gave him a prominence which he cannot be said to have sought by any purely ambitious efforts. Nominated for congress in the same year, he was easily defeated by the Whig candidate, R. C. Winthrop; but in April 1851, after a protracted contest, he was elected to the national senate as the successor of Daniel Webster, by the combined Free Soil and Democratic votes of the Massachusetts legislature. The post thus gained he continued to hold during the remainder of his life, being re-elected in 1857, 1863, and 1869. At the outset he stood alone in the senate as the uncompromising opponent of slavery, and his elaborately prepared speeches, characterised alike by their studied array of facts and arguments and their bold denunciatory tone, excited universal attention, and were perhaps equally effective in winning support in one section and inflaming hostility in the other. The latter spirit found vent in an act which produced a more startling and profound impression throughout the northern states than any speech could have made. On the 22d May 1856, while sitting at his desk in the senate chamber after an adjournment, Sumner was suddenly assaulted by Preston S. Brooks, a member of congress from South Carolina, and by repeated blows on the head with a heavy cane prostrated on the floor in a state of insensibility. His injuries were in fact so severe as to incapacitate him for public life during nearly four years, while his vacant chair was pointed to as the most eloquent reminder of the violent and lawless animosity against which the advocates of freedom must prepare to contend. He resumed his seat at the close of 1859, and in June 1860 delivered a speech on the question of the admission of Kansas as a free state, which he published under the title of *The Barbarism of Slavery*.

But the predestined course of events no longer needed any impulse from oratory, and the attempts to arrest it by conciliatory offers, in which Sumner naturally took no part, only pointed more plainly to the inevitable collision. The secession of the southern states left the Republican party in full control of both houses of congress, and in March 1861 Sumner was elected chairman of the senate committee on foreign affairs. His interest in domestic affairs was still centred on those in regard to which moral principles could be adduced as the proper basis of political action. He was urgent for the emancipation of the slaves, and not less strenuous, after this had been secured, in obtaining for the coloured race the fullest civil and political equality with the whites. He supported the impeachment of President Johnson, regarding it as a continuation of the struggle for the overthrow of slavery, and he was foremost in opposing President Grant's project for the acquisition of San Domingo, on the ground that the assent of Baez, the president of that republic, had been given in opposition to the wish of the inhabitants. His conduct on this occasion led to his exclusion in 1871 from the chairmanship of the committee on foreign relations, and his continuous and acrimonious censures on Grant's administration brought about a rupture with the leading politicians of the Republican party which was rendered complete by his support of Greeley as candidate for the presidency in 1872. But, although the result of the election left him in the ranks of a discontented minority, his course had been too evidently dictated by principle to allow of his sinking in esteem with the mass of the party, and the breach was gradually

closing when his death, at Washington, on the 11th March 1874, obliterated all asperities, and left only the remembrance of his great services and distinguished career.

Sumner's position in the field of politics was in some respects unique. From first to last he was an independent rather than a partisan. Nature had given him neither the submissive temper of the follower nor the tact, the shrewdness, the persuasive eloquence, and the skill in the management of men and of affairs which are the requisites of leadership. Expediency had no place in his thoughts, flexibility in his disposition, or suavity in his methods or language. Had it been otherwise he might, on the death of Lincoln, have succeeded to the highest place in the national confidence and regard. For his position was a commanding one, owing to his unimpeachable integrity, his unflinching courage, his singleness of purpose and consistency of action, his freedom from every suspicion of intrigue or self-seeking, and his identification both as a victim and a victor with the cause to which he had devoted all his energy and talents. In person he was tall and well proportioned, and, though his features were rugged, the expression of his countenance was engaging. His speeches lacked the charm of spontaneous eloquence, but they were effective as essays or lectures, and furnished his supporters with an arsenal of arguments and illustrations. That his frequent virulence in public debate sprang from no bitterness of spirit is attested by his freedom from vindictiveness, his cordiality in private intercourse, and the warmth and fidelity of his friendships. His nature was too open to admit of misconstruction, and the poet Longfellow, with whom he lived in intimacy, described him as the whitest soul he had ever known.

See his *Works* (15 vols. 1870-79); his *Memoirs and Letters* by Pierce (4 vols. 1877-93); and shorter Lives by Anna Dawes (1892), Storey (1900), and Haynes (1909).

Sumner, JOHN BIRD, Archbishop of Canterbury, was born in 1780, and educated at Eton and Cambridge. Successively rector of Mapledurham (1818), Bishop of Chester (1828), and Primate of all England (1848), he was distinguished for his conciliatory disposition and moderate views, and wrote works on *Apostolical Preaching*, *The Moral Attributes of the Creator*, and *Evidences of Christianity*. He died 6th September 1862.—His brother, **CHARLES RICHARD** (1790-1874), was Bishop of Winchester, and his Life was published in 1876.

Sumptuary Laws (Lat. *sumtus*, 'expense'), laws passed to prevent extravagance in banquets, dress, and private expenditure. They abound in ancient legislation. The Locrian legislator, Zaleucus, 450 B.C., ordained that nobody should drink undiluted wine; and in Solon's code there were many sumptuary enactments. At an early period in Roman history the Censors, to whom was entrusted the superintendence of public and private morality, punished with the *notatio censoria* all persons guilty of luxurious living; but as the love of luxury grew with the increase of wealth and foreign conquest various legislative enactments were passed with the object of restraining it. The Lex Orchia, 187 B.C., limited the number of guests to be present at a feast; the Lex Fannia, 161 B.C., regulated the cost of entertainments. There were also the Lex Didia, Lucretia, Cornelia, Æmilia, and others, most of them passed in consequence of the practical disregard of the similar laws that had preceded them; but they all seem to have been habitually transgressed in the later times of the Republic. Julius Caesar, Augustus, and other rulers also made laws against luxury.

Sumptuary laws were in great favour in the

legislation of England from the time of Edward II. down to the Reformation. Statute 10 Edward III. chap. 3 narrates that 'through the excessive and over-many costly meats which the people of this realm have used more than elsewhere many mischiefs have happened; for the great men by these excesses have been sore grieved, and the lesser people, who only endeavour to imitate the great ones in such sorts of meat, are much impoverished, whereby they are not able to aid themselves, nor their liege lord, in time of need as they ought, and many other evils have happened as well to their souls as their bodies; and enacts that no man, of whatever condition or estate, shall be allowed more than two courses at dinner or supper, or more than two kinds of food in each course, except on the principal festivals of the year, when three courses at the utmost are to be allowed. All who did not enjoy a free estate of £100 per annum were prohibited from wearing furs, skins, or silk, and the use of foreign cloth was allowed to the royal family alone. Act 37 Edward III. declares that the outrageous and excessive apparel of divers people against their estate and degree is the destruction and impoverishment of the land, and prescribes the apparel of the various classes into which it distributes the people; it goes no higher than knights, but there are minute regulations for the clothing of women and children. This statute, however, was repealed the next year. In France there were sumptuary laws as old as Charlemagne, prohibiting or taxing the use of furs; but the first extensive attempt to restrict extravagance in dress was under Philip IV. By an edict of Charles VI. no one was allowed to exceed a soup and two dishes at dinner. Frederick the Great and other German princes endeavoured to suppress the use of coffee as a harmful luxury. Sumptuary laws continued to be introduced in England in the 16th, in France as late as the 17th century; and burial in woollen, prescribed by English law from 1678 till 1815, was akin to them, though its primary object was to lessen the importation of linen. The Scottish parliament attempted to regulate the dress of the ladies, to save the purses of the 'puir gentlemen their husbands and fathers; and statutes were passed against superfluous banqueting, and the inordinate use of foreign spices 'brocht from the pairts beyond sea, and sauld at dear prices to monie folk that are very unablill to sustain that coaste.' Neither in England, Scotland, nor France do these laws appear to have been practically observed to any great extent: in fact, the kings of France and England contributed far more, by their love of pageantry, to excite a taste for luxury among their subjects than by their ordinances to repress it. Froude has suggested that such statutes may have been regarded, at the time when they were issued, rather as authoritative declarations of what wise and good men considered right than as laws to which obedience could be enforced. Enactments of this kind have long been considered to be opposed to the principles of political economy. Most of the English sumptuary laws were repealed by 1 James I. chap. 25; but regulations of a similar kind survive in the university statutes of Oxford and Cambridge. There is a trace of the same principle in the present-day taxation of luxuries—wine and spirits, tobacco, tea, and coffee (though mainly with a view to regulating the incidence of the tax), and in the duties on male servants, armorial bearings, &c. And one reason sometimes urged for the suppression of the liquor traffic is the diminution thereby to be effected in wanton waste and pernicious luxury. In Montenegro strong laws were passed in 1883 against gloves, umbrellas, and non-national costumes.

Sumter. FORT (named after General Thomas Sumter, 1734-1832, an active partisan leader of the revolutionary war), an American fort associated with both the beginning and the end of the civil war, was built of brick, in the form of a truncated pentagon 38 feet high, on a shoal, partly artificial, in Charleston Harbour, $3\frac{1}{2}$ miles from the city. On the secession of South Carolina in December 1860, Major Anderson, in command of the defences of the harbour, abandoned the other forts, and occupied Fort Sumter, mounting sixty-two guns, with a garrison of some eighty men. The attack on the fort was opened by General Beauregard on April 12, 1861, and it surrendered on the 14th: this event marked the beginning of the war. The Confederates strengthened it, and added ten guns and four mortars. In April 1863 an attack by a fleet of monitors failed. In July batteries were erected on Morris Island, about 4000 yards off, from which in a week 5000 projectiles, weighing from 100 to 300 lb., were hurled against the fort; at the end of that time it was silenced and in part demolished. Yet the garrison held on amid the ruins, and in September beat off a naval attack; and in spite of a forty days' bombardment in October-December 1863, and for still longer in July and August 1864, it was not till after the evacuation of Charleston itself, owing to the operations of General Sherman, that the garrison retired, and the United States flag was again raised, April 14, 1865; an event soon followed by the evacuation of Richmond and the Confederate surrender.

Sun, the star which governs, warms, and illuminates the earth and the other bodies forming the solar system. Early observations were necessarily confined to records of its motions and eclipses, by means of which predictions were made even in ancient Chaldaea, Egypt, and China (see *ASTRONOMY*). The apparent motions of the sun, determining the amount of light and heat received at different parts of the earth, naturally give us our principal time-measures (see *DAY, YEAR, SEASONS*). For long the observation of these formed perhaps the chief part of astronomy. But when Copernicus showed that the sun was really the centre of our system, and Galileo discovered the moons of Jupiter, the idea of a community of nature between the sun and our world—the earth circling around the sun as the moons around Jupiter—began to take firm root in men's minds. Newton's discovery of the law of gravitation greatly aided this process. The idea that the sun shone because it was composed of mysterious fiery elements faded away, and men began to ask after its real constitution, and seek the secret of its stores of energy.

(1) *The sun's distance* was the first problem to be attacked. Aristarchus of Samos, realising that the moon shone by reflected light from the sun, argued that the moon would be exactly half-full when the directions of the sun and earth as seen from the moon were at right angles. From measures of the angular distance between the sun and the moon, when the moon appeared to be half-full, he concluded that the sun was eighteen times as distant as the moon. The method is right in principle, but in practice it is not possible to say when the moon is exactly half-full with sufficient precision. This value was generally accepted till the time of Kepler, who showed that the distance must be at least three times as great. The first determination which approaches to what is now known to be the distance was made between 1670 and 1680 by Cassini. He found the sun's distance indirectly from a determination of the distance of Mars when in opposition and therefore nearest the earth. The relative distances of the planets from the sun are known by Kepler's Laws (q.v.), and thus the measure of the distance between any two

is sufficient to give the absolute distances of all. To obtain the distance of Mars, observations to determine its Parallax (q.v.)—or displacement among the stars due to its being seen from different standpoints—were made simultaneously at Paris and Cayenne in South America. The equatorial horizontal parallax of the sun—i.e. the angle subtended by an equatorial radius of the earth—was thus found to be $9.5''$, corresponding to a distance of 87 million miles. Flamsteed obtained $10''$, Picard $20''$, and Lahire $6''$ by the same method. It was pointed out by Halley in 1716 that the transits of Venus might be used to determine the sun's distance. At rare intervals this planet passes between the earth and the sun, and may be seen crossing the sun's disc as a black spot. At these times Venus is only 25 million miles from the earth, and seen from widely different stations on the earth its projection on the sun's disc will be different. In the diagram E is the earth, V Venus, and S the sun. An observer at A, a station on the

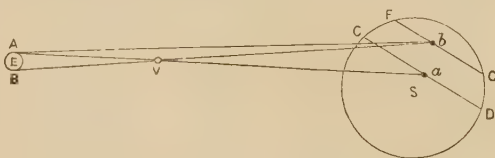


Fig. 1.

northern part of the earth, will see the planet projected on the sun at a , while a southern observer will see it at b . The observer at A sees the planet move along the chord CD, and by his observation of the exact duration of the transit, the length of CD can be determined in minutes and seconds of arc, as the motion of Venus is known. Similarly, from the observations of the observer at B the length of FG is determined. The angular distance ab between these two chords can then be calculated. This is the angle aAb . From the triangle AVb , A and b being very small angles, it follows that $b:A=AV:Vb$, and the ratio of $AV:Vb$ is known. Hence the angle AAb , or the angle subtended by AB at the distance of the sun, is found, and thus from the calculated distance of AB in terms of the earth's radius, the parallax of the sun is found. The parallax deduced by Encke in 1824 from the observations of the transits of 1761 and 1769 was $8.6''$, corresponding to a distance of 95 million miles. The next transit of Venus (1874) was carefully observed by expeditions sent all over the world by various governments; but the results were disappointing from the observational difficulties of determining the times at which the transits began and ceased, because of the great brightness of the sun.

In the year 1877 Sir David Gill made observations of Mars near opposition from the island of Ascension. Owing to the earth's rotation the observer is carried between morning and evening from one side of the earth's centre to the other. This difference of position serves as a base for the measure of parallax. With a heliometer Gill made a series of measures of the position of Mars with respect to neighbouring stars, and thus determined its parallax. The year 1877 was chosen because, owing to the eccentricity of the orbit of Mars, it was then unusually near the earth. Very accurate results were obtained, but it was seen that the greatest source of error arose from Mars having a sensible disc and not being, like the stars, a point in the telescope. Accordingly, in 1888 and 1889, Gill made at the Cape observations of the small planets Victoria, Iris, and Sappho, and deduced from them the value $8.802''$ for the sun's parallax, corresponding to a distance of 92,874,000 miles. In 1898

a small planet, Eros, was discovered which comes much nearer the earth than any other planet. In 1900 extensive series of observations were made by many observatories, mainly photographic, to utilise the opposition of Eros to determine the solar parallax. The result derived by Mr Hinks from these numerous observations is $8.806''$; this result agrees with Gill's to less than 50,000 miles in the deduced distance of the sun.

The methods we have described may be classified as 'trigonometrical' or 'surveying' methods. The sun's distance may be found by two wholly different methods. In 1675 the Danish astronomer Römer discovered that the eclipses of Jupiter's satellites by the shadow of Jupiter took place earlier than their predicted times when the earth was nearer than its mean position to Jupiter, and later when it was farther from its mean position. From these observations he determined the velocity of light. This procedure may now be reversed, since the velocity of light has been measured with all necessary accuracy by physicists in their laboratories. The Constant of Aberration (q.v.), which has been carefully determined, also gives the ratio of the velocity of the earth in its orbit to that of light. Thus the earth's velocity may be determined, and as its orbit is described in a year the distance from the sun follows readily. It is also possible by spectroscopic observations of stars to determine the ratio of the earth's velocity to that of light, and the solar parallax has been found with considerable accuracy in this way by Küstner and by Halm.

The other methods may be described as 'gravitational.' An inequality in the sun's motion due to the fact that the earth each month moves round the centre of gravity of the moon and itself; an inequality each month in the movement of the moon depending on the sun's parallax; and the motion of the node of the orbit of Venus on the ecliptic due to the earth's attraction, all furnish means of determining the sun's distance.

(2) The sun's motion in space is ascertained in two ways. Analysis of the proper motions of Stars (q.v.) gives the direction of the motion, and its amount can be roughly determined from a knowledge of stellar parallaxes. The velocity is found more accurately from a comparison of spectroscopic determinations of the velocities of stars in the line of light, and the direction may also be obtained in this way. The direction of the sun's motion is towards the point in the sky whose R.A. is 18 h. and Dec. $+30^\circ$. The amount is $12\frac{1}{2}$ miles a second, or four times the distance from the earth to the sun in one year.

(3) The rate at which the sun is radiating heat is determined by measuring the amount received on a given surface exposed perpendicularly to the sun's rays. Pouillet in 1837 concluded that 1.76 calories were received per minute on a square centimetre. As much heat is absorbed by the earth's atmosphere, allowance is made for this as far as possible by taking the observations on a high mountain. The latest result is 2.25 calories, or sufficient to raise one cubic centimetre of water by 2.25° centigrade. If the radiant energy received from the sun could be transformed into mechanical energy, it would amount to three horse-power for every square yard exposed to the sun. The rate at which energy is being radiated from the sun's surface is easily calculated from the above figures to be approximately 100,000 calories per minute for each square centimetre. This would be sufficient to melt a layer of ice on the sun's surface 50 feet thick in one minute. The mechanism by which this radiation is maintained is by the constant flow of heat from the sun's interior to its surface, partly by radiation and partly by convective currents.

The temperature of the sun varies very rapidly

near the surface. From arguments based on Stefan's law that the radiation varies as the fourth power of the temperature, Wilson and Gray and Very have found by comparison of the heat received from platinum raised to a known temperature, with that received from the sun, a temperature of approximately 6000° centigrade. A similar result has been derived from the position of the maximum intensity of the continuous light in the solar spectrum, and recently by Saha from the nature of the absorption lines. These results give the temperature at which the surface of the sun, considered as a perfect radiator, would need to be maintained for the same amount of heat to be received by the earth.

The radiation of heat from the sun takes place at a rate which would reduce its temperature by about 2° centigrade annually. It is known from geological evidence that the sun's temperature cannot be diminishing at anything like this rate. Heat is acquired by the contraction of the sun under the effect of gravitation, and a shrinkage which would be too small to be detected in the diameter of the sun would be sufficient to compensate for the immense amount of heat radiated into space for a few million years. Taking the estimate of the age of the earth as a thousand million years, it is found that contraction is wholly insufficient to supply the loss of energy by radiation. At the high temperature of the interior, which is of the order of a million degrees centigrade, it is supposed that some of the internal energy of the atoms may be liberated and find its way to the sun's surface in the form of heat.

(4) The Solar Spectrum (q.v.) consists of a bright band crossed by dark lines. The dark lines are the source of our knowledge of the chemistry of that gaseous layer of the sun where the absorption which has produced them has taken place. From careful maps of the solar spectrum by Rowland, and comparisons with the spectra of terrestrial elements, it is found that the sun contains hydrogen, oxygen; carbon, silicon; sodium, potassium, magnesium, calcium, strontium, barium; aluminium, chromium, iron, nickel, cobalt, manganese; lead, zinc, tin, copper, silver, palladium; titanium, vanadium; scandium, yttrium, zirconium, lanthanum, cerium, erbium, ytterbium, europium, neodymium, gallium, and dysprosium. The principal elements not found in the solar spectrum are nitrogen, phosphorus, sulphur, fluorine, chlorine, bromine, and iodine; we cannot affirm that they are not present. Helium is in the spectrum of the sun's chromosphere, not in the ordinary solar spectrum.

(5) The surface of the sun may be examined visually by the use of dark glasses in front of the eyepiece of the telescope, or some other means of diminishing the light; by drawing the eyepiece a little out of focus and projecting an image of the sun on a screen; or by photography, with suitable means for securing sufficiently short exposures. It is found that the sun becomes less bright as the limb is approached; this holds especially for blue light, and is therefore most conspicuous in photographs. The existence of a dusky layer above the sun's surface is indicated in this way. The sun's surface or photosphere, when examined under sufficiently steady atmospheric conditions, presents a mottled appearance, compared by Langley and Janssen to rice grains. The separate grains are about 400 miles in diameter, and may be hypothetically considered as the tops of long columns in which heated matter from the sun's interior rises to the surface. The reversing layer is a term applied to the part of the photosphere near the surface, where the absorption takes place which produces the Fraunhofer lines in the spectrum.

One of the earliest discoveries made after the

invention of the telescope was the existence of spots on the sun. Occasionally these are sufficiently large to be seen with the naked eye when protected from excessive glare by fog or dark glass. They have three well-marked areas, distinguished by different degrees of blackness—the *penumbra*, the *umbra*, and the *nucleus*. In their neighbour-

hood, but the tentative hypothesis of the rotation of electrified particles round the spot has been put forward. Photographs taken in the monochromatic light (see below) of the red hydrogen line $H\alpha$ show that vortical motion exists in the neighbourhood of spots.

The existence of other phenomena which bear on the sun's physical condition has been revealed by total solar eclipses. At these times the immediate surroundings of the sun, which are usually invisible owing to the glare produced by the diffusion of sunlight in the atmosphere, are disclosed. Two remarkable features, the *prominences* and the *corona*, have been discovered in eclipses. The prominences are great tongues of flame which stand out from the sun's surface, sometimes reaching distances of 50,000 miles. Janssen discovered in the eclipse of 1868 that the spectrum of a prominence consisted of bright lines, and not, like that of the sun itself, of a bright band crossed by dark lines. Prominences, therefore, consist of luminous gas, of which hydrogen is often a main constituent. Janssen and Lockyer showed how the spectra of prominences could be observed without an eclipse. They argued that if the continuous spectrum of the sun were weakened by high dispersion, the spectrum of the prominences which is concentrated in a few bright lines would be visible. Soon afterwards it was found that by widening the slit slightly the forms of the prominences could be seen in monochromatic light.

By bringing different parts of the sun's limb tangential with the slit of a spectroscope, the existence of a layer all round the sun of the same constitution as the prominences was discovered. To this the name of *chromosphere* has been given. Although this can be studied at all times, the movements near the beginning and end of an eclipse are most favourable. It is found that the spectrum of the chromosphere is not the solar spectrum with bright lines in place of absorption lines, but differs in important particulars: the presence of lines due to helium, the long series of hydrogen lines in the ultra-violet part of the spectrum; and that the spectra of the metallic lines resemble that given by the electric spark, while the solar spectrum corresponds more nearly to that of the arc. The regular examination of prominences shows that they are of two kinds—quiescent and eruptive. The former are generally found on the sun's limb, and are taken out of sight by the sun's rotation. The latter shoot up with amazing rapidity, sometimes moving hundreds of miles in a second. Quiescent prominences are usually found in the polar regions of the sun; while eruptive ones are found in the spot-zones, and vary in their numbers periodically with the spots.

The *corona* is of an entirely different character from the prominences. The instant an eclipse becomes total it is seen as an aureole surrounding the eclipsed sun. It is of pearly-white colour, and is brightest near the moon's dark limb. It is of complex form, and streamers from it can sometimes be seen extending to a distance of several diameters from the sun. The corona shows a faint, continuous spectrum such as would be given by incandescent solids or liquids, and in addition a number of bright lines due to incandescent gas. The continuous spectrum may indicate that part of the light from the corona is reflected sunlight, but the existence of Fraunhofer lines in it has not been certainly established. None of the bright lines have been

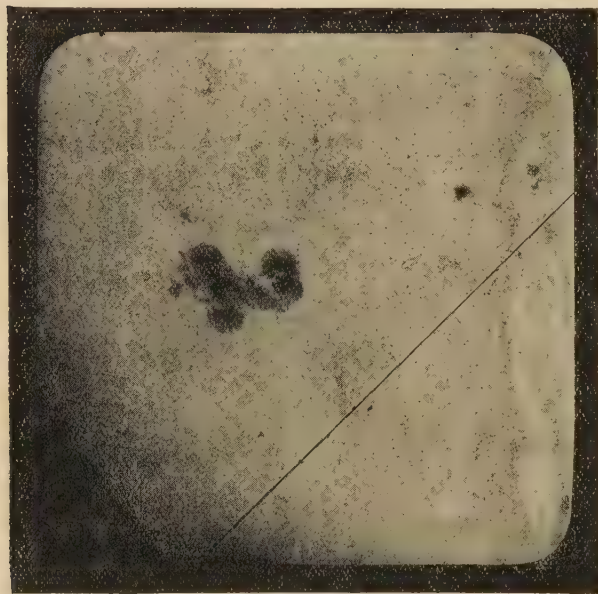


Fig. 2.—Sun-spot, 13th August 1911.

hood bright patches known as *faculae* are usually observed. Sun-spots are not found in all parts of the sun's surface, but only between the limits of 5° and 45° of solar latitude, both north and south of the equator. Sometimes the sun has many spots, and at other times is entirely free from them. In 1843 Schwabe of Dessau announced the important discovery that these periods of spot-activity occurred at regular intervals of ten years. Wolf in 1852 corrected this to 11.2 years. This is a mean period, as the individual periods vary considerably. Associated with this period is a drift of the spots in latitude. At sun-spot minimum the few spots there are occur either near the equator or far from it. As the number of spots increases the number near the equator becomes less, and those at a distance are in a lower latitude. These changes are associated with changes in the form of the sun's *corona*, and, what is very remarkable, with the frequency of magnetic storms and *aurorae* on the earth's surface—magnetic storms being frequent at sun-spot maximum. Some evidence has been brought forward by Mr Maunder in support of the hypothesis that electrified particles shot out from sun-spots reach our atmosphere and start magnetic storms.

In the spectra of sun-spots a large number of lines have been identified as due to titanium oxide, magnesium hydride, and calcium hydride. The existence of these compounds shows that spots are at a lower temperature or higher pressure than the reversing layer. In 1898 Hale proved that the apparent widening of certain lines in the spectra of spots was in some cases a doubling of the lines. He showed that this arose from the circular polarisation of the light from the spots, and established by experimental evidence that the phenomenon was what is known as the 'Zeeman' effect due to the existence of an intense magnetic field in sun-spots. How this arises has not yet been ex-

identified in the spectra of terrestrial elements, and they are attributed to a hypothetical gas—*coronium*. The corona is of different shape in different parts of the sun-spot cycle. At sun-spot minimum the

taken in the light of K—a line in the violet due to calcium vapour. It is found that the sun, especially in the neighbourhood of spots, is covered with white patches, called *floculi* (fleeces) from their appearance, due to clouds of calcium vapour.

The structure of the sun is thus seen to be extremely complicated. The lowest part emits a continuous spectrum; this passes through an absorbing layer where the dark Fraunhofer lines have their origin. Next there is a dusky layer which cuts off a great deal of the light, especially that of short wavelength, the existence of this layer being shown by the diminishing brightness of the sun as the edge is approached. Above these are the *floculi*, or clouds of calcium. Then we reach the chromosphere, with its bright line-spectrum, and outside this the corona. In addition there are the more local phenomena of spots, faculae, and prominences.

(6) The rotation of the sun was discovered by Galileo from the motion of spots across the disk. The axis of the sun is fixed in direction, and inclined at an angle of 7° to the perpendicular to the ecliptic. From June 3 to Dec. 5 the plane of the ecliptic is north of the sun's equator, and the north pole of the sun is on the visible side of the sun, the south pole being visible the other half of the year.

The position of the sun's axis was fixed with precision by Carrington from a study of sun-spots between 1853 and 1861. He also made a very careful study of the rotation of the sun. The sun does not rotate like a solid body. At the equator a complete revolution takes place in twenty-four and a half days, but at 30° from the equator in twenty-six and a half days. The paucity of spots in high latitudes makes it impossible to determine the period of rotation for all latitudes of the sun by the movements of spots. In 1891 Dunér determined spectroscopically the law of rotation for all latitudes to within 15° of the poles. Other observers have obtained very accurate results by this method, especially Adams, at the Solar Observatory at Mount Wilson in California. The rate at which the sun rotates in different solar latitudes is:

Latitude.	Time of Rotation.
0°	24.5 days.
20°	25.5 "
40°	27.5 "
60°	29.6 "
80°	30.6 "

These results, obtained spectroscopically, are confirmed by the motions of spots, faculae, and *floculi*. Spectroscopic results from hydrogen lines which have their origin probably at a somewhat higher level show polar retardation of not more than half this amount. There is no wholly satisfactory explanation of this remarkable law of rotation.

These tabular data may be convenient:

Equatorial horizontal parallax.....	$8.80''$.
Angular diameter.....	Max. $32' 36''$, Min. $31' 32''$.
Mean distance.....	92,900,000 miles.
Diameter.....	866,000 miles.
Volume.....	1,306,000 times that of the earth.
Mass.....	332,000 " " "
Force of gravity at surface.....	27.6 " " "
Density.....	1.41 times that of water.
Period of rotation at equator.....	24.5 days.
Velocity of rotation.....	$1,285$ miles per second.
Inclination of axis to plane of the ecliptic.....	$82^\circ 45'$.
Longitude of node of equator on ecliptic (1900).....	$73^\circ 40'$.
Surface in square miles.....	2,860,000,000,000.
Energy radiated from each sq. ft. of surface=	10,000 horse-power.

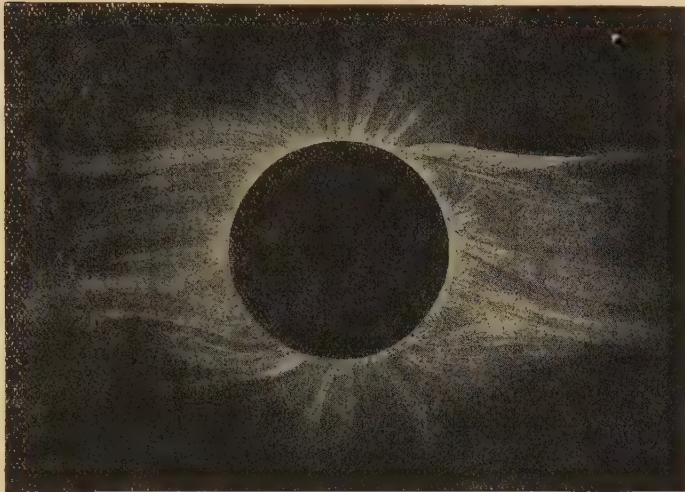


Fig. 3.—The Sun's Corona on 18th May 1901, drawn by Mr H. Morgan from Photographs taken at the Eclipse by the Expedition from the U.S. Naval Observatory.

extension is greatest in the direction of the sun's equator, while at maximum it extends irregularly from all points of the sun's disk.

The photography of the prominences was accomplished by Hale and Deslandres. They devised an instrument known as a spectroheliograph. In this instrument light falls on a slit and a spectrum is formed. All the light of the spectrum is cut out, except a very small amount, by a second slit; thus, for example, all the light except that corresponding to the red line of Hydrogen (H_α) is cut out. If

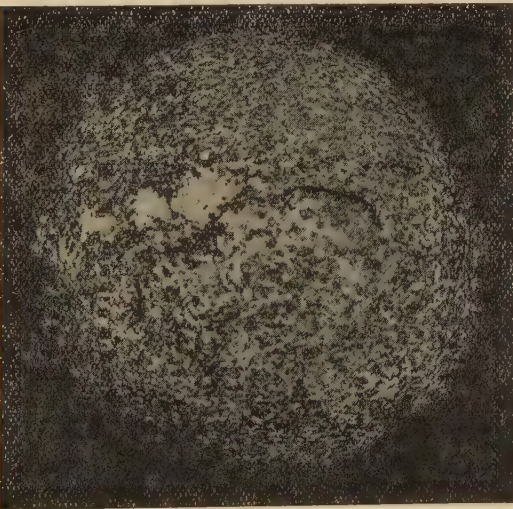


Fig. 4.—Calcium flocculi.

now the whole apparatus is moved parallel to itself different parts of the sun are successively seen in the light of wave-length peculiar to H_α , and when the movement is perfected photographs may be taken in light of this wave-length. Not only the prominences round the edge of the disk, but the surface of the sun, may be photographed in this way. Special interest attaches to photographs

See *The Sun*, by Young; *Le Soleil*, by Secchi; *The Sun*, by Abbott; *History of Astronomy in the Nineteenth Century*, by Miss Clerke; *The Problem of Stellar Evolution*, by Hale; also the articles ECLIPSES, MOON, PLANETS, SOLAR SYSTEM. *The Astrophysical Journal* contains much of the recent research. For Sun-worship, see SUN-CULT.

Sun-animalcules. See HELIOZOA.

Sunart, LOCH, a picturesque sea-inlet in the west of Argyllshire, winding $19\frac{1}{2}$ miles eastward from the north entrance to the Sound of Mull.

Sunbirds (*Nectariniidae*), a family of Passerine birds related to the Honey-eaters (q.v.), having long, slender beaks and a protrusible and deeply cleft tongue. In general appearance and habits they resemble the Humming-birds of America, with which, however, they have no real affinity. They are birds of brilliant plumage, glittering with metallic lustre. They are confined to the hotter regions of the Old World, being particularly abundant in Africa and southern Asia and extending to North Australia, but the species commonly have a limited range. Captain Shelley in his monograph on the Sunbirds (Lond. 1876-80) subdivides the family into three sub-families, (1) *Neodrepaninae*, (2) *Nectariniinae*, (3) *Arachnotherinae*. They are all of small size, although none are so small as the smallest humming-birds; they rival humming-birds in brilliancy of plumage, and like them they feed on the juices of flowers, which they suck by their long bill, occasionally hovering in the air before a flower when feeding, but generally hopping about or clinging to the smaller twigs and flowering branches; small insects and their larvæ and spiders are, however, their principal food. Some of the nectar-sucking species pollinate the flowers they visit. They have a feeble chirping note.

Sun-bittern (*Eurypyga helias*), so called from the brilliant many-coloured markings on its plumage, a South American bird about the size of a small curlew, long-legged and long-necked, which usually struts in a solemn balanced manner, but at times goes through a series of poses somewhat like the Argus (q.v.). It is found from Brazil north-west into Central America.

Sunbury, capital of Northumberland county, Pennsylvania, on the Susquehanna River (here, a mile below the junction of its branches, crossed by a bridge), 53 miles by rail N. of Harrisburg. It contains flour-mills, dye-works, foundries, and other works. Pop. (1920) 15,721.

Sun-cracks, superficial markings frequently seen on the surfaces of thin bedded flagstones and argillaceous sandstones. They are believed to have been formed in the same way as the fissures which are produced upon the mud-flats of tidal rivers or estuaries by the drying and shrinking of the deposits during their temporary exposure at low tide. The cracks are of course filled up by new deposits when the mud-flats are again overflowed. Not infrequently the material filling the sun-cracks is of harder consistency than the rock in which they occur. When the bed overlying the cracks is removed a cast of these often projects from its under surface, or frequently the casts remain in the moulds so as to form a series of polygonal ridges ramifying over the whole surface of the exposed stratum.

Sun-cult. There is no reason to believe that men have worshipped the sun itself on a wide scale. The worship of the disc of the sun, instituted by Akhenaton of the eighteenth dynasty of Egypt, is practically the only instance of the sort.

Wherever found, with this exception, the cult is not that of the sun, but of a sun-god. This cult is invariably carried on by men calling themselves Children of the Sun, who can be traced in all parts of the world. In most places they have vanished, but they still persist in Japan, the emperors of which are descended from Amaterasu, in this case a sun-goddess. The royal family of Egypt after the beginning of the fifth dynasty, the most important ruling families of India, including the family of Buddha, the Incas of Peru, and many others, were of solar descent. The sun-cult evidently originated in Egypt at Heliopolis, which is assumed to be the home of the Sothic calendar. Prior to the fifth dynasty there are but few signs in Egypt of a solar cult; but the kings of the fifth and succeeding dynasties were the Children of the Sun, having Re, the sun-god of Heliopolis, as their actual father. This family of Children of the Sun eventually, it would seem, spread throughout a large part of the world, and everywhere claimed that they were born of the union of the sun-god and a woman, often a virgin. The marriage of brother and sister, or of mother and son, was a common characteristic of this family wherever they went. The ritual of the sun-cult was, in Egypt, based on that of Osiris, the first king who was mummified. The sun-god was supposed to die every night, and every morning the king, his son, had to perform the necessary rites to bring him to life again.

See Perry, *The Children of the Sun* (1923). See also APOLLO, BELTANE, CHRISTMAS, FIRE, FOLKLORE, MYTHOLOGY, PARSEES, SOLAR MYTH.

Sunda Islands, a name that bears in geography two interpretations. (1) It is applied, but not very correctly, to the long chain of islands which stretches from the Malay Peninsula south-east to the north coast of Australia, beginning with Sumatra and ending with Timor. (2) In the more proper sense of the term it means the islands that lie between the east end of Java and the north side of Timor, namely Bali, Lombok, Sumbawa, Flores, Sandalwood Island, and some smaller ones. These have been already treated of in separate articles.

Sunda Strait is a passage, from 70 to 90 miles in breadth, lying between Sumatra and Java and connecting the Indian Ocean with the Sunda Sea. Several islands stand its waters, as Krakatao (q.v.), Princes Island, Steers, and Calmeijer.

Sundarbans, or SUNDERBUNDS, the lower portion of the delta of the Ganges in British India, extending from the mouth of the Hugli on the west to the mouth of the Meghna on the east, a distance of 165 miles, and stretching inland for half that distance. The total area is estimated at 7550 sq. m. The region is entirely alluvial, is intersected by a network of anastomosing streams, and contains a vast number of swamps and morasses. Next the sea is a wide belt of dense jungle and underwood, the haunt of the tiger, leopard, rhinoceros, buffalo, wild hog, deer, monkeys, python, cobra, and numerous sea-birds and birds of prey. Behind this belt the land is cultivated, the fields being enclosed with embankments. Rice is the staple crop, though the people also grow pulses, vegetables, jute, and sugar-cane. Besides rice the principal products of the region are timber and fish. There are no villages, the population being thin and scattered. The chief highways are the water-courses, shown in the map at CALCUTTA. Part of the area is liable to be swept by destructive 'typhoon waves' or high tides caused by cyclones.

Sunday. See SABBATH.

Sunday-schools, as we know them in modern times, sprang from the efforts begun in 1780

by Robert Raikes (q.v.), a printer in Gloucester. Although systematic and wide-spread attention to the religious training of children is of modern date, still some attention was bestowed upon it in early times. The father acted as teacher and priest towards the children in patriarchal times; there was provision for the training of children in the knowledge of the law in the Jewish economy. Ezra read and had the law explained 'before the congregation both of men and women and all that could hear with understanding' (Neh. viii.). There were religious schools in connection with the synagogues in New Testament times. The Mishna says, at five years of age 'let children begin the Scriptures, at ten the Mishna, and at thirteen let them be subjects of the Law.' In the apostolic age teachers were set over the young and ignorant. Mosheim says 'the Christians took all possible care to accustom their children to the study of the Scriptures, and to instruct them in the doctrines of their holy religion.' Clement of Alexandria and Origen did duty as catechists. The classes of Catechumens (q.v.) were intended for the instruction of candidates for church fellowship; instruction was given on Sundays just previous to public worship, and the scholars were mostly adults. At the Reformation Luther (1529), finding the people fearfully ignorant, opened schools for children for catechising. Knox (1560) did the same in Scotland. St Charles Borromeo (q.v.), Archbishop of Milan, founded Sunday-schools in his diocese, which still exist, but these were chiefly secular. Sunday-schools are noticed in an ordinance of Albert and Isabel in 1608 as then existing in the Catholic Netherlands. The magistrates were enjoined to see to their establishment and support in all places where not already set afoot. Both Richard Baxter and the Rev. Joseph Alleine (1634-68) were in the habit of gathering young people together for instruction; and there were many irregular and isolated attempts in the same direction in different parts of Britain. But it was Raikes who founded and consolidated the modern Sunday-school system and gave the subject publicity through his journal and other organs of public opinion. There is no doubt that his philanthropic work in Gloucester gaols had impressed him with the direct connection between ignorance and crime. One day, in 1780, he had gone to hire a gardener in a low suburb of the town near the Severn, where the people were mostly employed in a pin-factory. He was grieved at seeing the groups of wretched ragged children at play in the streets, and on inquiry was informed that on Sunday 'the street was filled with a multitude of wretches, who, having no employment on that day, spent their time in noise and riot, playing at chuck, and cursing and swearing in a manner so horrid as to convey to a serious mind an idea of hell rather than any other place.' To check this he engaged four women, who kept dame-schools, to instruct as many children as he should send them on Sunday in reading and the church catechism, for which they were to receive one shilling each for their day's service. In this work he was assisted by the Rev. Thomas Stock, of St John's parish. The children gathered into the first Sunday-schools ranged from six to twelve or fourteen years of age. Personal cleanliness was the one requirement. 'All that I require,' said Raikes, 'are clean hands, clean faces, and their hair combed.' Owing to the total ignorance of the scholars the teaching was of an educational nature at first; the little folks learned their letters, and to spell and read. The schools opened at 8 A.M., by 8.30 lessons were begun; afterwards the children went home, or to forenoon service, and in the afternoon to school again at the close of the church service till 5.30 P.M. Boys and

girls were separately taught, and once a month they were publicly catechised in church as to their religious knowledge. In a short period a visible improvement was effected in both the manners and morals of the children. One employer of labour said 'the change could not have been more extraordinary had they been transformed from the shape of wolves and tigers to that of men.' More than three years after its foundation the scheme was noticed in Raikes's *Gloucester Journal* (November 3, 1783); but it was a letter by Raikes, quoted in the *Gentleman's Magazine* in 1784, which first drew general attention to the subject. In 1784 the first Sunday-school was established in London by the Rev. Rowland Hill. Numerous schools sprang up in all the principal towns, and a society under high patronage was formed in London in 1785 for the establishment and support of Sunday-schools throughout the kingdom, which in fourteen years spent £4000 in payment of teachers. By 1789 there were already 300,000 scholars throughout the kingdom. Hannah More (q.v.) started a school in 1789, and Sydney Smith one at Netheravon. Adam Smith wrote that 'no plan has promised to effect a change of manners with equal ease and simplicity since the days of the apostles;' and Cowper and John Wesley likewise approved of the system.

One great impediment to the early prosperity of the Sunday-school was the expense of hiring so many teachers. But several young men banded themselves together to teach the children gratuitously; the example spread, and soon the teaching was almost universally gratuitous. One authority says gratis teaching began at Oldham. A higher class of teachers offered their services; the schools ceased to be filled by the very poorest alone; handsome buildings were erected in connection with the different churches and chapels, or by general subscription, and that system was organised which covered the land with schools. The secular teaching, which in certain instances included writing and arithmetic, was not of a very high order; but it placed the key of knowledge in the hands of multitudes who would otherwise have been unable to read.

The establishment of The Sunday-school Union in 1803 gave a powerful impetus to the extension of Sunday-schools in England. In increased attention paid to the training of teachers, grading of the classes, and the provision of schemes of lessons suitable to the various stages of the scholars' mental growth, much valuable pioneer work was done by Mr G. Hamilton Archibald and others.

Sunday-schools were introduced into Wales in 1789 by the Rev. Thomas Charles of Bala (one of the founders of the Bible Society, q.v.), and were much appreciated even by adults—in one class at Bangor every pupil wore spectacles. The Sunday-school was known in Scotland in 1756, but it was not till 1786, when the Society for Promoting Religious Knowledge was formed, that it was publicly recognised, nor till 1795, when the Gratis Sunday-school Society was originated, that schools became general. At first they met with considerable opposition from both the civil and ecclesiastical authorities. The names of Dr Chalmers, James Gall, and David Stowe deserve mention in connection with the progress of Sunday-schools in Scotland. In Ireland Sunday-schools had been partially anticipated by Dr Kennedy, in County Down, in 1770; but it was not till 1785 that the system pursued by Raikes was adopted. The Sunday-school Society for Ireland was established in 1809.

In the United States, as in Great Britain, there were isolated attempts at Sunday-school teaching before the example of Raikes reduced it to a system. The Methodist Bishop Asbury (q.v.) is said to have planted the first American Sunday-

school in Hanover county, Virginia, in 1786. The Methodist Conference in 1790 resolved to establish Sunday-schools for white and black children. A Sunday-school Union was formed at Philadelphia in 1791 which employed paid teachers; the New York Union was formed in 1816; and the American Sunday-school Union in 1824, which sprang from the Sunday and Adult School Union (1817). The Congregationalists, Methodist Episcopalians, Presbyterians, and Baptists have also organisations. Dr Vincent, one of the founders of Chautauqua (q.v.), and Mr Jacobs originated the International Series of Lessons (1873). The Sunday-school is an invariable adjunct to the work of the missionary. Roman Catholics have also Sunday-schools.

See RAGGED SCHOOLS, EDUCATION; also Watson, *Sunday-school Union* (1853); Harris, *Robert Raikes* (1899); Trumbull, *Yale Lectures on the Sunday-school* (Philadelphia, 1888); Brown, *Sunday-school Movement in America* (1901); G. H. Archibald, *The Organisation and Grading of a Sunday-school* (1904), *The Junior Department* (1907), *The Sunday-school of To-morrow* (1909), and *The Modern Sunday-school* (1926); E. Archibald Johnston, *The Primary Department* (1924).

Sunday Society, an institution founded in 1875 'to maintain and enhance the importance of the English Sunday,' included amongst its members Dean Stanley, Huxley, and Tyndall, and addressed itself zealously to secure and maintain the opening of museums and galleries on Sundays. It was in direct response to an appeal by the society that in 1908 the National Gallery and the Wallace Collection were opened on Sundays throughout the year. Others followed. The Sunday National League, aiming to promote intellectual and elevating recreation on Sundays, had been established as early as 1855. A Sunday Lecture Society was founded in 1869, and succeeded in proving that its lectures (by Huxley, Carpenter, and others), together with sacred music, were not an infraction of the Sunday Act.

Sunderland, a seaport, municipal, county and parliamentary borough of Durham, situated at the mouth of the Wear, 13 miles NE. of the city of Durham, and 12 SE. of Newcastle-upon-Tyne. A monastery was founded by Benedict Biscop (q.v.) on the north side of the river in 674. Bede, who was a member of this establishment, called the river the Wiri. Towards the close of the 12th century Wearmouth became a borough, but until the discovery of coal in the district it does not appear to have been a place of much importance. It was in 1396 that the first exportation of coal from Sunderland took place, while the first mention of shipbuilding on the Wear occurs in 1346. The borough received its charter of incorporation from Bishop Morton in 1634. It was about 1669 that letters patent were granted for the building of a pier and lighthouse, the harbour at that time being almost unnavigable. There was no bridge over the Wear at Sunderland until 1796, when Rowland Burdon, M.P., advanced a large sum towards that object, and an iron structure with a span of 236 feet was thrown across the river. The bridge was remodelled, widened, and improved in 1859 by Robert Stephenson. In 1839 the North Dock was opened, and in 1860 the South Dock, while in 1880 a lock was constructed to connect the docks with the south outlet.

Sunderland is an extremely progressive commercial centre. Its geographical position in the midst of the coal and metalliferous-ore area, and its proximity to sea, river, and railway communication have secured for it immense advantages. From the harbour entrance, by means of the north half-tide basin, vessels have direct passage into the docks. Concrete piers, faced with granite, afford adequate protection to the harbour entrance. A

water area of 211 acres is covered by the harbour entrance, the south outlet, and the docks. There are seven graving docks, a huge pontoon—capable of lifting 7000-ton vessels—and warehouses, storehouses, cranes, &c., elaborately fitted for the handling of goods; especially noteworthy are the arrangements for the shipment of coal. Steam-tractors and other fishing-vessels land cargoes near the entrance to the river at the Fish Quay, in direct railway communication with all parts of the country. Shipbuilding on Wearside has long been famous, all kinds of vessels up to 15,000 tons gross being turned out; there are excellent facilities for repairs, refits, &c., as well as good engineering works for every type of engine. Besides the yards supplying ship fittings, there are foundries, breweries, collieries, potteries, and brass, iron, glass, paper, chemical, and electrical works.

As a town, Sunderland is well laid out. The more important buildings include the Theatre Royal (1853); Workmen's Hall (1872); Public Library, Museum, and Art Gallery (1879); Town Hall (1890); Technical College (1901); Quarter Sessions and Police Court Buildings (1907); Queen Alexandra Rail and Road Bridge between Deptford and Southwick (1909); and the Training College (1922). Of the many churches in the borough, the most interesting is that of St Peter, Monkwearmouth; remnants of the original church (674) are retained in parts of the western tower and western wall of the nave; while there are fine stained-glass windows, also some good carving. Sunderland is a healthy town, owing to its proximity to the North Sea. It possesses no less than seven public parks, with the usual recreations; Barnes Park has an area of 33 acres. Roker, Sunderland's seaside suburb, is situated on the north side of the river about a mile from the centre of the town. The bathing is good, the beach being protected with piers, and there are parks, promenades, &c. Sunderland returns two members to parliament. Pop. of parliamentary borough (1851) 67,394; (1881) 124,760; (1901) 159,359; (1921) 173,742, of whom 159,100 were in the municipal and county borough. Havelock was born at Ford Hall, Bishopwearmouth (1795); Jack Crawford, the hero of Camperdown (1775–1831), at Sunderland; and other natives were Clarkson Stanfield, R.A., Tom Taylor, Sir Joseph Wilson, and Swan the electrician.

Sunderland, ROBERT SPENCER, EARL OF, was born in 1640, and in September 1643 succeeded his father, who fell at the first battle of Newbury, having three months before been created first earl. After serving as ambassador to several courts, in 1679 he became Secretary of State, and at first united with Essex and Halifax in opposing Shaftesbury, who wished to set Monmouth on the throne, and favoured the exclusion of the Duke of York. He encouraged Charles II. to persevere in the degrading French alliance, and, with the Duchess of Portsmouth, to whom he attached himself, negotiated a treaty by which, in consideration of an annual French pension, Charles was to assemble no parliament for three years. Before the year was out a new triumvirate, consisting of himself, Hyde, and Godolphin, succeeded to the confidence of Charles. The treaty with France was broken off, and Sunderland, who was now afraid of the Whigs, engaged the king in a more popular alliance with Spain. After the dissolution of the last of the exclusion parliaments he lost his office; but the duchess remained faithful to him in disgrace, and in 1682 he was, 'upon great submission made to the Duke [of York], again restored to be Secretary.' He remained in office until the accession of James II., when his influence in the ministry became greater than ever. Although there is reason to believe he gave some encouragement to Monmouth

in his rebellion, he managed, with consummate art, to win James's entire confidence, and in 1685 became prime-minister. He alone was entrusted with a knowledge of the king's intention to establish Catholicism as the national church; and in 1687 he privately conformed thereto, and afterwards openly professed his conversion. His influence was so great that James would grant no favour until he had asked the question: 'Have they spoken to Sunderland?' and when told that this nobleman got all the money of the court, he would reply: 'He deserves it.' Yet we find him about this time in correspondence with William of Orange. With profligate but masterly dexterity he contrived to deceive both James and Barillon, and to keep them in ignorance of the events that were passing in Holland. When William arrived in England Sunderland went to Amsterdam, whence he wrote to the new monarch, claiming his favour and protection on the ground that he had all along been in his interest. In 1691 he was allowed to return to England, and to kiss the king's hand; in 1695 William spent a week at his house at Althorp. He had changed, it was said, his religion, in the late reign, in order the more effectually to ruin King James; and it was generally believed that he had rendered King William, when Prince of Orange, some signal services, which no one else could have done. This belief gained credit from the favour now shown him. He was made Lord Chamberlain, and as such took his seat at the head of the council table. After directing affairs as the acknowledged head of the government, he resigned office in 1697, and retired to Althorp, where he died, 28th September 1702. By his wife, Anne, daughter of the second Earl of Bristol, he left CHARLES SPENCER, third earl, who was born in 1675, and whom Evelyn describes as a youth of extraordinary hopes, very learned for his age, and ingenious. From 1706 to 1710 he was Secretary of State in the reign of Queen Anne, and under George I. he rose to be all-powerful; but in 1721, being accused of receiving £50,000 worth of the fictitious stock distributed by the directors of the South Sea Scheme (q.v.), in order to bribe the government, he was acquitted only by an inconsiderable majority and that from party considerations, and the indignation of the public made him resign his office. He died on 19th April 1722, not without suspicion of having intrigued, after his fall, for the restoration of the Tories, if not for the return of the Pretender. Sunderland was a type of the political morality, or rather immorality, of a disgraceful age, when the greatest statesmen made no scruple of sacrificing either their own party or the interests and dignity of the nation to personal ambition. His title descended to Charles, his second son, who succeeded in 1733 to the honours of his maternal grandfather, John Churchill, the earldom of Sunderland became absorbed in the dukedom of Marlborough. The third son, John, was father of the first Earl Spencer (q.v.).

Sundew. See INSECTIVOROUS PLANTS.

Sun-dial. See DIAL.

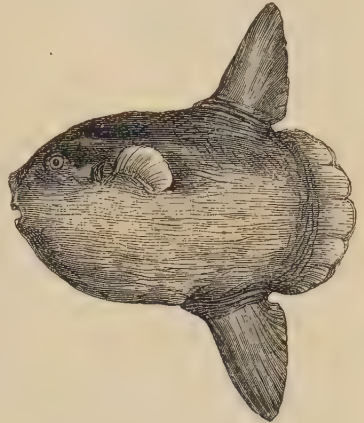
Sundsvall, a seaport of Sweden, on a bay of the Gulf of Bothnia, 80 miles N. by W. of Stockholm, and 290 miles by rail E. by S. from Trondhjem in Norway, has ironworks and saw-mills, and a large trade in iron and timber. Pop. 17,000. The town was almost entirely destroyed by fire in 1888.

Sunfish (*Molidae*), a family of Teleostean fishes in the sub-order Plectognathi, nearly related to 'Globe-fishes' (Tetrodontidae) and 'porcupine-fishes' (Diodontidae). Two genera, *Orthogoriscus* (or *Mola*) and *Ranzania*, are distinguished; both are

occasionally represented off British coasts. The body, unlike that of globe-fishes and porcupine-fishes, is non-inflatable; it is laterally compressed, truncate posteriorly, without a caudal fin; the dorsal and ventral fins are strongly developed and pointed; the skin is rough or tessellated; the very young stages (formerly referred to a distinct genus, *Molacanthus*) are armed with spines. The Sunfishes have a wide distribution, occurring usually near the surface in the open sea, but sometimes descending to great depths. One of the best known forms is the cosmopolitan Short or Rough Sunfish,

Orthogoriscus

mola, often found on the south coasts of England and Ireland. It may attain a length of 8 feet and a weight of 1800 pounds. In the young the vertical axis is about as high as the longitudinal axis is long, but in the adults the latter increases a little in proportion. The spinal cord is only about as long as the



Short Sunfish (*Orthogoriscus mola*).

brain, if the slender filum terminale is not counted in. There are only 17 vertebrae. The fish sometimes swims about in a leisurely way near the surface, with its high dorsal fin projecting out of the water; and to this habit of sunning itself, if not to the somewhat circular shape, the name Sunfish may refer. The food seems to consist of larval fishes, pelagic crustaceans, jelly-fishes, and the like; and it is an interesting fact that the very young *Leptocephalus* stages of the common eel are found in the Mediterranean in the stomach of Sun-fish. The flesh is white and well-flavoured, somewhat resembling that of the skate. There is much oil in the liver, and this is in repute among sailors as an external application for the cure of sprains and rheumatism. For another Sun-fish, see OPAH; and for another (the basking-shark), see SHARK.

Sunflower (*Helianthus*), a genus of Compositae, having large flowers; the florets of the ray strap-shaped, without stamens or pistils, yellow or orange; the florets of the disk tubular, perfect, yellow or purplish brown; the heads solitary or in corymbs, with an involucre of numerous leaves; the fruit compressed, with a pappus of two or more deciduous scales. The species are numerous, all natives of America; large herbaceous plants, with opposite or sometimes alternate undivided leaves. The Annual Sunflower (*H. annuus*), common in flower-gardens, is a native of tropical America, where it sometimes attains a height of 20 feet. The stem is thick and rough; the heads solitary, and from 1 foot to 2 feet in diameter, nodding; the leaves heart-shaped-ovate. This plant is now cultivated in almost all parts of the world, and in southeastern and central Europe is a field-crop, the seeds being valued as food for cattle, cage-birds, and poultry, and for their oil, little inferior to olive-oil, and the residual cake (a cattle-food). An acre of good land produces about fifty bushels of seed, each bushel yielding a gallon of oil. The seeds are also used like almonds for making demulcent and

soothing emulsions; and in some parts of Europe a bouilli is made of them which is used as food for infants. Russians eat them like nuts, and American Indians make bread of them. The flowers abound in honey, and are much frequented by bees. The leaves are good fodder for cattle. The stems and husks are used for fuel, and yield much potash. A profusely flowering garden variety, *H. multiflorus*, is referred to the same species. The error that the flowers turn with the sun is mentioned by Gerarde (1597), who adds, 'the which I could never observe, although I have endeavored to finde out the truthe of it.'—The Jerusalem Artichoke (q.v.) is of this genus



Sunflower
(*Helianthus annuus*,
var. *multiflorus*).

Sungei Ujong, a native state of the Malay Peninsula under British protection, with which Jelebu was united in 1888. In 1895 Sungei Ujong rejoined the confederation known as Negri Sembilan ('Nine States'), to which it had once belonged, comprising Sri Menanti, Johol, Rembau, and Tampin; and in 1896 Negri Sembilan became one of the Federated Malay States.

Sunium. See COLONNA.

Sunn. See CROTALARIA, FIBROUS SUBSTANCES.

Sunnites, the name commonly given to orthodox Muslims, because in their rule of faith and manners the Sunna (pron. *Soonna*), or traditional teaching of the Prophet, is added to the Koran. According to Islam the human mind is incapable of attaining light in law or religion but through the Prophet, and all expressions of God's will are equally important. Reason and conscience are here of no value; memory is all. Hell-fire is the award due alike to him that prays without being properly washed and to him that denies the word of the Prophet. Accordingly during the Prophet's life his counsel was eagerly and continually sought; and after his death his example and sayings were collected as of infinite value. After the death of the four rightly guided khalifs, Abu Bekr, Omar, Othman, and Ali, intimate friends of the Prophet, fearful uncertainty arose and gradually occasioned the four schools of the four orthodox Imams. The first of these was Abu Hanifa, born in Basra of a noble Persian family. He taught in Kufa on the Euphrates. He logically deduced from the Koran all religion and law; for the Koran says (Sura 16: 91) 'to thee we have sent down the book which clears up everything.' Consequently, when the Koran says (S. 2: 20) 'for you have I created the whole earth,' it follows that to Muslims belongs all the property of unbelievers. Hence the propriety of piracy and aggressive war against them. In his school arose the famous legists of Iraq, and his system, the most widely spread of the four, now prevails in the Turkish territories. He would never hold any office under government, fearing the doom due according to prophetic tradition to every giver of a wrong decision, namely, to be plunged into hell from a height of forty days' journey. He died in 767 in prison, where the khalif had confined

him for refusing to be Cadi over the new capital Bagdad.

In 795 died Malik ibn Anas in his eighty-fourth year at Medina, where he was born and had lived all his days. There, surrounded by traditions of the Prophet, he had taught after the custom of Medina. This had been impossible to Abu Hanifa, residing amid a partly foreign people and a very complex civilisation. Malik gathered from the Koran and from local traditions of Mohammed his *Muwattaa*, or Beaten Path, a complete body of law and religion. He never announced any such tradition without a previous ablution. On his death-bed he regretted with tears that he had ever used his own judgment in pronouncing an opinion on a point of law, and wished that he had been flogged and re-flogged every time. His system was established in North Africa by African students, who found Medina the most convenient school, and in Spain by his Berber pupil Yahya 'bn Yahya. The third orthodox imam was Ash-Shafi'i of the Koraish tribe, and descended from the Prophet's grandfather, Abdul-Muttalib. He was born, it is said, on the day of Abu Hanifa's death. He taught in Cairo, and there he died in 820. He was an eclectic, but leaned more to the traditional precedents of his teacher Malik than to the deductive method of Abu Hanifa. His system prevailed in Egypt, and was not uncommon eastward. It still flourishes in the Asiatic islands.

The use of reason and Greek philosophy had by this time wrought such laxity in faith and in public and private conduct that rigid puritanism was a natural concomitant. Its exponent was Ibn Hanbal, the fourth orthodox imam, who died in 855 in his native city Bagdad, beyond which his system never had much power. He was a pupil of Ash-Shafi'i, whose lectures, however, he would never allow his own pupils to attend. Tradition and Sunna had now immensely increased, and by these alone the Hanbalites were guided. They are now almost extinct, but were strenuous in their early days, when they would break into festive meetings in Bagdad, beat the singers, break the musical instruments, and pour the wine into the streets. The bulk of tradition had now made editing indispensable, and those huge masses of it began to appear under which the Muslim mind has been crushed to death. As Ibn Hanbal said, 'the punishment of the learned man in this world is blindness of heart.' Abu Hanifa had used only 18 traditions, Malik 300. Ibn Hanbal used 30,000. These were mainly collected by his friends and pupils. One of these, the excellent Abu Da'ud Suleiman, travelling in many Muslim lands, collected half a million, which he sifted down to 4800. Another, Yahya 'bn Main, spent a large fortune and wore out his last pair of shoes in collecting 600,000. Helpers copied as many more for him. 'I copied quantities of traditions to the dictation of liars,' he said, 'and heated my oven with them, whereby my bread was well baked.' But of the six accepted collections the standard one was made by Al Bukhari, a friend and pupil of Ibn Main. He taught in Bagdad, and like the best Muslim theologians was a Persian. He died in 870. Of the 600,000 traditions heard by him he admitted only 7275, whereof the half are probably genuine. Till he had washed and performed two rekas of prayer he never inserted any tradition. An edition by Krehl appeared at Leyden in 1862-72, in 3 vols. The collection by his Muslim pupil is better arranged, and is more used. The sources of tradition were Aysha, the first four khalifs, and the six companions of the Prophet, of whom Abu Horaira, a manifest liar, was more prolific than any other. Through one of these channels to Mohammed the *isnad* or pedigree of every tradition

had to be traceable. Worth or internal evidence counted for nothing. The work of collecting was begun too late. The real origin of most traditions was the requirements of interested parties, conscious mendacity, or gossip, specially in the standing camps of Arabs required in every conquered land. The matter is called *Hadith*, events, tradition, and is much more entertaining than the *Koran*. Besides the legal and religious utterances of Mohammed, which are generally in one or two sentences, it embodies endless nonsense about his life and miracles, although Mohammed disowned all miracles but his own inspiration, about spirits, the beginning of the world and its end. Whatever in the *Hadith* can be imitated or obeyed is *Sunna*, method; compulsory for guidance if connected with religion, but redundant or collateral, though praiseworthy, if giving mere details of such things as the Prophet's mode of standing and sitting. Its object is to make needless all appeals to reason and conscience. In legislation it is much less used than formerly; but, like the *Koran*, it is infallible and unalterable, and its only independent expounders are the four orthodox *imāms*. Legislation merely means a declaration by the *Sheikh-ul-Islām* and his council of *ulemā* or doctors that this or that agrees with the *Koran* or tradition. Reformation of law or religion from within is impossible.

Sunstroke (otherwise called Heatstroke, Heat Apoplexy, Heat Asphyxia, Coup de Soleil, Erythismus tropicus, and Insolation) is a very fatal affection of the nervous system, which seldom occurs in Great Britain, except in extremely hot summers, but is very common in India and other tropical countries. The symptoms of the disease are liable to be greatly modified in different cases. Two contrasted forms are recognised. In the *cardiac* the heart is chiefly affected, and the symptoms are weakness, faintness, dimness of sight, giddiness, &c. Death may take place either suddenly or more gradually from failure of the circulation. If recovery occur it is complete. This form may be caused by the sun's rays (sun-stroke), or may occur in close hot places (heat-stroke). In the *cerebro-spinal* form, or *siriasis*, the symptoms usually come on more gradually; nausea and giddiness may be present at first; but the most striking feature of the disease is deep unconsciousness or coma, with a pungently hot skin and extremely high temperature—106° F. or upwards. Even those who recover from this form of the disease are apt to suffer for a long period, or it may be permanently, from severe headache, epilepsy, enfeebled mental power, or other nervous disorders. Intermediate varieties are also met with, forming links between these two extremes. The mortality from sunstroke is about one in four of those affected. In the cases that terminate favourably a gradual remission of the symptoms takes place; and when the skin becomes cool and moist, and sleep has been procured (phenomena which usually occur within thirty-six hours of the attack), the patient may be regarded as out of danger.

The predisposing causes of sunstroke are (1) an unusually elevated degree of temperature; (2) heavy or unduly tight clothing, particularly if it interfere with the free expansion of the chest; (3) a contaminated atmosphere from overcrowding; (4) all debilitating causes, such as prolonged marches, previous disease, intemperate habits, &c. Death sometimes occurs so suddenly that there is little opportunity for treatment, but the general indications in these cases are the cold douche, from a height of three or four feet, keeping the surface wet and exposed to a current of air, the exclusion of light as far as possible, and the free employment of stimulants. In less rapidly fatal cases the outer clothing should be removed, and the douche

applied, as before, over the head and along the spine. Relaxation of the pupil is the first favourable sign. In the cardiac form, where the seizure is of the nature of a severe faint or syncope, and also in the cerebro-spinal form if the pulse flags, the douche must be replaced by the mere application of cold to the head, and it may be necessary to apply hot bottles, &c., to the extremities. The extremities and chest should be stimulated with mustard poultices. If the breathing threatens to fail, recourse should be had to artificial respiration. If injurious effects persist long after partial recovery, the patient should be removed to a cooler climate.

Sun-Yat-Sen, son of a Cantonese Christian convert, born in 1867, studied medicine for five years at Hong-kong, promoted an unsuccessful rising at Canton in 1895, and fled to Japan and the United States. He was kidnapped a month after reaching London at the Chinese Legation, and freed only on the intervention of Lord Salisbury (1896). He was in China preaching reform during the Boxer troubles; returned to America and Europe to collect money from his countrymen abroad; and, once more in China, became the soul of the revolution at Hanyang (1911) which issued in the establishment of the Chinese republic, of which he was chosen provisional president. He withdrew in favour of Yuan Shih-kai; but a breach came in 1917. From 1921 Dr Sun maintained himself on the whole—though driven out for a time in 1922–23—as head of a Southern Chinese republic at Canton, and leader of the more democratic element. His influence waned however, and he died 12th March 1925. See CHINA, and a book on him by Cantlie and Jones (1912).

Suomenlinna, or SVEÅBORG, fortress of Hel-singfors (q.v.).

Suomi. See FINLAND.

Supererogation, WORKS OF (Lat. *opera supererogatoria*), a class of works which, in the Roman Catholic system, are described as not absolutely required of each individual as conditions to his eternal salvation. The doctrine is based on the distinction between *præcepta* and *consilia evangelica*, the former including the common duties of all, the latter (called also 'Counsels of Perfection') establishing a merit. Roman Catholics found this definition on the distinction between what they believe to be commanded and what they hold to be only counselled, for an example of which they appeal to the words of our Lord to the young man in Matthew, xix. 21, which distinguish one class of works which are necessary in order to 'enter into life,' and a further class which must only be done if we 'would be perfect.' Roman Catholics do not profess to recognise in works of supererogation any distinctive essential quality by which they differ, whether in their physical or their moral entity, from other works, and in virtue of which, by their own nature, the individual may found upon them a personal claim to reward. For works of supererogation, as for all supernaturally good works, they hold that the assistance of God's grace is indispensably necessary; and they do not ascribe to them any merit, except that which arises from God's own free and gratuitous promise. In one word, the only distinctive characteristic of a work of supererogation lies in its not being supposed to be prescribed or commanded as absolutely necessary for the salvation of the individual, and its being done for the sake of greater perfection; and the doctrine which teaches the possibility of such works is, according to Catholics, a necessary consequence of the unequal fervour and unequal degrees of holiness which exist even in the class of the virtuous servants of God. The main difficulty

comes in at the next step—the claim that a further consequence of this doctrine is that God may accept the superabundant works of one in atonement for the defective service of another. Hence in the theory of indulgences, along with what they regard as the infinite and inexhaustible treasure of the merits of our Lord, Roman Catholics also regard, although in a degree infinitely inferior, the superabundant merits of the saints as forming part of that ‘treasure of the church’ which is applied in the form of indulgences. See **INDULGENCE**.

Superfetation, or the circumstance of two distinct conceptions occurring in the same woman at a considerable interval, so that two fetuses of different ages—the offspring possibly of different fathers—may co-exist in the uterus, is a subject of great interest both in a scientific and in a medico-legal point of view. Two centuries ago there was a universal belief in not only the possibility but the comparative frequency of this occurrence. Early in the 19th century it was as universally disbelieved; and now again (owing to the investigations of various inquirers) we are returning to the belief of our ancestors. The cases described as instances of superfetation may be arranged in three classes; but it is only to the cases of the third class that the term superfetation is truly applicable. The *first class* includes the numerous undisputed cases in which two mature children, bearing evidence, from their different colours, that they are the offspring of different parents, are born at the same time. (In the slave states of America it was by no means uncommon for a black woman to bear at the same time a black and a mulatto child—the former being the offspring of her black husband, and the latter of her white lover; and the converse has occasionally occurred—a white woman at the same time bearing a white and a mulatto child.) There is no difficulty in accounting for these cases, which may be examples of nearly contemporaneous conception rather than true superfetation. The *second class* includes those cases in which a twin has aborted, leaving its fellow undisturbed in the uterus, to be matured and born in due time, or in which twins have been produced at the same time, one of which was fully formed, while the other was small and apparently premature, from being ‘blighted’ or arrested in its development at an early period, or in which the birth of two children, both mature or nearly so, is separated by a short interval. Cases of these kinds are by no means rare; but there is no reason for believing that the infants were conceived at different periods.

The *third class* only presents serious difficulty. A case of genuine superfetation may be defined as one in which a woman bears two (or more) mature children, with an interval of weeks or months between the birth of each; or, if she part with the whole contents of the uterus at the first delivery, the difference of the ages of the fetuses, or the mature child and the fetus, as the case may be, must be unmistakable, and there must be the absence of all marks of blight of the latter, so as to leave no doubt that, had it remained in utero, it would have gone on to perfect maturity. Several apparently well-authenticated cases are on record where a second living child has been born two, three, or four months after the first; and these seem inexplicable on any hypothesis except that a second conception has taken place during the progress of the first pregnancy. Cases of double uterus occasionally occur; and in the absence of clear evidence to the contrary it is possible that a second conception may have taken place in the unoccupied division.

Superheated Steam. See **STEAM, STEAM-ENGINE**.

Superintendent is, especially in the Lutheran Church, a clergyman who exercises supervision over the clergy and churches of a district, but without claiming episcopal rank or authority. In the Reformed Church of Scotland, without infringing Presbyterian polity, there were superintendents from 1581 till the introduction of Episcopacy in 1610.

Superior. See **CASUALTIES, FEU**.

Superior, in Wisconsin, at the west end of Lake Superior, and opposite Duluth, ships iron and copper ore, is a great grain-market, and has ship building, flour-milling, and many manufactures. Pop. (1890) 11,983; (1900) 31,091; (1920) 39,671.

Superior, LAKE, the largest body of fresh water on the globe, is the highest and most western of the great lakes lying between Canada and the United States. It is bounded on the N. and E. by Ontario, on the S. by Michigan and Wisconsin, and on the NW. by Minnesota. Greatest length, 412 miles; greatest breadth, 167 miles; area, 32,200 sq. m.—nearly that of Ireland. The surface of the lake is 601 $\frac{1}{2}$ feet above the level of the sea, and its mean depth about 475 feet; its maximum depth is 1008 feet, or 406 feet below the level of the sea. Its surface has an elevation of 20 $\frac{1}{2}$ feet above that of Lakes Huron and Michigan; this difference occurs in the rapids of St Mary's River, the only outlet (see **SAULT STE MARIE**), where the average discharge is 86,000 cubic feet per second. Lake Superior, being situated very near the watershed between Hudson Bay and the Mississippi, receives no rivers of importance, although hundreds of small rivers pour themselves into it, the largest the St Louis and the Nipigon. Its aggregate drainage area (including its own area) is 82,800 sq. m. (Compare the articles on the four other lakes of the system, and those on Victoria Nyanza, Baikal, &c.) Near Dog Lake (318 miles by rail E. of Port Arthur) a short portage connects streams flowing to Lake Superior with others flowing north to Hudson Bay. The Sault Ste Marie Canal ($\frac{3}{4}$ mile, opened 1895) gives continuous navigation from the head of Lake Superior to the sea, 2384 miles.

The bold northern coast is fringed with rocky islands, some rising from deep water to 1300 ft. above the lake. The largest island is Isle Royale, which is 44 miles long. The southern shore is generally lower and more sandy, with occasional ridges of limestone. Keweenaw Point (q.v.) projects far into the lake. At Grand Isle Bay, about 100 miles W. of Sault Ste Marie, are the Pictured Rocks, cliffs of sandstone from 50 to 200 feet high, in many places presenting fantastic forms, and marked by numerous vertical bands and blotches of red and yellow. The boundary line between Canada and the United States is drawn through the centre of the lake from its outlet to the mouth of Pigeon River, but is diverted so as to include in the United States Isle Royale.

The water of Lake Superior is singularly pure and transparent. It never freezes over, but the shore ice prevents navigation in winter. The lake also is subject to very violent storms; waves have been observed, during protracted autumn gales, 15 to 18 feet high. It has the small tides common to the great lakes (see **MICHIGAN**), and also the *seiches* seen in Swiss lakes—a regular series of small waves, or pulsations, at intervals of about ten minutes.

The rocks around the lake are very ancient, belonging principally to the Laurentian and Huronian systems of the Azoic series, overlaid in some places, especially on the south side, with patches of the Lower Silurian (soft sandstones). There is everywhere much evidence of glacial action. On the north side, both on the islands and shores, copper and silver are worked, especially at Thunder

Bay; while the copper and red hematite iron ores of the south side are celebrated (see COPPER). The principal towns on the Canadian side are Sault Ste Marie and Port Arthur, and on the other side the American Sault Ste Marie, Duluth, Superior, and Marquette. The Canadian Pacific Railway skirts parts of the northern shore.

Superphosphates. See PHOSPHORUS.

Suppé, FRANZ VON (1820-95), an Austrian composer of light opera, born at Spalato in Dalmatia, who was music director in Vienna theatres.

Supple Jack, a name given in the southern United States to *Berchemia volubilis*, a twining shrub of the family Rhamnaceæ, which is found as far north as Virginia. It has oval leaves, small flowers, and violet-coloured berries. Some of the tropical American Paulinias are also called Supple Jack. The same name is also given in the West Indies and tropical America to *Serjania lucida*, a shrub of the family Sapindaceæ (q.v.), with a long, flexile, woody stem, which climbs to the tops of the highest trees, and is used for walking-sticks.

Supply. See DEMAND AND SUPPLY.

Supply, COMMISSIONERS OF, so called because they were originally appointed for the purpose of levying and collecting the land tax or cess offered as 'supply' to the sovereign, were long the chief county authority in Scotland for administrative and rating purposes. They were first appointed by the Act of Convention of 1667, and in order to qualify them to act they required formerly to be possessed of £100 Scots of yearly valued rent in property, superiority, or liferent. Until 1854 they were individually named in acts of supply; but since the passing of the Valuation Act in that year they have consisted of all owners of lands and heritages (other than houses) of the annual value of £100, of owners of houses of the value of £200 a year, of the eldest sons of owners of lands of £400 annual value, and, in the absence of their constituents, of the factors of owners of £800 a year, together with the sheriff and sheriff-substitute and certain representatives of the burghs within the county. It was by them that the general business of the county used to be conducted; they executed the statutes regulating its administration and finance; under the County General Assessment Act of 1868 they raised by rate the money necessary to meet the general expenditure of the county; they prepared annually a valuation roll of all lands and heritages within the county; they appointed the county officials; and in each county, with the exception of Orkney and Shetland, they maintained a force of police. By the Local Government (Scotland) Act, 1889, all these powers and duties were transferred to and vested in the County Council. Under the Act of 1889 the Commissioners of Supply still meet annually in May on the same day as the County Council. They transact no business, however, other than electing a convener and appointing certain of their number to sit with representatives of the County Council on a standing joint committee which superintends the police and the capital expenditure of the county. For a parliamentary Committee of Supply, see PARLIAMENT.

Supporters. See HERALDRY.

Suppuration is a morbid process which gives rise to the formation of Pus. (q.v.), which, as is well known, is one of the commonest products of inflammation. The fluid portion of pus is agreed by all to be derived mainly from the liquor sanguinis; but with regard to the origin of the pus-corpuscles there has been a singular fluctuation of opinion. Before 1850 it was generally held that they

developed in the fluid exudation of an inflammation by aggregation or growth of granules contained in it. This doctrine was replaced by that of Virchow (1858), who believed that they resulted from rapid multiplication of the cells of the irritated tissue. In 1867 Cohnheim, repeating accurate but neglected observations made in England more than twenty years before, showed that during inflammation (q.v.) white blood-corpuscles escape from the capillaries, and make their way through the tissues; and he maintained that these, and not fixed tissue-cells, give origin to pus-corpuscles. At present Cohnheim's view is generally regarded as the true explanation in the majority of instances; but it is maintained by some pathologists that at least in some cases many of the corpuscles arise from multiplication and alteration of the cells of the inflamed tissue, an opinion which at the present time has been found to be very largely the case.

With regard to the causes which lead to suppuration there has been almost as great a change of current opinion during the same period. It used to be regarded as the natural result of any kind of severe irritation, and a necessary incident in the healing of the great majority of wounds. But when Lister demonstrated the possibility of preventing it in many cases by Antiseptic (q.v.) methods, and when micrococci were found in the pus of many abscesses, even where there had been no visible breach of surface, it became clear that microscopic organisms play an important part in the process. The experiments of some observers indeed led them to conclude that though some of the results of inflammation may be manifested, suppuration cannot take place without their presence and activity. It has been shown, however, (1) that dead micro-organisms can excite suppuration; (2) that a fluid in which they have grown, even when completely freed from solid particles can do so —i.e. that their influence depends, at least in part, not on the organisms themselves, but on chemical products of their growth; (3) that certain chemical irritants (e.g. mercury, turpentine, croton-oil) experimentally introduced into the tissues of animals with the most complete antiseptic precautions do lead to suppuration. Such conditions, however, can hardly occur except as the result of a carefully planned experiment; and in cases coming under the care of the surgeon it may be assumed that where suppuration is present it is due to micro-organisms.

Suppuration must thus be regarded as one phase of that effort of the organism to resist the causes of disease which takes so prominent a place in pathology at the present day. But though essentially a defensive process, it very frequently becomes harmful, and leads to serious results. If suppuration takes place beneath a surface which does not participate in the morbid change, or which is capable of resisting it for a time, an abscess is formed; when pus-cells are poured forth from an exposed surface we have an ulcer.

See INFLAMMATION; Leber on inflammation, and Metchnikoff (1892); Walker's *Pathology of Inflammation* (1904); and treatises on pathology such as those of Barlow, Green, MacFarland, Riesmann, and Adams (1901-10).

Supralapsarian. See PREDESTINATION.

Supra-renal Capsules, two small, flattened, glandular bodies of a yellowish colour, situated, as their name implies, immediately in front of the upper end of each kidney (q.v.). In weight they vary from one to two drachms. They belong to the class of ductless glands, and on making a perpendicular section each gland is seen (like the kidney) to consist of cortical and medullary substance, surrounded by a fibrous investment which is intimately connected with the subjacent structure.

and is continuous with the fibrous stroma which pervades the organ. In the cortical portion the cells are arranged in rows or columns, and are polyhedral in shape, while in the medullary portion the stroma forms a network, in the meshes of which groups of cells of more irregular outline are found. The blood-vessels and nerves of the glands are exceedingly numerous. Their function is somewhat obscure, but they produce an internal secretion—adrenalin—which is associated with the maintenance of *tone* in the walls of blood-vessels, and thus with their contraction and the arrest of hæmorrhage. In 1855, however, Dr Thomas Addison showed that a rare form of disease, characterised by progressive debility and emaciation, with increased pigmentation of the skin (known as *Addison's Disease*, or *Bronzed Skin*), is associated with disease of these organs. It has since been proved that only one particular form of degeneration leads to this result; cancer, sarcoma, &c., have no similar consequence.

Supremacy, ROYAL. The term supremacy is, in politics, chiefly used with regard to authority in matters ecclesiastical. From the time of Pope Gelasius (494 A.D.) to the Reformation the pope exercised a very extensive authority, judicial, legislative, and executive, over all the churches of western Europe, somewhat undefined in its limits, varying in different countries and at different periods; and this continues to be more or less recognised in all countries whose inhabitants are in communion with the Church of Rome. The Statutes of Provisors (q.v.) and Præmunire (q.v.) asserted in some measure the authority of the sovereign; but at the English Reformation the papal supremacy was abolished, and 26 Henry VIII. chap. 1 declared the king and his successors to be the 'only supreme head on earth of the Church of England.' A document was at the same time drawn up by the government, in which it was explained that the recognition of this headship of the church implies only that the king should have such power as of right appertaineth to a king by the law of God, and that he should not take any spiritual power from spiritual ministers, or pretend to 'take any power from the successors of the apostles that was given them by God.' In 1535, the year in which this act was passed, Bishop Fisher of Rochester, Sir Thomas More, and others were beheaded for denying the king's supremacy. On Elizabeth's accession it was thought prudent, while again claiming the supremacy in all causes, as well ecclesiastical as civil, to keep that designation in the background. By successive statutes the oath of supremacy was appointed to be taken by the holders of public offices along with the oath of allegiance and of abjuration; these three oaths were consolidated into one in 1858; and now the oath of supremacy is not explicitly imposed on members of parliament. See OATH, ENGLAND (CHURCH OF), HENRY VIII.

Supreme Court of Judicature, in England, comprises the Court of Appeal (q.v.) and the High Court of Justice, with its four divisions—Chancery, Common Law, Bankruptcy and Probate, Divorce and Admiralty, all separately dealt with. In Scotland the term refers to the Court of Session (q.v.) and the Justiciary Court (q.v.).

Surabaya, or **SOERABAJA**, the largest city of Java, and capital of the residency of Surabaya, is situated on the north coast on the strait of Madura, over against the island of Madura. The town serves as an export centre for the rich eastern region, and has well-constructed harbour-works and a good roadstead. It is the principal naval base of the Dutch East Indies, and has a naval arsenal and

several shipbuilding-yards. Sugar, coffee, hides, and tobacco are the chief articles exported; rice and cotton are also grown in the province. Pop. 192,000.

Suraja Dowlah. See BLACK HOLE, CLIVE.

Surakarta, or **SOERAKARTA**, a town in the centre of Java, but connected by rail with Samarang on the north and Surabaya on the east. It is the residence of the native sultan of Surakarta, who, however, is a dependant of the Dutch government and is advised by a resident. The town (pop. 134,000) is the capital of his kingdom, a mountainous but in part very fertile region.

Surat, a city of British India, on the south bank of the river Tapti (crossed by a five-girder bridge), 14 miles from its mouth, and 160 by rail N. of Bombay. It stretches in a semicircle for more than a mile along the river, the quondam citadel (1540; government offices since 1862) forming the central feature in the line. The houses are closely packed, but the streets are clean and well paved; beyond them lie the suburbs, widespread in the midst of gardens. The chief ornaments of Surat are four handsome Mohammedan mosques, two Parsee fire-temples, three Hindu temples, the old English and Dutch factories, and a clock-tower (80 feet high). The existing city was founded early in the 16th century, and very soon after (in 1512) was burned by the Portuguese, who burned it again in 1530 and 1531. A stronger fort was erected in 1546, and Surat, already a place of considerable trade, soon rose to be one of the greatest commercial cities of India. In 1612 the English established themselves there, in spite of the opposition of the Portuguese, and shortly after they were followed by the Dutch. These last were the busiest of the European traders. Surat at this time had commercial relations with western Europe, with the great cities of Northern India, with Arabia, Persia, the coast-towns of Southern India, Ceylon, and the East Indies, silk, cotton, and indigo being the most valuable exports. Here, too, the Mohammedan pilgrims of India were wont to embark for Mecca. Shortly after the middle of the 17th century the Mahrattas began to harass the city, and they pillaged it several times before the century ran out. But towards the end of the 17th century the commerce of Surat began to decline, Bombay gradually taking its place, especially after the East India Company transferred to that city the headquarters of their government. Just previous to this change Surat is believed to have had a population of 200,000. The place was transferred to English rule entirely in 1800, and for a time it had a revival of its old prosperity and became the most populous city in India. But by a quarter of a century later it had once more declined, and in 1837 was almost wholly ruined by a disastrous fire followed by a great flood. In 1858 it began once more to revive, and flourished during the period of the American civil war, its chief export being cotton. Pop. (1811) 250,000; (1847) 80,000; (1881) 109,840; (1921) 117,434. Cotton, silk brocade, and embroidery are manufactured.

Surbiton. See KINGSTON-UPON-THAMES.

Surcouf, **ROBERT**, a great French privateer, was born at St Malo, 12th December 1773, and died there, a taciturn but prosperous and corpulent boat-builder, in 1827. He preyed on the English shipping in the Indian seas during the long war, and showed extraordinary skill and courage. His greatest exploits were the capture of the Company's ships *Triton* of 800 tons (1785) and of the *Kent* (1800), almost at the end of her voyage, from England to Calcutta. See Laughton's *Studies* (1887); Statham's *Privateering* (1910).

Surd. See IRRATIONAL NUMBERS.

Surety. See GUARANTY.

Surface-tension, in liquids, is that property in virtue of which a liquid surface behaves as if it were a stretched elastic membrane—say a sheet of india-rubber. We owe the idea to Segner (1751); but it was Young who, in 1805, first applied it successfully to the explanation of various physical phenomena, such as those of capillarity. The whole subject was subsequently developed in its complete mathematical form by Laplace and Gauss. The general description of the meaning of surface-tension has been given under CAPILLARITY. Here we shall refer to a few other phenomena, which require for their elucidation the assumption of a tension existing in liquid surfaces. Pure water has the highest surface-tension of any ordinary liquid except mercury. If a little alcohol be dropped on the water, the surface-tension will be diminished there. The more powerful surface-tension over the pure water will show its superiority by pulling the alcohol over the whole surface until the surface is reduced to uniformity, and equilibrium produced. Again, a piece of camphor placed on water will dart from place to place in the most capricious manner. This is due to the irregular way in which the camphor dissolves in the water, so that the surface-tension is more weakened on one side than on the other. It is the action of surface-tension that draws out all over the surface any impurities that may settle on it; and hence arises the great difficulty of getting a clean water or mercury surface. Drops of liquid, free from all but their own molecular forces, assume spherical forms, this being the only shape consistent with equilibrium under the influence of equal surface-tension at all parts of the curved surface. Ripples on the surface of any liquid progress because of the action of surface-tension, which gives rise to an inward pressure on any convex surface. The laws governing the propagation of ripples on the surface of mercury were carefully studied by Professor C. Michie Smith and Lord Rayleigh. Some very instructive experiments may be made with soap-films (see SOAP-BUBBLES); while in cohesion figures we have some very exquisite phenomena, which have been closely studied by Tomlinson. These are produced by dropping a dark-coloured liquid into a transparent liquid of slightly smaller density. Ordinary ink dropped into water will serve the purpose very well, although better effects are obtained with a solution of permanganate of potash. As the drop meets the water-surface, the action of the surface-tension pulls the under surface of the drop outwards, and transforms the drop into a vortex ring, which slowly sinks through the clear fluid. As it so sinks it breaks up into smaller rings and shoots out fantastic ramifications of rare beauty. Ultimately, of course, under the influence of diffusion, the vortex motion decays and the dark liquid mixes with the clear liquid.

Surf-bird (*Aphriza virgata*), a plover-like bird found on the Pacific coasts of North and South America, akin to sandpipers and turnstones, and sometimes called Boreal Sandpiper.—The Surf-duck or Scoter is treated at SCOTER.

Surgeons, COLLEGE OF. The present 'Royal College of Surgeons of England' dates its origin from 1460–61, when Edward IV. 'did, at the supplication of the freemen of the mystery of barbers of the city of London using the mystery or faculty of Surgery, grant to them that the said mystery, and all the men of the same mystery of the said city, should be one body and perpetual community.' An act of 1511 prohibits any one from practising as physician or surgeon unless duly examined and admitted. Hence arose a company called the Sur-

geons of London. In 1540 the Company of Barbers of London and the Company of Surgeons of London were united; it was not till 1745 that the surgeons of London were by act of parliament separated from the barbers of London, and made a distinct corporation under the name of 'the Master, Governors, and Commonalty of the Art and Science of Surgery of London.' This company was dissolved, and in 1800 replaced by 'the Royal College of Surgeons of London.' A new charter granted in 1843 to the Royal College of Surgeons of England gave power to the council to elect not less than 250, nor more than 300, members of the college to be Fellows. By an addition to the charter, obtained in 1852, power was given to the council, subject to certain regulations, to appoint members of fifteen years' standing to the fellowship without examination. The college was likewise empowered to test the fitness of persons to practise midwifery, and to grant certificates; in 1859 it was authorised to grant certificates to dentists; in 1888 additional powers were conferred, but the duty of examining in midwifery was withdrawn; and in 1899 the council of the society was empowered to elect fifty honorary fellows.

The government of the college is vested in a Council of twenty-four members, with a president and two vice-presidents. There is a Board and a Court of Examiners for the fellowship, and examining boards for the membership. There are professorships of comparative anatomy and physiology, of surgery and pathology, and of dermatology, besides lectureships. A Hunterian Orator is appointed every second year. The museum of the College of Surgeons is incomparably the finest museum of its kind in the United Kingdom. The Hunterian Collection (see HUNTER, JOHN), which forms its basis, was purchased by a parliamentary vote of £15,000, and presented to the college in 1799. The original edifice in Lincoln's Inn Fields (the germ of the present pile of buildings) was completed in 1813. See the Calendar of the college.

THE ROYAL COLLEGE OF SURGEONS OF EDINBURGH obtained the first charter to the 'Surreianis and Barbouris' in 1505, and had it confirmed by James IV. next year. For a century and a half the members of the guild were sole teachers and almost sole professors of the surgical art in Edinburgh. In 1694 they obtained from the town-council a grant of the bodies of convicts and founding infants; in 1705 the professorship of anatomy was founded; about the same date botany, chemistry, and physic were taught; in 1726 the teachers of theory of physic, practice of physic, and chemistry were constituted professors of medicine in the town's college, and from this time the constitution of the medical school in the university dates. In 1778 the College of Surgeons became a royal college. The present building, dating from 1832, possesses a fine museum. The college grants the diplomas of Fellow, Licentiate, Licentiate in Dental Surgery, a Higher Dental diploma, and a diploma in Public Health; 300 diplomas were granted in 1926, including 19 to women.—The Royal College of Surgeons in Ireland was incorporated in 1786; see history by Cameron (1886).

Surgery includes all manual operations, either by the hand alone or more frequently with the aid of instruments or appliances, in injuries or malformations of the body. From very early times there has been a tendency to divide those who practise the healing art into surgeons who deal with the treatment of wounds and perform operations, and physicians who deal with internal maladies. Certain operative procedures, such as the stitching of wounds, application of splints to fractures, and opening of abscesses, are so obvious that they are practised by the most primitive

peoples. Even more elaborate processes of treatment date from a very early time; for example, splints from before 3000 B.C. have been found in 5th-dynasty Egyptian graves, and the operation of couching a cataract was known among the early Babylonians of 2000 B.C. Circumcision, castration, the removal of tumours by knife or cautery were also practised by these peoples; and instruments, such as knives, probes, forceps, saws, and trephines, have been found both in Nineveh and in Egyptian tombs.

Among the Indians, surgery as well as medicine occupied a high position. Various medical procedures came down from remote antiquity, and by the time of Suśruta (see SANSKRIT) surgery was practised with considerable skill. The instruments, numbering over 100, were finely made of steel, cleanliness and neatness were demanded of the operator, the student was taught how to make incisions by experimenting on fruits, plant stems, or leather bags. The surgeons could operate for fistula in ano, and stone in the bladder, and in extreme cases they did not hesitate to open the abdomen. The reparation of deformities, e.g. of the nose by skin-grafting, and the removal of cataract by couching, were matters in which they showed special skill.

Among the other Eastern nations, surgery was not highly developed. From several centuries B.C. Greek medical men were valued as surgeons at the Persian court. The Chinese performed some operations, e.g. castration, in a rough fashion, and made great use of acupuncture by gold and silver needles, and of the moxa or burning cone. They seem, however, to have had considerable knowledge of anæsthetic drugs.

Western surgery had attained a high degree of development in Greece by the time of Hippocrates (460–370 B.C.). Many of the treatises in the Corpus Hippocraticum show great skill especially in treating wounds and injuries of the bones and joints, for which experience was doubtless derived from the injuries that often occurred in the gymnasia and athletic schools. The surgeons undertook trephining, incision of the pleura, tapping the abdomen, nephrotomy, amputation of gangrenous limbs, numerous small operations like those for hæmorrhoids and fistula, and a host of skilful manipulative devices in dislocations and fractures. To their list of instruments belonged sponges, probes, cupping-vessels, canteries, knives of steel, dissectors, retractors, spatulæ, raspatories, trephines, bladders with tubes for injections, catheters, specula, forceps, and the 'scamnum Hippocratis,' a bench provided with pegs and pulleys for various manipulative operations. Hippocrates describes healing by first intention, which he recommends, and that by pus formation. The special dangers attending wounds of the throat, groin, and large joints were well recognised, and tetanus was a much-dreaded complication. In the treatise on *Wounds of the Head* there is a masterly description of head injuries, for which trephining was very frequently practised, usually on the third day. Fractures were set with roller bandages, and splints or methods of extension were applied on the seventh day, while compound fractures were washed and dressed with wine. Lithotomy was not undertaken by the general surgeon, but left to special practitioners of that operation, and there is little about hernia in the Hippocratic writings.

The Alexandrian school contained several celebrated surgeons whose names have been recorded by other writers. Herophilus and Erasistratus were specially famous as anatomists, Philoxenus for improvements in surgical practice, Ammonius as a lithotomist. Julius Cæsar, by conferring

civic rights at Rome upon medical practitioners from Egypt and Hellenic lands, greatly stimulated their immigration to that city. One of the earliest of these, Asklepiades, introduced the operation of tracheotomy. Native Roman surgery had been of a very primitive type. Cato (234–149 B.C.) had given in his *De Re Rustica* simple rules and charms for treating fractures, ulcers, retention of urine, &c. Archagathus (218 B.C.), known at first from his skill in treating wounds as 'Vulnerarius,' had been provided at the public expense with a 'taberna' for his operations, where he subsequently became so fond of the knife that he was termed by the populace 'Carnifex' or the 'Butcher,' and had to leave the city.

In the first century of the Christian era, Celsus, himself a Roman patrician, gives an admirable account of surgery as practised in his time, drawn mainly from the Alexandrian teachers. In the treatment of wounds, he recommends various salves which contain both antiseptic and astringent substances; bleeding is valuable against inflammation; the ligature is to be used for arrest of hæmorrhage; and minute details are given for trephining, amputation, radical cure of hernia, lithotomy, stitching of the wounded large intestine (though wounds of the small intestine were said to be always fatal), urethrotomy, removal of goitre, &c. Among the contemporaries of Celsus was Heliodorus, in the reign of Trajan, who ligatured or twisted blood-vessels for arrest of hæmorrhage, performed a radical cure for hernia, and amputated by the circular or flap incision. Another contemporary, Antyllus, removed cataract by extraction and suction, and treated aneurysm by applying ligatures at either end, and opening the sac between them. A great number of surgical instruments belonging to the time of the early empire was found in the house of the surgeon at Pompeii (buried 79 A.D.); these consist of over 200 different forms of instrument, e.g. probes, sounds, spatulæ, artery forceps with ring catch, tooth forceps, sequester forceps, catheters, needles, dilating specula, saws, syringes, knives, shears, cupping vessels, arrow extractors, &c. Many other collections have been discovered elsewhere. Galen, though in early life he acted as surgeon to a school of gladiators, later practised in Rome as a physician, so that surgical references occur infrequently in his works. Leonides about his time was a skilful operator acquainted with the ecraseur, dissected out the cervical glands when enlarged, and amputated by the flap method.

In the Eastern empire surgery fairly maintained the high standard set by Celsus and his contemporaries, as may be judged from the books compiled by Oribasius (4th century) and Paulus of Ægina (7th century). The latter in his celebrated sixth book gives descriptions of lithotomy, trephining, tonsillotomy, amputation of the breast, but in describing the radical cure of scrotal hernia commits the mistake of recommending removal of the testicle, which was perpetuated by the Arab surgeons. He also gives good accounts regarding the surgery of the eye, removal of weapons, and operations on the genital organs. Military medical services were well organised, and, in addition to the ordinary medical officers with the cohorts and legion, there were, as described in the Emperor Maurice's book *On Tactics* (about A.D. 590), ambulance companies whose duty was to bring the wounded to the rear, and who were provided with water-flasks. The foundations of military hospitals in permanent camps have been discovered showing that these were spacious handsome buildings, and to them 'nosocomi' or male nurses were attached. The Arabs, from the 7th to the 13th century, followed Greek medicine, taking the

details of their operations chiefly from Paulus of Aegina, and showing little originality. Abulcasim (11th century) of Cordova was their most celebrated surgeon, and the most noteworthy character of his work on surgery lies in the numerous illustrations of instruments that it contained. A striking feature of his practice was his great fondness for cauteries of all shapes and sizes which he used for incisions, arrest of bleeding, &c.

Until the rise of the universities in the 12th century Western surgery, like medicine, was chiefly in the hands of churchmen, although various edicts were issued against this practice, culminating in that of the Council of Tours (1163), 'Ecclesia abhorret a sanguine.' Still, this did not deter highly-placed churchmen like Guy de Chauliac and Bishop Theodoric from being the most distinguished surgeons of their age. These edicts were issued largely, no doubt, because of the discredit attaching to the vagaries of the strolling and ignorant mountebanks who also practised surgery during its state of disorganisation before the rise of the universities and guilds. As a consequence of the serious injuries often inflicted by the ill-qualified, the mediæval surgeon went constantly in fear of life or limb from the vengeance of patients or their friends. Even celebrated surgeons, like Hugh of Lucca and Roland of Parma, as late as 1250 refused to operate on the injured lung of a Bolognese nobleman till thirty of his friends had given them an oath that no harm should befall them in the event of failure. Minor surgery passed gradually into the hands of the barbers, and in London a Barbers' Company was organised by the 13th century; in Paris they were united in a corporation about the same time; similarly in other cities. In time of war the great bulk of the surgical staff required was drawn from the barbers. These had later a considerable amount of special training, as in the lectures on anatomy at Edinburgh in 1505 to the 'surreganis and barbouris,' and the similar courses at the Collège de St Côme in Paris, and of Banister to the barber-surgeons of London in 1581. Apart from the barbers we find a limited number of celebrated surgeons in the middle ages, including Roger of Palermo, who wrote a treatise on *Practical Surgery* (1180), and his pupil Roland of Parma; William Salicet (1201-77), who recommended suture of divided nerves; Lanfranc, who set up in Paris (1295), and was the virtual founder of French surgery; Henri de Mondeville (1260-1320), an early exponent of aseptic surgery; Jehan Yperman (1295-1351), the great surgeon of the Low Countries; and Heinrich von Pfolspundt, who, in his *Wound-surgery* of 1460, gives the first account of gunshot wounds. The greatest name in surgery during the middle ages is that of Guy de Chauliac (1300-70), whose cultured and interestingly-written *Chirurgia magna* (1363) gives the best picture extant of mediæval surgery, and remained the authoritative work till the time of Ambroise Paré. John of Vigo uses this author extensively in his *Practica Copiosa* of 1514, wherein he is the originator of the theory that gunshot wounds are necessarily poisoned, a theory which called for the use of boiling oil in treatment of wounds, and inflicted a great deal of unnecessary suffering upon the injured.

The chief effect of the Renaissance on surgery was exerted through the revival of anatomy, of which the most striking monument is the handsomely illustrated *Structure of the Human Body*, published by Vesalius, professor at Padua, in 1543. The improved teaching of anatomy made more skilful surgery feasible, and the four great representatives of Renaissance surgery are Ambroise Paré (1510-90), who, beginning life as a barber, elevated himself by strenuous work during the

French wars to be surgeon to several kings of France, and is renowned for advocating a mild treatment of gunshot wounds and for reintroducing the ligature; Pierre Franco (1505-70), who gave the earliest known account (1556) of the relief of strangulated hernia; Gasper Tagliacozzi (1546-99), who introduced plastic surgery of the face, especially the repair of the nose; and Fabricius Hildanus (1560-1624), the 'father of German surgery,' who wrote an original work on *Six Hundred Surgical Cures and Observations*. Scultetus gives a good sidelight on the operations of his time in the illustrations of his *Armamentarium Chirurgicum* (1653). In England, William Clowes, surgeon to Queen Elizabeth, wrote an excellent treatise on gunshot wounds (1591), and Richard Wiseman, who served on the royalist side through the Civil War, in his *Severall Chirurgical Treatises* (1672), did for clinical surgery what his contemporary Sydenham did for clinical medicine; he was also the first to recognise the identity of tuberculosis in the bones and joints with this disease in the lungs.

In the 18th century a great school of anatomists and surgeons arose in England, of whom the brothers William Hunter (1718-83) and John Hunter (1728-93), who both founded great pathological museums, are the most famous. Indeed the great feature of the latter half of the 18th century both in England and on the Continent was the ardour with which the most distinguished surgeons developed anatomy. W. Cheselden (1688-1752), who introduced the operation of lateral lithotomy; Percival Pott (1714-88), who wrote several masterly monographs on hernia, fractures, and spinal deformity, were also well-known operators and teachers in London. In France, Petit (1674-1750) invented the screw-tourniquet, and was the first to open the mastoid process; Anel treated aneurysm by a single ligature (1710); Brasdor (1721-97) introduced the distal ligature; Desault and Chopart are also well-known names. In Italy, Scarpa (1747-1832) was distinguished both for his research in anatomy, his skill in orthopædic surgery, and for the admirable skill with which he illustrated his own works. In Germany, L. Heister published his *Chirurgie* (1718), which became the most popular text-book on surgery, and is of unusual interest still for its admirable illustrations of surgical treatment at that time. A striking example of the social status of the average surgeon on the Continent during this century is found in the fact that one of the duties of the Prussian and Austrian army surgeons was to shave the officers; but a great advance in education and in status followed the founding of the Collegium Medico-Chirurgicum and Charité Hospital in Berlin (1727), of the Josephinum or Medico-Chirurgical Academy at Vienna (1785), and of the Collegium Medicum at St Petersburg (1763).

The 19th century begins with the distinguished surgeons of the Napoleonic wars. Larrey (1766-1842), whose most interesting work was his *Memoirs of Military Medicine*, was surgeon-in-chief to the Grand Armée, the inventor of the celebrated 'flying ambulances,' and a man of immense popularity for his courage, good-nature, and humanity. Dupuytren, celebrated especially for his *Injuries and Diseases of the Bones*, Lisfranc, Delpech, Velpeau, Malgaigne, and Nélaton carried on the development of surgery in France. The leading English military surgeon of the wars was G. J. Guthrie (1785-1856), who after Waterloo published his *Treatise on Gunshot Wounds of the Extremities requiring Amputation*, which has saved many injured limbs. In England, Sir Astley Cooper (1768-1841) occupied a great place in the public eye, achieved extraordinary success in practice,

produced books on hernia, injuries of the joints, and diseases of the testis, and was a most indefatigable dissector. Sir B. C. Brodie was the acknowledged head of the profession in London for many years, wrote a classic treatise on the *Pathology and Surgery of the Joints*, and was the pioneer of subcutaneous surgery. A. Colles, professor of surgery in Dublin, is celebrated for his description of the fracture of the forearm which bears his name, and for his *Practical Observations on the Venereal Disease* (1837). The Edinburgh school was represented by the brothers John Bell and Sir Charles Bell (1774-1842), both possessed of great artistic as well as surgical talent, and the latter celebrated as a physiologist and anatomist; Liston, who introduced many new procedures; James Syme (1799-1870), who was the first to adopt excision of diseased joints (1831) in preference to amputation; Sir W. Fergusson (1808-77), who is regarded as the founder of conservative surgery; and Lizars (1783-1860), who was one of the first to remove the lower jaw and to perform the operation of ovariectomy. In Germany, Langenbeck (1776-1851) was celebrated for his extraordinary speed in operating; and in Russia, Pirogoff (1810-81) is regarded as the greatest figure in the surgical development of that country. In America, Valentine Mott (1785-1865) greatly developed the surgery of blood-vessels, Ephraim McDowell (1771-1830) was the earliest ovariectomist, and J. Marion Sims (1813-83) became one of the greatest operators in the domain of women's diseases.

The introduction of anæsthetics inaugurated a new period in surgery by permitting longer and more elaborate operations than were possible before. In 1800 Sir Humphrey Davy had experimented with nitrous oxide gas; in 1846 the first surgical operation was performed under ether administered by Morton; and in 1847 Simpson introduced ether and, later, chloroform into obstetric practice. Surgeons had been rendered much more familiar with the bodily functions and reparative powers through the experiments of Magendie, Claude Bernard, and other physiologists. In 1847 Semmelweis discovered the nature of blood-poisoning and of child-bed fever, and his work was amplified and incorporated into practical surgery by the researches of Lister from 1865 onwards. Since this time many disinfectants and antiseptic procedures useful for different purposes have been introduced, and the harmful properties of various bacteria have been carefully studied on the foundations laid by Pasteur and Koch from 1870 onwards. It is an interesting comment on the progress of abdominal surgery that, while in 1855 we find Sir George Ballingall stating 'no man in his senses would think of enlarging the external wound for the purpose of searching out and sewing up the wounded part of the gut,' by 1881 Billroth, the pioneer of visceral surgery, for the first time excised a cancer of the stomach with success, and between 1878 and 1883 had performed various excisions of the intestine. Other pioneers of the later 19th century were Miculicz, Czerny, von Volkmann, von Esmarch, von Bergmann, von Graefe in Germany; Paget, Hutchinson, MacEwen, Horsley, Spencer Wells, Lawson Tait in Britain; Kocher in Switzerland; and Bigelow, Senn, and Murphy in America. The general establishment of pathological and experimental institutes in the last decades of the 19th century did much to diffuse the knowledge of surgery and to increase the precision and safety of operations; while the discovery of X-rays in 1893 and their application in diagnosis has proved of immense assistance, particularly in regard to injuries of the bones and diseases of the alimentary tract. All these in-

fluences have contributed to swell the numbers of abdominal operations to their present great proportions.

Following upon the more accurate knowledge regarding the functions of the various parts of the nervous system that has been afforded by advances in physiology and clinical medicine, the surgery of the brain and spinal cord has reached a high degree of efficiency. In this also the help which has been rendered by X-rays in localising injuries and foreign bodies has played a considerable part. In the surgery of the urinary tract, the increased knowledge derived from advances in chemistry, the invention of ingenious instruments, such as the cystoscope, by which the interior of the bladder may be inspected, and, in a very high degree, the help of X-ray examination have brought a great degree of precision to operations on the kidney and bladder. The surgery of the eye and ear has greatly developed in the matter of finer and more successful operations for dealing with disease in these organs. Even in general surgery, the removal of tumours, the conservation of tuberculous bones and joints, the repair of bones and other tissues by grafting, and the more uniformly successful treatment of injuries have all shown a great advance. Finally, the experience of the Great War has not only effected the introduction of many new improvements in surgical technique, but has proved of great educational value to surgeons scattered throughout country districts, whereas formerly the practice of operative surgery was largely restricted to the teachers in the great medical schools.

For the bibliography of works which give the fullest and most trustworthy account of the healing art, surgical as well as medical, see the article on MEDICINE. Monographs like Wise's *History of Medicine among the Asiatics*, Young's *Annals of the Barber-Surgeons of London*, Struthers's *Historical Sketch of the Edinburgh Anatomical School*, Parker's *Early History of Surgery in Great Britain* (London, 1920), Miles's *Edinburgh School of Surgery before Lister* (London, 1918), and Cameron's *History of the Royal College of Surgeons in Ireland* may also be consulted. Special operations in surgery (Lithotomy, Ovariectomy, &c.) are dealt with under their respective heads, or in connection with the articles on such subjects as AMPUTATION, APPENDICITIS, CATARACT, DISLOCATION, EYE, FRACTURES, HIP-JOINT, SHOULDER-JOINT. There are articles on CATETER, FORCEPS, OPHTHALMOSCOPE, RÖNTGEN RAYS, STETHOSCOPE, TOURNET, &c. See also the articles in this work on the great surgeons.

Suricate (*Suricata tetradactyla*), a South African carnivore belonging to the Viverridæ, of which civet and mongoose are representatives. Body and head reach a length of 12 or 13 inches, tail 6 inches; there are only four toes, and the claws are very long, suited for burrowing. This furry, largely vegetarian, gregarious creature—in captivity an amusing and delightful pet—is also called Zenick and Meerkat (Dutch, 'sea-cat'); the latter name also given to the related *Cynictis penicillata*.

Surinam. See GUIANA (DUTCH). For the Surinam Toad, see AMPHIBIA.

Surplice (Lat. *superpellicium*, 'above the robe of fur' worn by the monks from the 9th century), a white linen garment worn over the cassock by clerks of all degrees. Its most ordinary use is for the service of the choir, and it is also employed, along with the stole, by priests in the administration of the sacraments, and in preaching. The use of the surplice was strongly objected to by the Calvinistic and Zwinglian reformers on the Continent, and by the Puritans in England, who regarded this vestment as a relic of popery, and made it the subject of vehement denunciations.

Ere ritualism became so common in England, no little stir used from time to time to be created by the use of the surplice, instead of the Gown (q.v.), in the pulpit, contrary to the more general practice in the Anglican Church. The length of the surplice varies, never in the Roman Church coming below the knees; the short Italian *cotta*, adorned with lace, dates from about the 17th century.—*Surplice-fees* are payments to the clergy by the laity when any sacred functions—baptisms, marriages, funerals—are performed for the latter's benefit.

Surra, a disease of horses in India and eastern Asia, caused by a Trypanosome.

Surrender. See CAPITULATION.

Surrey, an inland county in the south of England, is bounded on the N. by the Thames, which separates it from Middlesex, E. by Kent, S. by Sussex, and W. by Hants and Berks. Its maximum length from east to west is 39 miles; greatest breadth, 26 miles; and it contains 461,833 acres. Pop. of administrative county, with the county borough of Croydon (1921), 930,377. Far-famed for the beauty of its scenery, Surrey is traversed from east to west by the North Downs (see DOWNS), which, near Titsey on the Kentish border, rise to the height of 880 feet; on the north side of this range the land slopes gradually to the banks of the Thames—though even there plenty of high ground is to be found, as Cooper's Hill, St George's Hill, Richmond Park, and Wimbledon Common—but on the south the descent is rugged and broken up before the level of the Weald is reached. South of the main range, and about 5 miles distant from Dorking, is Leith Hill (967 feet), the highest point in the county, whilst in the extreme south-west rises Hind Head (903 feet). From all these places, as also from many others—e.g. the Hog's Back, St Martha's Chapel, and Newland's Corner (both near Guildford), Box Hill, the downs above Reigate and Epsom, and at Virginia Water—glorious views are to be obtained, a noticeable feature in the landscapes being the prevalence of commons and heath-lands—the latter chiefly in the west—scattered throughout the county. Of rivers the most important are the Wey and the Mole, both tributaries of the Thames. The soil of the northern half of the county is fertile, especially in the vicinity of London, where large tracts are occupied by market-gardens and nursery-grounds, but in the centre and southern districts the land is of a poor quality, consisting mostly of sand and chalk; it is well wooded, box-trees especially growing in great profusion, and around Farnham are hop-grounds. Croydon, Guildford, Kingston, and Reigate are—not reckoning the suburbs of London—the principal manufacturing centres and most important towns. Near the last-named extensive beds of Fuller's Earth (q.v.) are found. The county is divided into fourteen hundreds, and since 1918 has returned seven members to parliament, not including the boroughs of Croydon (2 divisions), Wimbledon, Richmond, and Kingston.

In history Surrey has played but a meagre part, the only incident of importance of which it was the scene, other than those noticed under Kingston, being a defeat of the Danes at Ockley in 851. Between the two last-named places traces of the old Roman road between London and Chichester are plainly visible, whilst on Wimbledon Common, Hascombe Hill, and near Aldershot are Roman encampments. Of buildings of an architectural or historical interest the castles of Farnham and Guildford and the ruined abbeys of Newark and Waverley most call for attention, whilst at Claremont, Oatlands Park, and Sheen (now Richmond), were royal residences; nor must mention be omitted

of the quaintly-timbered old houses—many of them moated—abounding in the district around Goms-hall, Godalming, and Haslemere.

See works by Manning (3 vols. 1804-14), Allen (2 vols. 1829-30), Brayley (5 vols. 1841-48), Bevan (1891), Murray's *Handbook*, and Surrey in the 'Victoria County History' (ed. Malden, 1902-14).

Surrey, HENRY HOWARD, EARL OF, poet, was born between 1516 and 1518, most probably in Suffolk, either at Framlingham or Tendring Hall, the eldest son of Thomas Howard (q.v.), who in 1524 succeeded as third Duke of Norfolk. In 1532 he was married to Lady Frances Vere, daughter of the Earl of Oxford, in the same year accompanied Henry VIII. to France, and afterwards spent about twelve months in study at Paris in company with Henry's natural son, the young Duke of Richmond, who was affianced to his only sister, but died an untimely death in 1536. Surrey's eldest son Thomas was born that same year, and it is interesting that the child's nativity, which still exists, foretold dark disaster to the father. It was soon after this that his romantic passion for the fair but disdainful Geraldine awoke, unless she is to be relegated to the domain of fancy in the same sense as Héloïse, Petrarch's Laura, and Tasso's Leonora. It seems certain, however, that if she had real existence she was the Lady Elizabeth Fitzgerald, the second of the three daughters by his second marriage of Gerald, ninth Earl of Kildare. But the story is surrounded with difficulties, and we are not helped by Thomas Nash's absurd account (*Unfortunate Traveller*, 1594) of how Surrey traversed Italy like a knight-errant for his mistress' sweet sake. His second son, afterwards Earl of Northampton, was born in 1539. In 1542 he was made a Knight of the Garter. Later in the same year he lay some time in the Fleet for challenging a gentleman with whom he had quarrelled, and next year he was again committed for roystering and breaking windows in the streets at night. Soon released, he went to serve in the camp before Landrecy near Boulogne, and returned in winter to complete his beautiful seat of Mount Surrey near Norwich. It was at this time that he admitted to his household the physician Hadrian Junius and the poet Churchyard. Again in 1544 Surrey went to France as marshal of the invading army, and distinguished himself at the siege of Montreuil, being severely wounded in the attempted storming (19th September). Again next year we find him holding command at Guisnes and at Boulogne, and defeated by a superior French force in the beginning of January, for which he was soon superseded by the Earl of Hertford, who, as uncle to the heir to the throne, looked forward to a regency on the king's death, and at once feared and hated the Norfolk party. For his bitter speeches against Hertford Surrey was imprisoned at Windsor in July, and on the 12th December was, like his father, committed to the Tower on a charge of high-treason. His offence was merely that he had assumed the arms of his ancestor Edward the Confessor, in conjunction with his own proper arms, a thing which by all the laws of heraldry and common usage he was perfectly entitled to do, and which, moreover, had been specially allowed the Duke of Norfolk by Richard II. His father's mistress and his own sister gave evidence against him, and, though he defended himself with singular ability at his trial at the Guildhall on the 13th January 1547, he was found guilty by the jury, condemned to death, and beheaded eight days later, 21st January 1547. His body was first buried in All Hallows-Barking, Tower Street, but was removed by his son, the Earl of Northampton, to Framlingham Church, where it rests under a stately monument of black and white marble.

Surrey's character would seem to have been much less amiable than it appeared to his eulogist, Dr Nott. He was proud, headstrong, and imprudent, and his unkindness to his mother remains a blot upon his memory, however unworthy of respect she may have been. His poems seem to have circulated freely in manuscript during his lifetime, but were not printed till 1557, when they appeared, together with poems by Wyatt and others, in *Tottel's Miscellany*. They consist of sonnets, lyrics, elegies, translations, paraphrases of the Psalms of David and Ecclesiastes, besides translations in good blank verse—the first in English—of the second and fourth books of Virgil's *Aeneid*, the last not given in Tottel but printed by Day (1554?). As a poet he shows grace, delicacy, a quick eye for the beauties of nature, and a sensitive ear to the harmonies of versification. His love-poetry follows Petrarch too closely, yet not without a truth and genuineness of feeling of its own. He was not only the first in English to employ the sonnet, but within his range he had mastered the difficulties of that artificial form.

See editions by Dr Nott (1815-16 with Wyatt); in 'Aldine Poets' (1831; 1866); and by Padelford (1920); Miss Willcock's study in *Mod. Lang. Rev.* (1919-22); and Berdan's *Early Tudor Poetry* (1920).

Surtees, ROBERT, born at Durham, 1st April 1779, graduated B.A. from Christ Church, Oxford, in 1800, and, after less than two years at the Middle Temple, in 1802 came into his paternal estate of Mainsforth, near Bishop Auckland. Here till his death on 11th February 1834 he largely devoted himself to the compilation of his *History and Antiquities of the County Palatine of Durham* (vols. i.-iii. 1816-23), to vol. iv. of which (1840), completed by the Rev. James Raine, a memoir by George Taylor is prefixed. To Scott's *Minstrelsy* Surtees contributed two 'ancient' ballads he himself had made—*Barthram's Dirge* and *The Death of Featherstonhaugh*. The Surtees Society, founded in 1834 for the publication of unedited MSS. relating chiefly to the northern counties, had issued a hundred volumes before the end of the century.

Surtees, ROBERT SMITH (1803-64), of Hamsterley Hall, Durham, wrote anonymously a series of inimitable sporting novels, introducing Mr Horrocks, grocer and sportsman. Among the best known are *Handley Cross* (1843, 1854); *Mr Sponge's Sporting Tour* (1853); *Ask Mamma* (1858); *Plain or Ringlets?* (1860); and *Mr Facey Romford's Hounds* (1865)—all illustrated by John Leech and 'Phiz.' See *Robert Smith Surtees* by himself and E. D. Cuming (1924).

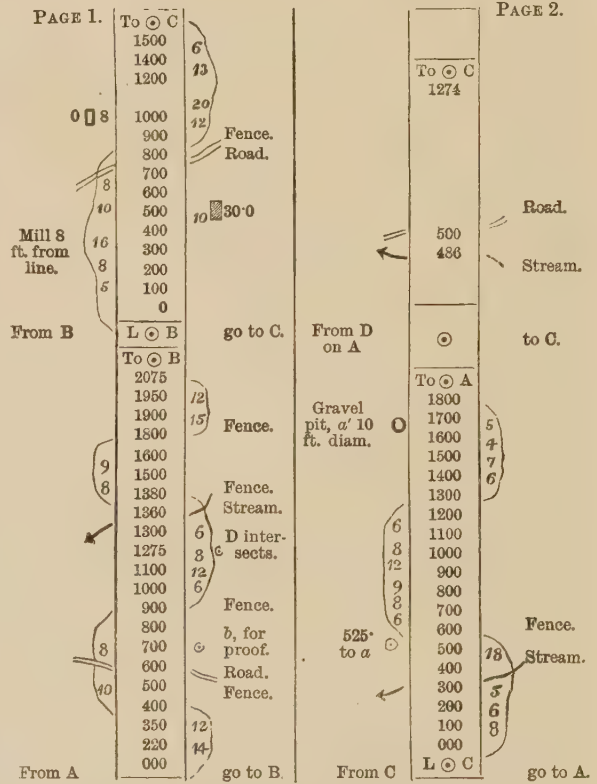
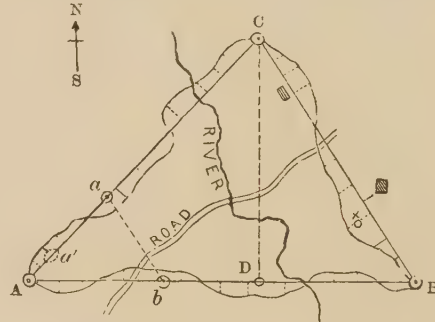
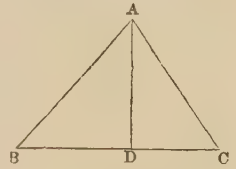
Surturbrand, a kind of Lignite (q.v.) found interstratified with basalts and tuffs of Tertiary age in Iceland and the Faeroe Islands.

Surveying. Land-surveying may be considered the earliest practical application of the art of geometry or earth measurement, and must have been in some more or less rude form coeval with agriculture and the division or appropriation of the soil. In Rome surveying was considered one of the liberal arts, and the measurement of lands was entrusted to public officers who enjoyed certain privileges; and it is probable that the system of measurement practised by them was very similar to our plain surveying with the chain and cross-staff of the present day, and has been handed down to us through the feudal period. An exam-

ination of ancient records and title-deeds will show that both areas and boundary lines of the different enclosures forming fields, hundreds, town-lands, &c., are often laid down with much accuracy.

Land-surveying may be considered under the following heads: (a) Plain surveying with the chain, and without the aid of angular instruments, except the cross-staff or fixed angle of 90°; (b) modern engineering surveying, in which angular instruments are used; (c) coast and military surveying; (d) trigonometrical surveying.

The fundamental rule of every description of



land-surveying, from the humblest attempt to lay down an irregular garden-plot to the trigonometrical survey of a large extent of the earth's surface, when the aid of the most refined improvements of modern science is indispensable, is simply to determine three elements of a triangle, and thence to calculate its area.

In plain surveying with the chain the three sides of the triangle, ABC, are supposed to be accessible, and are carefully measured on the ground, and then laid down or platted to scale on paper, when an accurate figure of the triangle will be obtained, on which the length of the sides can be marked. To get the area, however, it will be necessary to determine the length of the perpendicular line AD, and this is usually done (when possible) on the ground by means of a simple instrument called a cross, which consists of two sights or fine grooves at right angles to each other; which being placed on the line BC (keeping B and C visible in one of the sights), nearly opposite the angle A, is moved gradually till the angle A is intersected by the other sight. The line AD can also be laid down on the drawing, and its length found by scale and afterwards verified on the ground, or it may be at once laid down on the ground by the use of the chain alone. An improved reflecting instrument, called an optical square, is also often used for this purpose. Any boundaries along the lines or sides of the triangle, ABC, can be determined by the use of offsets or insets, as they occur on right or left of line. No matter what the form of the surface to be surveyed may be—polygon, trapezium, or trapezoid—it may thus be determined by a judicious subdivision into triangles; and when the survey is not of a very extended nature or character, and when no serious obstructions exist, chain surveying is both accurate and expeditious, especially if proof or tie lines are properly introduced for the purpose of testing the accuracy of the work.

In every description of surveying it is best to make the original triangle as large as possible, and to work from a whole downwards rather than build up a large triangle by the addition of several small ones. It would be impossible here to lay down rules to meet the many difficulties which arise in the practice of surveying; indeed the best test of a good surveyor is the ease with which he will overcome local obstructions which appear almost insurmountable to a novice, or even to a theoretical surveyor with little field practice. Where buildings or other impediments are found in the measurement of a straight line, they are generally passed by the erection of short perpendiculars sufficient to clear the obstacles, and a line parallel to the original measured as far as they exist; when the original line can be again resumed. Differences of level occurring in measuring a line where no instruments are used are generally compensated or allowed for by the judgment of the surveyor.

In registering the dimensions taken on the ground, such as sides of triangles, offsets, intersections of roads, fences, &c., and everything necessary to make a perfect delineation or plan of the surface, surveyors use what is called a field-book, the mode of keeping which varies very much with individual practice. Some surveyors use hand sketches or rough outlines of the form of the ground, and mark the dimensions on them, while others use the ordinary form of field-book, or a combination of the two methods, which perhaps is the best when any difficult complications happen on the ground, such as the frequent occurrence of buildings, enclosures, water, &c., along the line. In the ordinary field-book the centre column, commencing from the bottom, represents the length of any line or side of a triangle, and the figures in the column the distance at which the offsets to the right or left are taken, or where roads, streams, fences, &c., cross the line, or buildings adjoin the same. We give herewith the field-book of the assumed survey of the triangle ABC, with the different offsets and insets on its sides, and where roads, fences, streams, &c., cross them, the detail of which can be obtained by subdividing

the triangle into smaller internal ones. The figure can thus be laid down from the book, and its area calculated by the formula $\frac{AB \times CD}{2}$, and the off-

sets and insets calculated, and added or deducted.

Ponds, plantations, and enclosures of different kinds may be surveyed with a chain, especially if their form be such that they can be conveniently included in the area of a triangle, the correctness of which being proved by proper tie-lines, the form, area, &c., may be ascertained by offsets, or rather insets from the sides.

See ORDNANCE SURVEY, LEVELLING, MENSURATION, THEODOLITE, CONTOUR, &c.; and for the United States Coast Survey, see CHART.

Surya, in Hindu Mythology, the sun-god.

Sus, (1) a river and district of Morocco (q.v.), between the Atlas and the Anti-Atlas.—(2) A port (Fr. *Sousse*) of Tunis, 75 miles SE. of the capital. Pop. 20,000.—(3) See SUSA.

Susa, the same as the Shushan of Daniel, Esther, &c., a town of Persia, identified with the modern Sus, anciently the capital of Elam (mod. *Khuzistan*), and one of the most important cities of the old world. Excavation has yielded objects down to 60 metres below ground level, proving that a high civilisation had its seat there. This civilisation appears full-grown at Susa, and its origin and date alike are disputed. Some derive it from Egypt; others see in it a source of Egyptian culture and bring it from Central Asia. It has been dated 10,000 B.C. and 4500–4000 B.C. The 'proto-Elamites' were in an age of copper and stone. Their wheel-made thin pottery, painted in lustrous black with geometrical designs and conventionalised animal forms, is of great beauty and shows very great skill. It has since been found at various sites in Mesopotamia. After a period of desertion Susa was again inhabited, this time by Sumerians or kindred folk, who made an inferior pottery, realistic and often polychrome, as well as stone sculptures and cylinder seals. In the 7th century Elam plays its part in history with Assyria (q.v.) and Babylonia (q.v.). After the sack of Susa by Assur-bani-pal, followed by the fall of the Assyrian power, it was brought by Cyrus under Persian rule; and the Achæmenian kings raised it to the dignity of a metropolis of the whole Persian empire, having there a strong citadel and one of their treasure-houses. At the Macedonian conquest Alexander is reported to have found in it vast treasures, together with the regalia. On Babylon becoming the principal city of Alexander and his successors, Susa gradually declined, but seems still to have contained enormous wealth when it fell into the hands of Antigonos (315 B.C.). It was attacked by Molon in his rebellion against Antiochus the Great, and held out bravely for a long time against the Arab invaders at a later date. They, however, destroyed the fortifications. The ruins of the ancient city, the palace described in Esther among them, cover a space of about three square miles. The principal existing remains consist of four spacious artificial platforms above 100 feet high. Traces of a gigantic colonnade were laid bare by Loftus.

See De Morgan, *Mémoires de la délégation en Perse* (1900 et seq.); *The Cambridge Ancient History*.

Susa, a city of Northern Italy, on a tributary of the Po, at the foot of the Cottian Alps, 33 miles by rail W. of Turin. It has a Romanesque cathedral of 1029 (S. Giusto) with a fine brick campanile, together with other interesting mediæval buildings, and a triumphal arch erected by the Romanised Segusian king Cottinus to Augustus in 7 B.C. Its importance is largely due to its position guarding the Cenis pass. Pop. (1921) 4594.

Sušak, the Yugoslav (Slovenian) suburb of Fiume.

Susannah, HISTORY OF, *The Judgment of Daniel*, also *Susannah and the Elders*, are the different titles of a well-known story, which forms one of three apocryphal additions to the book of Daniel; the other two being *The Song of the Three Holy Children* and *The History of Bel and the Dragon*. It relates how Susannah, the wife of Joacim, and daughter of Hilkiah, celebrated alike for her beauty and her virtue, was falsely accused of adultery by two of the elders, whose own unchaste proposals she had spurned; and how, being condemned to death on their evidence, she was saved by the wise young Daniel, who made the elders confound each other in separate examination, and doomed them to the same fate they had designed for her. In most MSS. this story precedes the first chapter of the Book of Daniel, and so we find it in the old Latin and Arabic versions; but the Septuagint, the Vulgate, the Complutensian Polyglot, and the Hexaplar Syriac place it at the end of the present book, and reckon it as the 13th chapter. There are two Greek versions varying considerably—that of the LXX and that of Theodotion. There is no satisfactory evidence that it ever had a Hebrew or Aramaic original at all. Africanus had a controversy with Origen on the authenticity of *Susannah and Bel and the Dragon*, and pointed out that their original could only have been a Greek one, as the example of paronomasia in the words of Daniel depended on the Greek. Porphyry based his attack on Daniel partly on the Greek origin of Susannah. Jerome is careful to distinguish it from the rest of Daniel, as not possessing the authority of Scripture. At the same time the story is used by Hippolytus, Origen, Tertullian, Ambrose, Gregory Nazianzen, and Chrysostom. The object of the story may have been to correct the procedure of the Sanhedrim, by insisting on the proper use of evidence and the examination of witnesses.

See Kay in Charles's edition of the *Apocrypha* (vol. i. 1913).

Suslik. See ZIZEL.

Suso, Henry (1295–1366), German mystic, was a monk at Constance, and died at Ulm. He was a follower of Eckhart (q.v.).

Suspended Animation, the temporary cessation of the outward signs and of some of the functions of life, is treated under various heads in this work. In men it may be due to Asphyxia, Drowning, Strangulation, &c. See also CATAPLEPSY, COMA, INSANITY, SLEEP, DEATH, and for premature burial, BURIAL. For phenomena of this kind in the lower animals, see LIFE, DESICCATION, HIBERNATION, LATENT LIFE, ROTIFERA, &c.

Suspension Bridge. See BRIDGE.

Susquehanna, an American river, the North Branch (350 miles) of which has its origin in Schuyler Lake, in central New York, and the West Branch (250 miles) in the Alleghany Mountains. These two unite at Northumberland, Pennsylvania, and the river thence flows south to Harrisburg, and then south-eastward into Maryland, and so to the north end of Chesapeake Bay. Length, 150 miles; chief tributary, the Juniata. It is a shallow, rapid, mountain river, with varied and romantic scenery, and is of use mainly for floating timber. On its banks Coleridge and Southey proposed to found their 'pantisocracy.'

Sussex, a maritime county in the south of England, washed on the south-east and south for 91 miles by the English Channel, and elsewhere bounded by Hampshire, Surrey, and Kent. It has an extreme length from east to west of 76 miles, an extreme

width of 27, and an area of 1455 sq. m. From the Hampshire border, near Petersfield, to Beachy Head (q.v., 575 feet) the county is traversed by the chalky South Downs, whose highest points in Sussex include Duncton Down (837 feet), Linch Down (818), Ditchling Beacon (813), Harting Beacon (795), and Chanctonbury (783); their steep northern escarpment leads down to the richly wooded Weald, a clay plain. Along the north-east border, from Horsham to Hastings, runs the sandy Forest Ridge (792 feet at Crowborough Beacon). In the extreme north-west a ridge comes from Hindhead, entering Sussex at Blackdown (918 feet, the highest point of the county); on touching Hampshire at Rake it turns eastward past Petworth to the Arun. A very productive tract, 2 to 7 miles broad, extends westward from Brighton along the coast to the Hampshire boundary; in the south-east are rich marsh-lands, affording excellent pasture. The chief streams, all unimportant, are the Arun, Adur, Ouse, and Rother. Rather more than two-thirds of the entire area is in cultivation; and the area under woods is greater than in almost any other English county. The Sussex 'Forests' (Dallington, St Leonard's, and especially the largest, Ashdown) are mainly moorland. The Downs (q.v.) are clothed with a short, fine, and delicate turf, and here and elsewhere more than half a million of the well-known Southdown sheep are grazed. Sussex was once the chief seat of the iron trade, when wood was used for smelting, and its last furnace was not blown out till 1809; to-day the manufactures are not important. The county, which contains six 'rapes,' 68 hundreds, and two administrative counties (East and West Sussex), return six members to parliament, four for East, two for West Sussex, besides two for Brighton and one for Hastings. Brighton, Eastbourne, Hastings are county boroughs, and Arundel, Bexhill, Chichester, Lewes, Rye, Hove, and Worthing municipal boroughs; Newhaven, Seaford, Littlehampton, Shoreham, Bognor, Horsham, Petworth also deserve mention. Pop. (1801) 159,471; (1841) 300,075; (1881) 490,505; (1911) 663,378; (1921) 727,996. (East Sussex, 532,186; West Sussex, 195,810). Sussex contains the landing-place, probably not of Cæsar (55 B.C.)—for the neighbourhood of Deal is more likely than Pevensey—but of Ælla (477 A.D.) perhaps at Keynor, from whose subjects, the South Saxons, the county derived its name; and of William the Conqueror (1066) at Pevensey, as well as the battlefields of Hastings and Lewes. The antiquities include an ancient camp and flint factory at Cissbury. Roman remains at Pevensey and Bignor, a dozen mediæval castles (Arundel, Bodiam, Hurstmonceaux, Hastings, Bramber, &c.), Chichester cathedral (which dates from the 12th century), nine or ten religious houses (Lewes, Battle, &c.), and many interesting churches, mainly along the coast. Cobden, Collins, Fletcher, Otway, Sackville, Selden, and Shelley have been among the eminent natives; Sussex has also memories of Chillingworth, Titus Oates, Hayley, Blake, Lyell, Archdeacon Hare, John Sterling, Manning, Tennyson, and Francis Thompson.

See works by Horsfield (1835), Lower (1865–70), Parish (1886), G. F. Chambers (3d ed. 1891), E. V. Lucas (1904), H. Belloc, and Rudyard Kipling; and the 'Victoria History' by Page (1900 *et seq.*).

Sustentation Fund. See FREE CHURCH.

Sutherland, a maritime county in the extreme north of Scotland, is bounded W. and N. by the Atlantic, E. by Caithness, SE. by the North Sea, and S. by the Dornoch Firth and by Ross and Cromarty. Measuring 63 by 59 miles, it has an area of 2028 sq. m., or 1,297,914 acres, of which 47,633 are water and 12,812 foreshore. The

Atlantic coasts, deeply indented by sea-lochs, are bold and rock-bound, in Cape Wrath (q.v.) attaining 523 feet; the south-eastern seaboard is comparatively flat. On the Caithness boundary rise the Hill of Ord (1324 feet) and Cnoc an Eireannaich (1698); but the mountains of Sutherland are all in the west—Benmore Assynt (3273), Coniveall (3234), Bendibrick (3154), Ben Hope (3040), Foinaven (2980), Canisp (2779), and Suilven or the Sugar-loaf (2399). The Oykel, tracing the Ross-shire boundary, and falling into the Dornoch Firth, is the longest stream (35 miles); and of over 300 lochs and tarns the largest are Lochs Shin ($16 \times 1\frac{1}{2}$ miles) and Assynt (q.v., $6\frac{3}{4} \times \frac{3}{4}$). The geology is of great interest—Archæan gneiss predominating in the west, then Silurian, and then Old Red Sandstone. Coal has been mined at Brora off and on since 1573; and attempts have been made since 1868 to work the alluvial gold-field at Kildonan. The total percentage of cultivated area is only 1.7, in spite of costly reclamations carried on by the 3d Duke of Sutherland (1828–92)—so costly indeed that during 1853–82 the expenditure on his estates exceeded the income derived from them by nearly a quarter of a million sterling. The live-stock includes over 10,000 cattle and nearly 200,000 sheep; and the deer-forests, grouse-moors, and fishings (especially good for trout) attract many sportsmen. The climate varies much, and also the rainfall, which increases westward from 32 to 60 inches. Sutherland along with Caithness returns one member to parliament; its county town is Dornoch (q.v.). Pop. (1801) 23,117; (1851) 25,793; (1881) 23,370; (1891) 21,896; (1911) 20,179; (1921) 17,802. The Northmen, who to the 12th century often descended on Sutherland and pillaged it, called it the 'Southern land,' as lying to the south of Orkney and Shetland. An earldom of Sutherland was held from about 1228 by the Freskin family, but passed by marriage in 1514 to the Gordons, whose line also ended in an heiress in 1766. She married in 1785 George Granville Leveson-Gower, second Marquess of Sutherland, who in 1833 was created Duke of Sutherland. To him was due the credit or discredit of the so-called 'Sutherland clearances' (1810–20), by which the small tenants, living wretchedly in the interior, were compelled to remove to the coast or to the valleys near the sea.

See Gordon's *Earldom of Sutherland* (1813), Pococke's *Tour* (1888), St John's *Tour in Sutherlandshire* (1849; 1884), Mackenzie's *Highland Clearances* (1883).

Sutherland Falls, near Milford Sound, in the South Island of New Zealand, have a total height of 1904 feet. There are three leaps.

Sutlej, or SATLAJ (anc. *Hyphasis*), eastmost of the five rivers of the Punjab, has its genetic source in the Ganglung Glacier in Tibet, about 20 miles from the Brahmaputra Glacier, and flows into Lake Manasarowar, or Mansarowar (q.v.). Sven Hedin's explorations in 1901–2 shed much light on its upper course. Its passage into and out of Lake Rakas-tal is now normally underground, owing to silting of the channels and a fall in the level of the lakes. It flows at first north-west, but turns westward to cut its way through the Himalaya Mountains, in the course of which passage it drops to about 3000 feet. After entering British territory it pursues a general south-western direction, receives the Li or river of Spiti, passes round the Siwalik Hills, picks up the waters of the Beas and the Jhelum-Chenab, and, after flowing 900 miles in all, joins the Indus at Mithankot, south of Multan. Not far from Jullunder it is crossed by a magnificent iron bridge, 5200 feet long, carrying the Sind, Punjab, and Delhi Railway, and near Bhawalpur, just before its

confluence with the Jhelum-Chenab, is spanned by the bridge of the Indus Valley Railway. A great scheme is on foot in the Sutlej Valley for the irrigation of some 14,000 square miles, whereof the first unit came into use in 1926.

Sutler. See CAMP FOLLOWERS.

Sūtra, in Sanskrit Literature, the technical name of aphoristic rules, and of works consisting of such rules. In such aphorisms the ground-works of the ritual, legal, grammatical, metrical, and philosophical literature of India are written. See SANSKRIT, VEDA, PĪṬAKA.

Suttee (an English spelling of the Sanskrit *satī*, 'a virtuous wife'), a usage long prevalent in India, in accordance with which on the death of her husband the faithful widow burned herself on the funeral pyre along with her husband's body, or, if he died at a distance, was burned on a pyre of her own. The practice was in use in India as early as the times of the Macedonian Greeks, and was based by Hindus on various of their sacred books and laws (the *Brahma-Purāṇa*, the *Vyāsa-Smṛiti*, &c.). But the researches of European scholars have made it absolutely certain that no countenance to this barbarous rite can be derived from the oldest and most sacred scriptures. The few passages professedly cited from the Vedas have been proved to be misquoted, garbled, or wholly false; and the laws of Manu are silent on the subject. Nevertheless self-immolation, though not in theory enforced on an unwilling victim, or one enceinte, and not practised except in certain castes and families of old descent, was almost made incumbent on well-born widows by force of public opinion, unless they were willing to risk their own happiness hereafter, and to live on a life of utter degradation and misery. The rite was no doubt derived from a belief common to many races at all times of the world's history, that it was well to send wives, slaves, horses, favourite weapons, &c., along with a great man into the other world, by burying them with him, burning or slaying them at his tomb. The Vedic evidence shows that the Brahmins disliked the practice, and transformed the older usage by reducing the rite to a form, the wife lying indeed on the pyre beside the dead, but being bidden to arise to the world of the living, and to be taken in marriage by a brother of the dead man. Later, however, the older practice evidently regained its position in popular favour, and was doubtless promoted in royal families by the inconvenience of maintaining the wives—often numbering scores—of dead kings. Holocausts of such victims are recorded in the kingdoms of Southern India in the period after the Mohammedan invasions. In 1823 there were 575 widows burned in Bengal Presidency, 310 within the jurisdiction of the Calcutta Court. Of these 109 were above sixty years of age, 226 from forty to sixty, 208 from twenty to forty, and 32 under twenty (Max-Müller, *Biographical Essays*, 1884). When Lord William Bentinck resolved to put an end to this hideous sacrifice he was met by fierce opposition both from natives and Europeans, though backed by some official and public opinion. And on the 4th December 1829 he carried the regulation in council which made all who encouraged suttee guilty of culpable homicide. The enactment soon told on the custom. The prohibition of suttee is a feature of treaties between the imperial government and the Indian states; and though occasional cases of suttee occur in the territory of the Indian states, and rarely within the British area (on the death of Sir Jung Bahadur, prime-minister of Nepal, in 1877 several of his wives immolated themselves), suttee may be said to be practically extinct.

Suttner, BARONESS BERTHA VON (1843–1914),

Austrian writer, was born at Prague, a daughter of Count Franz Kinsky. She travelled extensively, was the author of *Die Waffen Nieder* (1889) and other novels, published books on international affairs, was for a time secretary to Alfred Nobel, presided at many peace congresses, and in 1905 was awarded the Nobel prize for peace.

Sutton, a town and urban district in Surrey, 11 miles from London. Pop. (1921) 21,065.

Sutton Coldfield, a municipal borough of Warwickshire, 8 miles NE. of Birmingham, and practically a residential suburb and health resort of that city. Sutton Park, owned by the corporation, is a natural wooded park of more than 2000 acres, with facilities for boating and bathing. In it can still be seen a long stretch of Ryknield Street (sometimes referred to as Icknield), one of the best remaining examples of a Roman highway in this country. Seized by William the Conqueror in 1071, the town remained a royal manor until 1126. Through the influence of John Vesey, Bishop of Exeter, Henry VIII. granted, in 1528, a charter (still in the corporation's possession) giving the town amongst other privileges the title of the Royal Town of Sutton Coldfield. The powers granted led to constant litigation and several commissions, resulting in a modern charter in 1886. Vesey founded the grammar-school in 1541, and was buried in the parish church, which was built in the 14th century; Vesey restoring the tower in 1533. Since then the church has been considerably altered, a new aisle being added in 1880. Municipal charities have an income of more than £3000 per annum. It forms part of the parliamentary division of Tamworth. Pop. (1901) 14,264; (1911) 20,132; (1921) 23,020. See Midgley's *Short History of the Town and Chase of Sutton Coldfield* (1904).

Sutton-in-Ashfield, a town of Nottinghamshire, 3 miles SW. of Mansfield. It has a fine church (1390; restored 1868), hosiery manufactures, and neighbouring coal-pits and lime-works. Pop. (1921) 23,852.

Sutton-on-Sea, a seaside resort on the coast of Lincolnshire, much frequented by the people of the big towns of Nottingham, York, Lancaster, and Leicester, is 28 miles NE. of Boston by rail. It has a fine stretch of broad, firm sand, and close by a submerged forest may be seen at low tide.

Suture (Lat. *sutura*, 'a seam') is a term employed both in Anatomy and Surgery. In anatomy it is used to designate the modes of connection between the various bones of the cranium and face. A suture is said to be *serrated* when it is formed by the union of two edges of bone with projections and indentations (like the edge of a saw) fitting into one another. The coronal, sagittal, and lambdoidal sutures (see SKULL) are of this kind. A suture is termed *squamous* when it is formed by the overlapping of the bevelled (or scale-like) edges of two contiguous bones.

In surgery the word suture is employed to designate various modes of sewing up wounds, so as to maintain the opposed surfaces in contact. The materials most commonly used are silk, silver wire, horsehair, and specially prepared catgut. As it may fall to the lot of any person, on an emergency, to have to sew up a wound, the following general rules, applicable to all forms of suture, should be attended to. In passing the needle, the edges of the wound should be held in contact with the forefinger and thumb of the left hand; and the needle should penetrate the surface at about an angle of 50° (rather more than half a right angle), and should, at least, pass through the whole thickness of the skin at each stitch. The distance from the edge of the wound at which each stitch should

enter and leave the skin must vary with the depth of the wound; but there should never be less than the eighth of an inch between the margin of the wound and the entrance or exit of the needle.

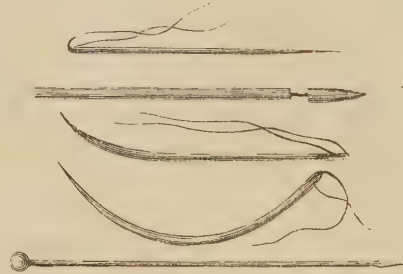


Fig. 1.

Sutures should not include vessels, nerves, muscles, or tendons. The line of the thread should cross that of the wound at right angles. For incised wounds on the surface of the body, when the edges can only be transfixed from the cutaneous surface, or when the opposite margins can both be traversed by one plunge, a curved needle (such as a common packing-needle) is most convenient, whereas a strong straight needle is more convenient for the completely free margins of extensive wounds, such as are left after amputation.

Fig. 1 represents various forms of needles used by surgeons; fig. 2 shows the *twisted suture*, as used in the operation for harelip, in which the wound is transfixed by pins, around which, beginning with the uppermost, a thread is twisted, in the form of the figure 8.

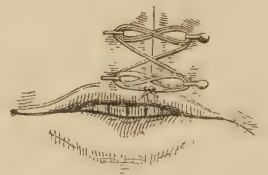


Fig. 2.

Suvóroff, or SUWARROW, ALEXANDER VASILIEVITCH, a Russian general, was born at Moscow on 24th November 1730, his father, of Swedish descent, being a general and senator. Small of stature and sickly in appearance, Alexander was a devoted student, and whilst still a boy acquired an excellent knowledge of languages; but his heart was fired with the passion of military glory, Caesar and Charles XII. of Sweden being the heroes of his imagination. Enrolled in the army at twelve, he began his actual service as a private at fifteen, but advanced rapidly in rank after the Seven Years' War, in which he greatly distinguished himself at Kunersdorf (1759) and Reichenbach (1761), and after the Polish war of 1768-71, in which his impetuous bravery, and the boldness and celerity of his attack, brought him prominently forward. From this time to the end of his life he was almost constantly in the field. In 1773 he passed from Poland to the south of Russia to war against the Turks; in 1774 he put an end to the insurrection of Pugatcheff; and in 1780 he crushed the revolt of the Kuban Tatars and other Caucasian tribes. He covered himself with glory in the Second Turkish War, defeating the armies of the sultan at Fokshani (1789) and at the river Rymnik, and storming the strong fortress of Ismail. In the Polish war of 1794 Suvóroff captured Praga, and so compelled the surrender of Warsaw. On the accession of the Emperor Paul he was for a time sent into retirement; but shortly afterwards Paul recalled him and ordered him (1799) to Italy to assist the Austrians in opposing the French. As usual he

won battles, defeating Moreau on the Adda, MacDonald at the Trebbia, and Joubert at Novi. Then he was directed to cross the Alps and unite his forces with Korsakoff for the purpose of sweeping the French out of Switzerland. After a terrible march, with fearful sufferings and heavy losses, he found, on descending towards the canton of Schwyz, that Masséna had defeated Korsakoff, and being himself too weak to attack he barely managed to escape over the mountains into Austria. On his return to Russia he was overtaken by death at St Petersburg on 18th May 1800. Suvóroff was a little man (5 feet 4 inches), with a wrinkled face and a stooping attitude; yet he was strong and healthy, and inured to hardship—he lived like a common soldier, and slept by preference on a truss of hay. Of great intelligence, he was a constant reader, even when on campaign, and a clever linguist. The idol of his soldiers, who loved to call him 'Father Suvóroff,' he was never defeated, and only once in his life acted on the defensive. He had a superb faith in his own star, and trusted to the inspiration of the moment, to rapidity of movement, and to boldness and dash in making the onset. Notwithstanding the terrible loss of life that attended his storm of Ismail (26,000 Turks were killed) and of Praga at Warsaw (where 15,000 Poles were massacred), he is stated to have been averse to shed blood, and to have been even humane and merciful. In his manners he was extravagantly eccentric, brusque and curt in speech, laconic in his despatches, and sarcastic to all who incurred the contempt of the soldier and man of action. Byron's description of him in *Don Juan* is as inaccurate as the biographies written by his enemies, the French. See *Lives* by Spalding (1890), and W. L. Blease (1920).

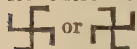
Suwałki, a town of northern Poland in the north corner of Białystok, 48 miles NW. of Grodno, has lumber and agricultural trade. Pop. (1921) 16,780.

Suwanee River rises in southern Georgia, in the Okefinokee Swamp, and flows in a winding, generally south-south-west course through Florida into the Gulf of Mexico.

Suzdal, a small Russian town, 12 miles N. of Vladimir, once capital of an important Russian principality.

Suzerain, a feudal lord. The term was applied less to the king than to his vassals who had subvassals holding of them. In modern times suzerainty indicates a degree of formal or real authority varying within a wide range.

Svalbard. See SPITSBERGEN.

Svastika, a widespread religious symbol. It consists of a Greek cross, either enclosed in a circle the circumference of which passes through its extremities ⊕, or with its arms bent thus , and according to some was intended to represent the sun, being found associated with the worship of Aryan sun-gods (Apollo, Odin). Similar devices occur on the monumental remains of the ancient Mexicans and Peruvians, on objects from the burial-mounds of the United States and in Tibet. A Svastika with its toes turned the wrong way, seeming to go contrary to the diurnal course of the sun, is sometimes regarded as wicked or of evil omen. The name *fylfot* which probably arose from a blunder, is by some appropriated to the reversed Svastika. In Germany the Svastika or Hakenkreuz, has been taken as a badge by the anti-Semites, 'Hakenkreuz am Stahlhelm' their slogan. See Cross; T. Wilson, *The Svastika* (1898).

Sveåborg, or SUOMENLINNA, a fortress protecting Helsingfors (q.v.).

Svealand. See SWEDEN, p. 803.

Svendborg. See FÜNEN.

Svendsen, JOHAN SEVERIN, composer, born at Christiania, 30th September 1840. He studied at Leipzig, Paris, and in Italy, conducted concerts in his native town, and in 1883 became master of the Chapel Royal at Copenhagen. His works comprise symphonies, an overture, and quartetts, quintetts, and concertos for strings. He died 14th June 1911.

Svenigorodka, a town in Ukraine, 100 miles S. of Kieff. Pop. (1920) 38,713.

Sverdlovsk, the new name of Ekaterinburg.

Sverdrup, OTTO, Norwegian explorer, born in 1855 in Helgeland, co-operated with Nansen on several Arctic voyages.

Swabia (Ger. *Schwaben*), or SUABIA, an ancient duchy in the south west of Germany, stretching from Franconia to Helvetia (Switzerland) and from Burgundy and Lorraine to Bavaria. It was so named from the Germanic Suevi, who drove out the Celtic inhabitants of the region in the 1st century B.C. With those conquerors the Alemanni, who invaded that part of Europe in the end of the 5th century, became amalgamated; and from that time there were dukes in Swabia, except for the period 746-919. During the reigns of the Hohenstaufen emperors, who were natives of Swabia and almost invariably conferred the ducal dignity on some relative of their own house, this duchy was the most rich, most civilised, and most powerful country of Germany, and the ducal court was the centre of art, literature, and learning. After the extinction of the imperial Swabian (Hohenstaufen) line the dignity of duke of Swabia remained in abeyance; the feudatories of the duchy asserted an immediate dependence upon the empire, and waged frequent wars one upon another. Of these minor states the most important and most powerful were the countships of Württemberg and Baden. The towns and cities, very many of which enjoyed the freedom of the empire, preserved a strong feeling for independence and a no less strong feeling of opposition to the feudal lords. In 1331 twenty-two towns (Ulm, Reutlingen, Augsburg, Heilbronn, &c.) united for purposes of mutual defence. Thirty years later many of the minor feudal lords formed a league to oppose the towns, and bloody feuds arose between the parties. The league of the feudal party was broken up by the Count of Württemberg, the ally of the Swabian league (of towns), in the last years of the 14th century. Nevertheless feuds and violent dissensions still raged rampant, and even continued to do so after the emperor summoned all the parties concerned to a conference at Esslingen (1487), where the Swabian League was formed (1488) for the maintenance of peace throughout the old Swabian duchy. This unhappy region suffered terribly during the Peasant War (q.v.) of 1525, in the Thirty Years' War (1618-48), and during the wars of the French Revolution. It formed one of the ten circles of the empire until the dissolution of the latter after Austerlitz, when Napoleon increased the territories of Baden and Württemberg by dividing between them the Austrian possessions in Swabia, at the same time raising the Duke of Württemberg to the status of king.

The *Swabian School*, in German literature, indicates a band of writers who were natives of Swabia (as Uhland, Schwalb, Kerner, Mörike, Hauff, and others). For the *Swabian Alb*, see WÜRTTEMBERG.

Swadeshi (Bengali, 'own country'), a movement in India dating from about 1905, for boycotting foreign goods.

Swaffham, a market-town of Norfolk, 15 miles SE. of Lynn. It has a cruciform Perpendicular

church (1474) of great beauty, a corn-hall (1858), and an ugly market-cross (1783). Pop. (1851) 3858; (1921) 2913.

Swahili (Arab. *Waswahili*, 'coast people'), the name given to the people of Zanzibar and the opposite coast belonging to the Bantu stock, with an Arab infusion, and speaking Kiswahili, a Bantu tongue modified by Arabic. The Swahili are intelligent and enterprising, and are in demand as porters by travellers into Central Africa. There are various collections of Swahili folk-tales, a handbook by Bishop Steere, and dictionaries (1902-3), and grammar (1921) by Madan.

Swale, a river in the North Riding of Yorkshire, flowing 60 miles ESE., and near Aldborough uniting with the Ure to form the Ouse (q.v.).

Swallow, a genus (*Hirundo*) and family (*Hirundinidae*) of Passerine birds. The members of this family are distinguished by their long and pointed wings, long head, slender wide bill, small legs and feet, tarsus scutellated in front, and tail generally forked. They have no autumn moult, but acquire their new dress in February; hence Seebohm thinks they are a recent import from the south which, like some shrikes, have changed their breeding time, but have not yet altered their moulting time. The genus *Hirundo* is cosmopolitan in distribution, and contains about sixty species. The members are gregarious, and prefer well-cultivated districts and the proximity of water. They have great powers of flight and perch but little, catching their prey, which consists chiefly of insects, on the wing. Their usual

the breast glossy bluish black, the forehead and throat chestnut, the lower parts white, and a patch of white on the inner web of each of the tail-feathers except the two middle ones. The whole length of the bird is about 8 inches, of which the outer tail-feathers make 5 inches. The female has a shorter tail, less chestnut on the forehead, and whiter under parts. The nest, probably originally built in caves, is made of mud or clay, formed into little pellets and stuck together, along with straw and bents, and lined with feathers. It is open and cup-shaped, and is generally placed in a situation where it is sheltered from wind and rain, as a few feet down an unused chimney, under the roof of an open shed, or in any unoccupied building to which access can be obtained. From four to six eggs are laid, blotched and speckled with shades of gray and brown. Two broods are produced in a year. Large flocks collect together in autumn before they depart for the south. Some individuals have been found in Britain in December, and may even survive a mild winter. A long-lived popular delusion credited swallows with hibernating regularly under water. The Window-swallow, or House-martin (*H. urbica*, or *Chelidon urbica*), is another very common British species, glossy bluish black above, white below and on the rump; the feet covered with short, downy white feathers. Its length is a little over 5 inches; the sexes are alike in plumage. The nest is built of mud or clay, like that of the chimney-swallow, but is hemispherical, with the entrance on the side, and is attached to a rock, or, very frequently, to the wall of a house, under the eaves or in the upper angle of a window. Two or even three broods are produced in a season, and the old birds return year after year to nest in the same spot. House-martins congregate in great numbers, as the chimney-swallows do, before their autumn migration, and disappear all at once. The only other common British species of swallow is the Sand-martin (*H. riparia*), smaller than the two preceding and arriving before them. It has the toes naked, the tail moderately forked, the plumage brown on the upper parts and across the breast, the under parts white. It makes its nest in sandy river-banks, the sides of sand-pits, and other such situations (even the turf-covered roofs of peasants' houses in Norway), excavating a gallery of 18 inches or 2 feet, sometimes 3 or even 5 feet in length, and more or less tortuous, in the

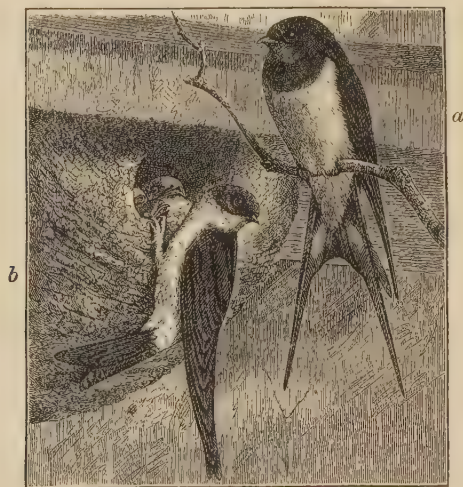


Fig. 1.—a, Common Swallow (*Hirundo rustica*);
b, House-martin (*H. urbica*).

note is a twitter, but some species sing sweetly. Their nests are built of mud, straw, and feathers, on ledges under eaves, on rocks, in caves, and in holes in earthy cliffs. Five species are found in Europe, and three are migrants to the British Isles. The Common Swallow, or Chimney-swallow (*Hirundo rustica*), is distributed in Europe, Asia, and Africa, from Lapland to the Cape of Good Hope and to the Moluccas. It breeds in the Orkney and Shetland Islands, and straggles to Iceland, Spitsbergen, and Novaya Zemlya, but does not reach America. It exhibits a character common to many other species, in the very long and deeply-forked tail, the two lateral feathers of which far exceed the others in length. The plumage is very beautiful, the upper parts and a band across



Fig. 2.—Sand-martin (*Hirundo riparia*).

slightly dilated extremity of which some soft material is placed for the reception of the eggs. This wonderful excavation is accomplished entirely by the bill of the bird. The floor slopes a little upwards from the entrance, so that the lodgment of rain is prevented. The sand-martin, on account of the nature of its haunts, is somewhat more local than the other British swallows; but it is distributed over most parts of Europe, Asia, Africa, North America, and South America to the Amazon valley. The Purple Swallow, or Purple Martin (*H. or Progne*

purpurea), is a North American species, which is said to have visited the British islands. The general colour, both of the upper and under parts, is shining purplish blue; the wings and tail black. It abounds in North America, and is a universal favourite in the northern parts, being hailed as the harbinger of spring, and frequenting even the streets of towns. It is a very general practice to place boxes near houses for the martins to make their nests in, which are very inartificial, consisting merely of dried grass, leaves, moss, feathers, and the like. Boxes nailed to trees are also readily occupied by the Rufous-bellied Swallow (*H. erythrogaster*), another North American species. But this species, which very nearly resembles the chimney-swallow of Britain, makes a nest of mud and fine hay, in the form of the half of an inverted cone, with an extension at the top, for one of the parent birds to sit in occasionally. The Republican Swallow, or Cliff-swallow (*Petrochelidon lunifrons*), of North America, makes a nest of mud, in form somewhat like a Florence flask, which it attaches to a rock or to the wall of a house. Hundreds sometimes build their nests in close proximity. The Fairy-martin (*H. ariel*), a small Australian species, also builds a flask-shaped nest with the mouth below, attaching it to a rock, or to the wall of a house; and numerous nests are often built close together. Another Australian species (*Pterochelidon nigricans*) lays its eggs in a hollow tree or rock without any nesting material. Some of the swallows of tropical countries are much smaller than any of the European species. See SWIFT.

Swallowing. See DIGESTION, CHOKING.

Swallow-wort. See ASCLEPIAS.

Swammerdam, JAN, entomologist and anatomist, born at Amsterdam, 12th February 1637, showed almost from his boyhood the greatest zeal in the study of natural history. Choosing medicine for his profession, he was trained at Leyden, and settled down to practise in Amsterdam. But he gave far more time and attention to investigating the life-history and anatomical structures of insects than to his calling, became straitened for means, and finally was carried away by the religious mysticism of Antoinette Bourignon (q.v.). He died at Amsterdam on 17th February 1680. His chief services in the advancement of science were the application of a method of studying the circulatory system by injections of hot wax, demonstrations in the anatomy of bees and other insects, and investigations into the metamorphoses of insects, the results of which afforded sure groundwork for subsequent classification. His most important books were *General Treatise on Bloodless Animals* (in Dutch, Utrecht, 1669) and *Biblia Naturæ* (ed. Boerhaave, 1737-38), giving the results of his researches in insect anatomy.

Swan (*Cygnus*), a genus of birds constituting a very distinct section of the Duck (q.v.) family Anatidæ. They have a bill about as long as the head, of equal breadth throughout, higher than wide at the base, with a soft cere, the nostrils placed about the middle; the neck longer than the body, arched, and with twenty-three vertebrae; the legs short and placed far back; the front toes fully webbed, the hind toe without membrane; the keel of the breast-bone very large; the intestines very long, and with very long cæca. They feed chiefly on vegetable substances, as the seeds and roots of aquatic plants, but also on fish spawn, of which they are great destroyers. They are the largest of the Anatidæ. They have a hissing note like geese, which they emit when offended, and they deal tremendous blows with their wings in attack or defence. The Common Swan, Mute Swan, or Tame Swan (*C. olor*) is about 5 feet in entire

length, and weighs about 30 lb. It is known to live for at least fifty years. The male is larger than the female. The adults of both sexes are pure white, with a reddish bill; the young (cygnets) have a dark bluish-gray plumage and lead-coloured bill. The bill is surmounted by a black knob at the base of the upper mandible, and has a black nail at its tip. In its wild state this species is found in the eastern parts of Europe and in Asia as far as Mongolia and the north-west of India, breeding in Denmark, the south of Sweden, in central and southern Russia, and in Turkestan; in a half-domesticated state it has long been a common ornament of ponds, lakes, and rivers in all parts of Europe. It is said to have been brought to England from Cyprus by Richard I. It is perhaps the most beautiful of water-birds, when seen swimming, with wings partially elevated, as if to catch the wind, and finely-curving neck. The ancients called the swan the Bird of Apollo or of Orpheus, and ascribed to it remarkable musical powers, which it was supposed to exercise particularly when its death approached. The note of the male bird at breeding time is loud and trumpet-like; the tame bird's note is little more than a hiss. The nest of the swan is a large mass of reeds and rushes, near the edge of the water, an islet being generally preferred. The female begins as a rule to lay in her second year from three to five eggs; when older she lays ten to twelve eggs, of a dull greenish-white colour. These birds are said to pair for life. The female swan sometimes swims about with the unfledged young on her back; and the young continue with their parents till the next spring. The swan is now seldom used in Britain as an article of food, but in former times it was served up at every great feast, and old books are very particular in directions how to roast it and to prepare proper gravy. The Polish Swan (*C. immutabilis* of Yarell) is generally believed now to be a mere variety of the common swan. The Whistling Swan, Elk Swan, or Whooper (*C. ferus* or *musicus*) abounds

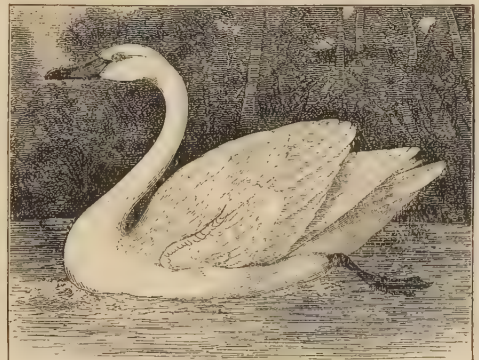


Fig. 1.—Wild Swan, or Whooper (*Cygnus ferus*).

in the northern parts of Europe and Asia, but to Britain it is now merely a cold-season migrant from more northern regions, although about a century ago it used to breed in the Orkneys. The size is about equal to that of the common swan, and the colour is similar, but the bill is more slender, is destitute of a knob, and is depressed and black at the tip and yellow at the base. This bird is frequently brought to the London market. The names whooper and whistling swan are derived from the voice. Like all swans of the northern hemisphere, except the common swan, this one has a large cavity in the interior of the breast-bone in which the windpipe coils before passing to the lungs. Bewick's Swan (*C. bewicki*), another native

of northern Europe, is more rare in Britain, but large flocks are sometimes seen. It is about one-third smaller than the whistling swan. The American Swan (*C. americanus*), closely resembling Bewick's swan but larger, is sometimes found in Britain. It breeds in the northern parts of North America, but its winter migrations extend only to North Carolina. The Trumpeter Swan (*C. buccinator*) is another American species, breeding chiefly within the Arctic Circle, but of which large flocks may be seen in winter as far south as Texas. It is rather smaller than the common swan. The ancients spoke of a black swan proverbially as a thing of which the existence was not to be supposed, but Australia produces a Black Swan (*C. atratus*), discovered towards the end of the 18th century, rather smaller than the common swan, the plumage deep black, except the primaries of the wings, which are white. The neck is long, thin, and gracefully curved. The eye is red. The bill is vivid carmine, with a white cross band. It has been entirely acclimatised in the northern hemisphere. The Black-necked Swan (*C. nigricollis*), perhaps the handsomest bird of the genus, is a



Fig. 2.—Black Swan (*Cygnus atratus*).

South American species, ranging from Chile to the Falkland Islands. The Duck-billed swan (*C. anatos*), the smallest of all the species, common about the Strait of Magellan, has the head and neck dark brown, and the rest of the plumage of the purest white. It is curious that the black colour appears in all the species of the southern hemisphere, and in them alone, except in the approach to it made in the cygnets of the north.

Swans, according to the law of England, are birds-royal. When they are found in a partially wild state, on the sea and navigable rivers, they are presumed to belong to the crown. The royal birds generally have a 'nick' or mark on them, and the king's swanherd once was an important person. But any person may have tame swans in his grounds, and then he has a property in them. Whoever steals or destroys swans' eggs forfeits 5s. for every egg, and whoever steals a marked swan of the crown, or a tame swan, commits felony. The most famous swannery is that of Abbotsbury in Dorsetshire, 8 miles NW. of Weymouth, though the number of its swans has diminished.

Swan, ANNIE S. (MRS BURNETT SMITH), daughter of a farmer at Gorebridge, Midlothian, a prolific writer of tales and magazine stories.

Swan, SIR JOSEPH WILSON, F.R.S. (1828-1914), best known as the inventor of an incandescent electric lamp, was born in Sunderland. The dry-plate process and other photographic methods owe much to his inventive genius. He also devised a miner's electric safety-lamp, and improved methods of electro-metallurgical deposition. He was knighted in 1904.

Swanage, a pleasant little watering-place of Dorsetshire, in the 'Isle' of Purbeck, nestling in the southern curve of a lovely bay, 9½ miles SE. of Wareham, but 11 by rail (1885). In Swanage Bay, in 877, King Alfred won England's first naval victory—a defeat of the Danes. Pop. (1921) 7112. See PURBECK.

Swanee River. See SUWANEE.

Swanetia. See CAUCASUS.

Swan River. See WESTERN AUSTRALIA.

Swansea (Welsh *Abertawe*), a seaport of Glamorganshire, South Wales, on the banks and at the mouth of the river Tawe, 45 miles WNW. of Cardiff and 216 W. of London. A municipal, parliamentary, and also (since 1888) county borough. It owes its rapid progress after 1850 to the manufacture of tin-plate here and in the neighbourhood, and to its harbour and docks. There are five docks, North, South, Prince of Wales, King's, and Queen's; the King's Dock has an area of 221 acres, and there are over 6 miles of quays. There are large manufactures of iron, zinc, lead, copper, silver, tin, &c., and in the 20th century oil refining has become very important. The tin-plate industry of Swansea is supposed to be one of the largest in the world. The principal exports are coals, anthracite, copper, and fuel, chemical, iron (including tin-plate), and cotton manufactures. The chief imports are crude oil from Abadan, for the National Oil Refinery at Llandarcy, about five miles from Swansea, whence the oil is pumped from the incoming tankers, corn, copper and iron ore, petroleum, sugar, potatoes, onions, and wood. Pop. of municipal borough (1851) 31,461; (1891) 90,423; (1911) 143,997; (1921) 157,561. Since 1918 the town returns two members, for the east and west divisions respectively. Swansea was originally probably a Scandinavian settlement. The castle, of which a tower still remains, was founded in 1106 by the Earl of Warwick, but in the reign of Edward IV. passed by marriage from the Herberts to the Somerset family, and is still the property of the Dukes of Beaufort. The Parish Church of St Mary, dating from the 12th century, was finally rebuilt by Blomfield in 1897. Since 1923, when the diocese of St David's was divided, Swansea has been part of the diocese of Swansea and Brecon. The Royal Institution of South Wales contains a library, art gallery, and museum with an Egyptian collection, and a magnificent department of British birds. Swansea also has a Public Library and Institute of Science and Art. The grammar-school dates from 1682. In 1920 the foundation stone was laid of the Swansea University College, incorporated as a constituent college of the University of Wales. Bishop Gower (d. 1347) and Beau Nash (1674-1762) were natives.

See works by L. W. Dillwyn (1840), G. G. Francis (1849-67), P. Rogers (1878), L. C. Martin (1879), and F. Grant (1881); Histories of Swansea (1920) and of the Port of Swansea (1922) by W. H. Jones; and the articles COPPER and TIN.

Swanwick, ANNA (1813-99), was born at Liverpool, studied Greek and Hebrew in Berlin, mathematics in London, and interested herself in women's education and philanthropy. She translated from Goethe, Schiller, and Æschylus. See Study by Bruce (1903).

Swastika. See SVASTIKA.

Swat, a river in Kafiristan (q.v.), joining the Kabul River near Peshawar. In 1897 the 'Mad Mullah,' proclaiming himself the successor by divine selection of the Akhund of Swat, who died in high reputation about 1878, roused the tribes inhabiting the Swat valley to a holy war against the infidels. They attacked the British camp at

Malakand, but were repulsed. The disturbance, however, spread through the neighbouring tribes, including the Buners, Waziris, Urakzais, and Afridis, and resulted in the frontier war which terminated with the brilliant engagement at Dargai, 20th October 1897.

Swatow, a seaport of China, which has been opened to foreign trade since 1869, stands at the mouth of the river Han, 225 miles E. of Canton, in the province of Kwang-tung. It is the seat of great sugar-refineries and bean-cake and grass-cloth manufactures, and has an important shipping trade. The chief exports are sugar, tobacco, grass-cloth, cloth and nankeen, and tea. Pop. 83,000.

Swaziland, a South African territory, lying on the west side of the Libomba Mountains, and forming an intrusion into the south-east of the Transvaal. It has an area of 6678 sq. m., and according to the census of 1921, a population of 133,563 (including 2200 Europeans). Cotton and maize are grown, and there is a considerable amount of cattle and sheep grazing, but the rich mineral resources (tin, gold, &c.) have not nearly been exploited to their full extent. For customs purposes, Swaziland is treated as part of the Union of South Africa. The seat of government is at Mbabane. The independence of this little state was recognised by its powerful neighbours, the South African Republic and the British government in 1884; the white settlers, mainly gold-miners, were put in 1890 under a joint 'government committee' appointed by Britain and the Boers, and in 1895 under the protection of the Republic. Authority over Swaziland was given in 1903 to the Governor of the Transvaal, and in 1906 to the High Commissioner for South Africa.

Swearing, or PROFANE SWEARING, the habit of using the name or attributes of God in a light and familiar manner by way of asseveration or emphasis. It was specially condemned by the Mosaic law, was long punished by severe penalties, and is still an actionable offence in England. By oaths are loosely understood also many terms and phrases of gross and obscene character. There is a legitimate use for solemn cursing; but weak men of limited vocabulary, under the pressure of excitement, seek for artificial strength or verification by employing irrelevant words that carry with them ideas of gravity or strength. Seafaring men and persons in command generally often use such expressions to add weight to their words, and some apology may be found for them in the fact that the persons with whom they have usually to deal have been so accustomed to their use as not to be readily inclined to obedience without them. Again, other and more imaginative men from the days of Rabelais until now garnish their talk with oaths as a mere exercise of verbal ingenuity, or by way of set-off to their conversation.—'How now?' said Ponocrates; 'you swear, Friar John.' 'It is only,' said the monk, 'but to grace and adorn my speech; they are colours of a Ciceronian rhetoric.'

To call God to witness is a thing natural enough on occasions of grave asseveration, as in giving witness in courts of law and the like, and it has been from the beginning a custom to take oaths on things sacred or august, as the head of the emperor, the beard of the Prophet, the sword blade or hilt, and the gospels. Thomas Becket denounced John the Marshal of England for swearing on the *troparium*, a collection of versicles and sequences used in the service of the mass. We find oaths frequent enough among the Greeks and Romans: Pythagoras is said to have sworn by the number four; Zeno, by the caper; Socrates used mild oaths, as 'By the dog,' and Aristophanes tells of a time when no men swore by the gods, but all

by birds. The Romans used 'Mehercule,' 'Medius Fidius,' 'Edepol,' 'Ecastor,' and 'Mecastor' (properly a woman's oath), &c. Brantôme tells us Louis XI. said 'Par la Pâque Dieu'; the oath of Francis I. was characteristic—'Foi de gentil-homme.' 'Ventre Saint-Gris,' again, was one of the Gascon oaths of Henry IV. of France, which he alternated with another favourite, 'Jarnidieu.' Many of the modern French oaths, as 'Parbleu' (*par Dieu*), 'Corbleu' (*corps de Dieu*), 'Ventrebleu,' and 'Sacrebleu,' are illustrations of a process of softening an oath by a deliberate disguise, like the old-fashioned 'Gad' and 'Egad,' the north country 'Dod' and 'Seush' (*God's curse*), and the older English 'Slight' (*God's light*), 'Od's fish'—the usual oath of Charles II., 'Zounds' (*God's wounds*), 'Od's bodikins,' and the American 'Darn.' Similarly in Italy, between the severe laws against profanity and blasphemy and the necessity of confession, forms like 'Per Dio' became in early times disguised as 'Per Dinci.' Indeed the Italians, especially in Tuscany, are extraordinarily rich in oaths, many strange and grotesque forms being in use, and the meanings of common forms being carefully differentiated. Mr Story tells us that 'Dio mio' is proper as an expression of sudden surprise, 'Madonna mia' of pity and sorrow, 'Per Christo' of hatred and revenge. Nothing on the Continent strikes an English ear more strangely than the familiar use of 'Dieu' in France and of such phrases as 'Herr Je' in Germany, and English reticence refuses to accept the over-subtle apology even of a Cardinal Newman (*Lect. on Certain Diffic. ix.*), that this variety and fertility in adjurations and invocations is merely because a Catholic populace has a greater insight into the unseen world than a Protestant. 'The Catholic's very jesting, and his very oaths, have been overruled,' says he, 'to create in him a habit of faith, girding round and protecting the supernatural principle.' But it is proper to explain that what James Howell calls 'this infandous custom of swearing' is to Continentals specially an English characteristic. Indeed Howell himself, after enumerating the performances of the German, the Italian, the Frenchman, the Spaniard, the Welshman, the Irishman, and the Scot, admits that 'for variety of oaths the English Roarers put down all.' Byron describes how Don Juan on his first arrival in England is rudely awakened from the innocent belief that 'their shibboleth "God damn"' is a usual salutation. Beaumarchais (*Le Mariage de Figaro*, iii. 5) says, 'Avec Goddam en Angleterre on ne manque de rien nulle part. . . les Anglais à la vérité ajoutent par-ci par-là quelques autres mots en conversant; mais il est bien aisé de voir que Goddam est le fond de la langue.' We hear this phrase as a synonym for Englishman even from the pure lips of Joan of Arc, and we certainly find the oath in the other Elizabethan dramatists, and in Shakespeare, but not in anything like its modern pre-eminence of importance. Still we find oaths enough of all shades of profanity in early English literature, and corresponding denunciations in the writings of preachers like Jeremy Taylor and Thomas Fuller, down to the days of that genial but true moralist, the *Spectator*. A few of the more common old English oaths—all in Shakespeare—were 'Bodikins,' 'By Cock and Pie' (*God* and the Roman service-book), 'Cock's passion,' 'By'r Lady,' 'Marry' (the Virgin Mary), 'By my halidom' (*holiness*), 'Od's me,' 'Sblood,' 'Gramercy,' 'By the rood' (the *Cross*), 'Shrew me.' Sir Thopas in the *Canterbury Tales* uses 'By ale and bread,' the dainty Madame Eglantine's greatest oath is only 'By St Eloy.' 'By Jove' and 'By George' are still heard; 'the dickens' (*devil*) already occurs in the *Merry Wives*; 'the

deuce' is at least of the 17th century, although hardly Middle English, *pace* Professor Skeat; 'By the living Jingo' has been boldly described as Basque, and was rendered classic by the *Vicar of Wakefield*; Etheredge and Dryden write 'bloody drunk'; Swift, 'bloody cold' and 'bloody sick'—early examples of one of the most odious of modern vulgarisms; the Duke of Wellington's 'twopenny damn' (of which there is an attempted innocent explanation) almost died with him; Queen Elizabeth, James I., Lord Thurlow, Picton, and Lord Melbourne, all notorious swearers, were catholic in their choice of oaths. The prophecy of Bob Acres (*Rivals*, ii. 1), that 'damns have had their day,' has not yet entirely come true, although the reformation of manners has long since driven swearing from the quarter-deck, and a Squire Western is now more than a phenomenon. Swift's *Swearer's Bank* (Scott's *Swift*, vol. vii.) is a characteristic satire on the profanity of his day. It is computed by geographers, he begins, that there are two millions in this kingdom [Ireland], of which number there may be said to be a million of swearing souls. It is thought that there may be 5000 gentlemen, each with one oath a day at a shilling each, yielding an annual revenue of £91,250. All classes of citizens contribute to this revenue, the farmers, the commonality, the hundred pretty fellows in Dublin alone at fifty oaths a head daily, the oaths of a little Connaught fair themselves computed at 3000. Militia under arms are to be exempted, nor is any advantage to be taken of any man's swearing in the Four Courts, provided he is at hearing in the exchequer or has just paid an attorney's bill. As for its medicinal use to help the lungs to throw off any distilling humour, on certificate of a course of swearing granted by any physician a permit may be issued to the patient, but all other licenses, compositions, or indulgences whatever are prohibited.

The church ever denounced profane swearing, but was powerless to check the practice. St Chrysostom spent twenty homilies upon it, and St Augustine's judgment is summed up with unnecessary severity in the solemn passage, 'Non minus peccant qui blasphemant Christum regnantem in cœlis quam qui crucifixerunt ambulantes in terris.' For much of our popular swearing is little more than the mere habit of vocabulary, a sin only from the lips outward, as Bishop Lightfoot said of the habitual profanity of the colliers of his diocese. Again, where swearing is a professional custom it is scarce possible to exist without conforming, and after all words have in themselves no absolute but a relative meaning. 'Our armies swore terribly in Flanders' in my Uncle Toby's time, as they have done since. And have we not still our familiar proverb 'to swear like a trooper.' 'To swear like a bargee' is a proverb still justifiable by the facts—an atmosphere of oaths continues to hang heavy over our canals and rivers. We are told that Robert Burton at last could only be made to laugh by going down to the Bridgefoot in Oxford and hearing the bargemen scold and storm and swear.

The old forms of excommunication in ecclesiastical use supplied forms enough, and the specimen of the powers of Ernulphus given in *Tristram Shandy* certainly displays 'an orientality we cannot rise up to, a copiousness of invention, a possession of all the excellencies of a swearer which make it impossible to swear out of it.' The advantage of a theological vocabulary is seen further in Scott's story of the swearing-bout between a skipper and a broken-down minister, where the latter swore his antagonist dumb with a copiousness and variety he could not equal. In England the growth of Puritanism was marked by

a series of attempts to stamp out swearing. In 1601 a measure for this end was introduced into the House of Commons, and one was carried in 1623. 'Not a man swears but pays his twelve pence,' says Cromwell proudly of his Ironsides. As early as 1606 swearing in plays had been forbidden, and even Ben Jonson himself narrowly escaped the £10 penalty. An act of 1645 in Scotland details the penalties to be inflicted, even on ministers of religion—it will be remembered that Barham recommends these not to go beyond 'zooks.' Shirley's play, *The Young Admiral* (1633), is especially noted as 'free from oaths, profaneness, and obscenity.' When Davenant's *Wits* next year was presented to Sir Henry Herbert for license, the latter crossed out many expressions. Davenant appealed to the king, who directed the Master of the Revels to allow such words as 'Faith,' 'Death,' and 'Slight.' Sir Henry made the following entry in his office-book: 'The king is pleased to take "Faith," "Death," and "Slight" for asseverations and no oaths, to which I do humbly submit as my master's judgment; but under favour conceive them to be oaths, and enter them here to declare my opinion and submission.' St Paul's Cathedral is supposed to have been built without an oath, the regulations of Sir Christopher Wren being so stringent, and this may be allowed to remain its most remarkable distinction.

Profane swearing, according to the law of England, is an offence for which the party may be convicted under an act of George II. by a justice of the peace according to a scale of penalties. A day labourer, common soldier, sailor, or seaman forfeits 1s. per oath; every other person under the degree of a gentleman, 2s.; and every person above the degree of a gentleman, 5s.; for a second offence, double these sums; for a third, treble, &c. If the cursing take place in presence of a justice of the peace, the latter may convict the swearer then and there, without further process or evidence; and in all cases a constable may apprehend a profane swearer, and carry him before a justice. On one occasion a man swore a volley of oaths, twenty times repeating the oath, and the justices fined him 2s. for each repetition, making in all £2, and this was held a proper conviction. It seems that this act does not apply to women; but there are provisions of a more general character in several modern police acts which impose a penalty for using profane or obscene language in public places. Profanity by cursing and swearing is never prosecuted now in Scotland except as part of disorderly conduct.

See articles on BLASPHEMY and OATH; also Julian Sharman, *A Cursory History of Swearing* (1884).

Sweat (O.E. *swát*), the moisture exuded by the skin, in which about 2 per cent. of solid matters is present, consisting of salt; formic, acetic, butyric, and other fatty acids; neutral fats; and cholesterin. The manner of its excretion, its uses, &c., are considered at Skin (q.v.).

Sweating Sickness, an extremely fatal epidemic disorder, which ravaged Europe, and especially England, in the 15th and 16th centuries. It derives its name 'because it did most stand in sweating from the beginning until the endyng,' and, 'because it first beganne in Englande, it was named in other countries the Englishe sweat.' It first appeared in London in September 1485, shortly after the entry of Henry VII. with the army which had won the battle of Bosworth Field on August 22. It was a violent inflammatory fever which, after a short rigor, prostrated the powers as with a blow, and amidst painful oppression at the stomach, headache, and lethargic stupor, suffused the whole body with a fetid perspiration. All

this took place in the course of a few hours, and the crisis was always over within the space of a day and night. The internal heat which the patient suffered was intolerable, yet every refrigerant was certain death. 'Scarce one amongst a hundred that sickened did escape with life' (Holinshed)—a statement which, while probably greatly exaggerated, illustrates the dread with which the malady came to be regarded. Two lord mayors of London and four aldermen died within one week; and the disease for the most part seized as its victims robust and vigorous men. It lasted in London from the 21st of September to the end of October, during which short period 'many thousands' died from it. The physicians could do little or nothing to combat the disease, which at length was swept away from England by a violent tempest on New-year's Day. In the summer of 1508 it reappeared in London, and in July 1517 it again broke out in London in a most virulent form, carrying off some of those who were seized by it within four hours. It seems chiefly to have attacked those in the upper classes or in comfortable circumstances. In many towns a third or even a half of the inhabitants are said to have been swept away, again probably an overstatement. On this occasion the epidemic lasted about four months. In May 1528—the year in which the French army before Naples was destroyed by pestilence, and in which the putrid fever known as *Trousse-galant* decimated the youth of France—the sweating sickness again broke out in the metropolis, spread rapidly over the whole kingdom, 'and fourteen months later brought a scene of horror upon all the nations of northern Europe, scarcely equalled in any other epidemic.' How many lives were lost in this epidemic, which has been called by some historians *the great mortality*, is unknown; the fact that King Henry VIII. left London, and endeavoured to avoid the disease by continually travelling, shows the general feeling of alarm that existed. We hear of it at Calais in the same year, but nowhere else out of England. In the following summer, having apparently died out in England, it appeared in Germany, first at Hamburg, where it is recorded that 8000 persons died of it, and shortly after at Lübeck, Stettin, Augsburg, Cologne, Strasburg, Hanover, &c. In September it broke out in the Netherlands, Denmark, Sweden, and Norway, whence it penetrated into Lithuania, Poland, and Livonia; but after three months it had entirely disappeared from all these countries. For three-and-twenty years the sweating sickness totally disappeared, when for the last time (March or April 1551) it burst forth in Shrewsbury, spread rapidly over the whole of England, but disappeared by the end of September. The deaths were so numerous that one historian (Stow) states that the disorder caused a *depopulation* of the kingdom. The very remarkable observation was made in this year that the sweating sickness uniformly spared foreigners in England, and on the other hand followed the English into foreign countries. The immoderate use of beer amongst the English was considered by many as the principal reason why the sweating sickness was confined to them. Since 1551 the disease has never appeared as it did then and at earlier periods. Its nearest ally is Sudamina (q.v.), or military eruption, which has appeared in frequent, but usually limited, epidemics in France, Italy, and Germany (still called there 'the English sweat') during the 18th and 19th centuries, sometimes, as in the 'Picardy Sweat' of the 18th century, in so severe and even fatal a form as to suggest the older epidemic in miniature.

See Dr John Caius, *A Booke against the Sweatyng Sicknesse* (1552); Hecker, *Epidemics of the Middle Ages* (Syd. Soc. Trans.); Hirsch, *Geographical and Historical*

Pathology (New Syd. Soc. Trans., vol. i. p. 82); and Creighton, *History of Epidemics in Britain* (1891).

Sweating System. This subject was first brought prominently before the public in 1847-48 by the *Morning Chronicle* newspaper, and subsequently by a pamphlet (*Cheap Clothes and Nasty*) and a novel (*Alton Locke*), both from the pen of Charles Kingsley. It was shown that some of the journeymen tailors, instead of doing the work on the premises of their masters, had commenced the practice of taking the garments to their own houses, where they called in the assistance of their families and of other persons. This system was called 'the Sweating (i.e. over-working) System,' because the persons employed under it worked harder than the public opinion of the men in the tailoring trade considered reasonable; just as an unconscionably industrious schoolboy is reproached by his fellows for 'swatting.' The term, 'the sweating system,' soon began to be applied to more or less analogous practices in other trades, and generally to all practices objected to by the workers. 'Sweating' is now used to denote unfair treatment of any kind, without reference to any particular system of employment. But the sweating system is still chiefly applied to cases in which work is sub-contracted—i.e. in which a principal employer, instead of having the work done by men in his own employment, hands it over to a 'middleman,' who gets it done with the assistance of persons engaged by him for the purpose. In some cases the sub-contractor and his employees work on the premises of the principal employer, this type of middleman being usually called a 'piece-master.' But, as a rule, when the sweating system is spoken of reference is made to the 'sweating-master' or 'garret-master,' who employs his workpeople in his own 'sweating-den.' In February 1888 a select committee of the House of Lords was appointed to examine into the sweating system in East London, the reference being afterwards extended to cover the United Kingdom. The industries investigated included the tailoring trade, shirt-making, mantle-making, furriery, boot-making, cabinet-making and upholstery, chain and nail making, the cutlery and hardware trades, and also dock labour and government contracts. The final Report of this committee, published in April 1890, states that 'the earnings of the lowest class of workers are barely sufficient to sustain existence. The hours of labour are such as to make the lives of the workers periods of almost ceaseless toil, hard and often unhealthy. The sanitary conditions under which the work is conducted are not only injurious to the health of the persons employed, but are dangerous to the public, especially in the case of the trades concerned in making clothes, as infectious diseases are spread by the sale of garments made in rooms inhabited by persons suffering from smallpox and other diseases. . . . As a rule, however, it must be remembered that the observations made in respect to sweating apply, in the main, to unskilled or only partially skilled workers, as the thoroughly skilled workers can almost always obtain adequate wages.' While blaming employers as 'regardless of the moral obligations which attach to capital when they take contracts to supply articles and know nothing of the condition of the workers by whom such articles are made, leaving to a sub-contractor the duty of selecting the workers,' the committee declare that 'the middleman is the consequence, not the cause of the evil; the instrument, not the hand which gives motion to the instrument, which does the mischief. Moreover, the middleman is found to be absent in many cases in which the evils complained of abound.'

On the other hand, the middleman or sub-con-

tractor is certainly present in very numerous instances in which the evils of sweating are absent. Thus, in the cotton trade, the 'minders' employ their own 'piecers'; in the iron trade a great number of operations are entrusted to sub-contractors ('puddlers' employing their own 'underhands,' 'hammermen' employing their own assistants, &c.); sub-contract is widely prevalent in mines and quarries, in the ship-building and in numerous other industries, but is in these cases unaccompanied by serious oppression of the workers, and is not called the sweating system. The sub-contractor usually himself performs a part, generally the most difficult part, of the work, and in all cases renders useful services by organising and directing the labour of his subordinates; while the remuneration which he receives is, as a rule, by no means out of proportion to the importance of the duties which he fulfils. But, since the amount of his remuneration depends directly upon his getting his employees to do a *maximum* of work for a *minimum* of pay, the sub-contractor, especially if his workpeople are deficient in skill or incompetent to combine against oppression, tends to become a greedy and exacting task-master.

The laws relating to factories and workshops and to the public health have been amended so as to embody most of the principal legislative provisions recommended by the Lords' Committee. A further check to the development of the sweating system has been given by the 'Fair Wages Clauses,' which it has for some time past been the practice to insert in all government contracts and in those of a considerable number of local authorities—clauses which stipulate for payment of full current rates of wages, and in many cases forbid sub-contract (except with permission). But the most decisive action taken for the remedy of the industrial evils under consideration is the enactment of the Trade Boards Act, 1909. Under this law, which applies to tailoring (other than retail bespoke), to box-making (paper, cardboard, chip, &c.), to machine-made lace and net finishing and mending and darning operations of lace curtain finishing, and to hammered and doliied or tommyied chain-making (all trades in which sub-contract more or less extensively prevails), and has been extended to other sweated industries, provision is made for fixing minimum rates of wages enforceable by law. The Trade Boards Act of 1918 extended the scope of that of 1909.

Further details in respect to the sweating system will be found in three Reports by J. Burnett, Labour Correspondent of the Board of Trade: (a) on the Sweating System at the East End of London; (b) on the Sweating System in Leeds; and (c) on the Nail Makers and Small Chain Makers in South Staffordshire and East Worcestershire (1887, 331; 1888, c. 5513; 1888, 385); the five Reports, Minutes of Evidence, Appendices, and Index of the Lords' Committee on the Sweating System; *Booth, Life and Labour in London* (first series, vol. iv.); and *Methods of Industrial Remuneration*, by David Schloss.

Sweden (*Sverige*), a kingdom of northern Europe, occupying the eastern side of the Scandinavian peninsula, with which from 1814 till 1905 Norway (q.v.) was associated. The Skager-Rak and the Kattegat touch its south-western shores. In the far north-east it is separated from Finland by the river Torneå and its affluent, the Muonio. Almost the whole of the eastern side is washed by the Gulf of Bothnia and the Baltic Sea; this last also beats against its short southern coast. The longest line, from north to south, measures little short of 1000 miles, the greatest breadth 250; the area is 173,105 sq. m.; the coast-line is about 1550 miles, not including the countless inlets and indentations. Besides the skerry-islands (see below)

Sweden owns Gothland (q.v.), properly Gottland, and (Eland (q.v.).

Physical Features.—The country may be generally described as a broad plain sloping south-eastwards from the Kjölen Mountains (see NORWAY) to the Baltic. The only mountainous districts adjoin Norway; the peaks sink in altitude from 7000 feet in the north to 3800 in 61° 30' N. lat. Immediately south of this point a subsidiary chain strikes off to the south-east, and, threading the lake-region of central Sweden, swells out beyond into a tableland with a mean elevation of 850 feet and maximum of 1240 feet. Fully two-thirds of the entire surface lies lower than 800 feet, and one-third lower than 300 feet, above sea-level.

By far the greater portion of Sweden is built up of crystalline gneisses and granite of the Azoic era, and of limestones, sandstones, clay-slates, and other slates of the Lower Silurian epoch. The non-fossiliferous formations, which fill the western, northern, and large portions of the southern parts of the country, lie as a rule close to the surface or are actually exposed. The Silurian strata are spread out in broad thin sheets, regularly disposed, but broken by large islands of granite, gneiss, eruptive trap (diabase), porphyry, greenstone. The Triassic and Cretaceous systems have just touched the southern end of the country. During the Glacial epoch the whole of Sweden was covered with ice. Its melting accounts for extensive deposits of glacial sand, clay, and gravel, as well as for the gigantic boulders and erratic blocks with which several districts are plentifully strewn, and the long narrow ridges of smooth stones, called *åsar*, that cross the country for many miles in a south or south-easterly direction. The eastern or Bothnian coast, like the western coast of Norway, is gradually rising; whilst the coast of Scania, in the extreme south, tends on the whole to subside. The islands of the skerry-fence (*Skärgård*) are nearly all small in size, low, bare of vegetation, and polished by the sea.

The climate of Sweden is continental in the north, along the Norwegian frontier, and on the southern plateau; the regions that border on the sea are more maritime. Yet both summer and winter, in all parts alike, are liable to considerable fluctuations from year to year. The difference between the winter and summer temperatures is of course much greater in the continental parts; for instance, in the extreme north as much as 49° F., whereas at Lund in the south it does not, as a rule, exceed 30°. The lakes in the colder (continental) districts of the north are ice-bound for some 220 days in the year; in the south for only about 90 days. The rainfall is greatest on the coast of the Kattegat (30 inches yearly), and decreases from west to east, and from south to north, being only 16 inches yearly in Norrland. The south-east corner is, however, exceptionally dry (17 inches).

Sweden is separated popularly and geographically into three great divisions—Norrland, Svealand, and Götaland.

Norrland in the north is a region of vast and lonely forests and short, rapid mountain-streams. These torrents, none of them 300 miles long, reach the Gulf of Bothnia along narrow parallel valleys running to the south-east; as they drop from level to level they form cascades and waterfalls, some of remarkable grandeur. Many of the valleys are filled for many miles with ribbon-like lakes, some of great size; whilst their slopes, and the ridges that lie between them, are clothed with dense forests of pine, fir, and birch, with wild berry bushes and similar low shrubs growing in between the trees and around the moss-carpeted blocks of granite and porphyry. Besides the Lapps with their reindeer herds, and the Swedish wood-

cutters and miners, the only denizens of these forest tracts are wild animals (reindeer, bears, wolves, lynxes, gluttons, foxes, lemmings, hares), birds of prey (hawks, eagles, falcons, owls), and game birds (ptarmigan, blackcock, heath-cock, hazel-grouse, snipe). The innumerable aquatic birds and the gnats of Lapland must not be forgotten. Numerous little seaports, where the lumber, floated down the streams, is cut up, and the iron ore from Gellivara and other mines is smelted, nestle at the mouths of the rivers. This division is very rich in mineral resources, but iron ore is almost the only one that is extracted.

The central division of Svealand, or Sweden proper, is a region of big lakes, and contains most of the mines. Lakes occupy nearly 14,000 sq. m., or 8.2 per cent. of the total area of Sweden; but in Svealand several of the largest, as Vänern, Vättern, Hjälmarn, Mälarn, are grouped together. Lake Mälarn bears on its bosom a vast number (1300) of islands, many of them beautifully wooded, with royal palaces or noblemen's castles gleaming through the trees. Its shores too are studded with prosperous towns, castles, palaces, and factories. These great sheets of water are connected together by rivers and navigable canals, and by the same means have communication with the Baltic on the one side and with the Kattegat on the other. In spite of the fact that several rivers pour their floods into these lakes, a process of slow desiccation is going on throughout the region. Indeed the waters of Lake Mälarn are at so low an elevation that at certain seasons there is an inflow from the Baltic. There is a pretty large area of forest in central Sweden, especially around the reed-fringed lakes. The firs of these districts are highly prized for ships' masts. Svealand possesses almost inexhaustible stores of iron and copper, and in less quantities silver, manganese, nickel, zinc, cobalt, and other minerals.

Götaland, the southern division, contains a much higher proportion of cultivated land than either Norrland or Svealand. Wide plains stretch from the lakes to the Kattegat, and these as well as the southern coast provinces are all under agriculture. The rivers are short; the most important is the Göta, which, after forming the picturesque Trollhätta Falls, pours the waters of Lake Vänern into the Kattegat at Gothenburg (properly Göteborg). Iron occurs in certain districts: Mount Taberg, for instance, the culminating point of the plateau, near the southern end of Lake Vättern, is a solid mass of magnetic iron ore. In Scania coal is mined, and large quantities of turf are dug. Turf moors cover a tenth of the area of the country. In the island of Gottland, with its capital Visby, are to be found many Gautish remains.

Population.—Since the middle of the 18th century the population has increased at a steady, though not very rapid, rate. In 1750 it numbered 1,785,727; in 1800 it was 2,347,303; in 1850, 3,482,541; in 1880, 4,565,668; in 1910, 5,521,943. The figures for 1920 are given in the subjoined table (with the areas). By nationality the people are all Swedes, except some 30,000 Finns, 7000 Lapps, and 22,000 foreigners, and two-thirds of the total population are rural. In 1920 there were fifteen towns with a population exceeding 20,000, of which the principal were Stockholm (the capital, 415,201), Göteborg (200,577), Malmö (111,931), Norrköping (57,377), Helsingborg (45,805), Gävle (36,092), Örebro (35,096), and Eskilstuna (30,103). The percentage of illegitimate births increased from about 6 in 1801 to about 14 per cent. in 1924. Less than 5 per cent. of the population receive poor relief. Some 10,000 persons emigrate every year, mostly to the United States.

Province (län).	Area in sq. m.	Pop. (1920.)
GÖTALAND—		
Malmöhus.....	1,871	487,459
Kristianstad.....	2,492	241,018
Blekinge.....	1,173	147,098
Halland.....	1,900	148,712
Göteborg and Bohus.....	1,948	424,788
Kronoberg.....	3,825	158,612
Kalmar.....	4,454	231,077
Jönköping.....	4,447	227,629
Älvsborg.....	4,914	300,371
Skaraborg.....	3,273	243,777
Östergötland.....	4,265	305,742
Gottland (island).....	1,220	55,853
SVEALAND—		
Stockholm (city).....	58	419,440
Stockholm (län).....	2,987	243,194
Uppsala.....	2,051	136,718
Södermanland.....	2,629	190,478
Västmanland (Vesterås).....	2,608	168,815
Örebro.....	3,559	218,506
Kopparberg.....	11,586	254,259
Värmland.....	7,424	268,681
NORRLAND—		
Gävleborg.....	7,615	268,300
Jämtland.....	19,968	133,586
Västernorrland.....	9,856	265,227
Västerbotten.....	22,749	182,246
Norrbottn.....	40,731	182,953
GREAT LAKES—		
Vänern, Vättern, Mälarn, and Hjälmarn.....	3,507	..
Total.....	173,105	5,904,489

Religion and Education.—The state religion is that of the Lutheran Church, ruled by twelve bishops, of whom the Bishop of Uppsala ranks as primate. Except about 22,000 persons, all the population belong to the national church; but choice of religion is perfectly free to every man. In the matter of education Sweden occupies an honourable position amongst the countries of Europe. Primary education is compulsory and free. There is an excellent system of elementary and secondary schools, and there is hardly any illiteracy. Besides normal schools, schools of navigation, and technical schools, there are military, naval, artillery, veterinary, mining, agricultural, and other academies. The highest branches are provided for by the state universities of Uppsala (founded 1477) and Lund (1668); also by the Medical School at Stockholm (1810), and the private universities at Stockholm (1877) and Göteborg (1889). The state universities have extensive and valuable libraries.

Occupations and Industries.—Generally speaking, Götaland is characterised by agriculture, Svealand by mining, and Norrland by forestry. Of the whole surface of the kingdom, more than half is woodland and forest, and about an eighth cultivated land and pasture. More than half of the total population, however, are dependent on agriculture and its associate callings, though in the 19th century the proportion was much higher (in 1870, three-quarters). There are rather less than half a million farms, of which a half are from 5 to 50 acres in area. The principal crops are oats, rye (of which the ordinary bread of the peasantry is made), potatoes, barley, and wheat, beet for sugar, and roots for fodder. Gardening and fruit cultivation are somewhat neglected. There is comparatively little poultry. Some attention is given to the breeding of cattle and sheep, and both are exported. Butter, upon the preparation of which great pains and skill are now expended, is also sent abroad.

Mining has always been very important, and during the last quarter of the 19th century the production of iron-ore multiplied fourfold. At the beginning of the 20th it amounted to 2½ million tons per annum, and in 1924 to 6½ million, most of which was exported. About half a million tons are produced annually both of pig-iron and ingot-iron,

while zinc, copper, lead, manganese, cobalt, silver, and, to a certain degree, coal are also obtained.

The greater part of the forest land is found in Norrland, mostly pine and spruce. The logs are easily floated down the rivers and lakes to the ports, but much of the timber is kept in the country for use in the ironworks and other establishments. There is also considerable water-power, still partly undeveloped, in the north of Sweden, though in 1926 a cable was completed across the Sound, taking electric current from Sweden to Denmark.

The industries of Sweden have grown very rapidly since the middle of the 19th century. In 1870 about 12 per cent. of the population depended on industry and commerce, in 1900 about 29, and in 1920 about 44 per cent. In factories generally, some 380,000 persons are employed, of whom about a fifth are women. The most important branches are timber industries (planing, paper, and saw mills and furniture, match, and wood-pulp factories), iron-works, foundries, metal and mechanical works (telephones, cream-separators, electric motors); also sugar mills and refineries, cotton and woollen spinning and weaving, distilleries, breweries, tobacco-factories, tanneries, flour-mills, glass, porcelain, and chemical works. The old domestic industries—the spinning and weaving of linen and cotton—still survive in some places.

The inhabitants of the skerry-islands and of the coast-lands are mostly fishermen. Herring and sprats are caught off the southern coast; salmon, eels, flounders, mackerel, haddock, and cod are taken off the east coast. The merchant marine consists in over 2500 vessels of about 1,300,000 tons. Every year about 53,000 vessels of 25,000,000 tons enter and clear the ports of Sweden, the chief of which are Göteborg, Stockholm, and Malmö.

Trade and Commerce.—After the Great War the imports averaged £71,000,000 in value per annum, and the exports £66,000,000. At the beginning of this century they averaged £28,000,000 and £21,000,000, and in 1870 amounted to £7,500,000 and £5,000,000 respectively. The chief imports are minerals (mostly coal), raw and manufactured textiles, metal goods (machinery, &c.), corn and flour, while half of the exports are accounted for by wood-pulp and timber, iron and steel also being important. The principal trade is done with the United Kingdom (to the extent of a quarter), United States, Germany, and then with the Baltic countries.

The total length of railways in Sweden amounts to about 9500 miles, of which about 3500 miles (all the principal lines) belong to the state. The system extends right to Luleå (q.v.), and then across Norrbotten to Narvik on the Ojsten Fjord in Norway, this being well within the Arctic circle. There exist a considerable number of canals, the most important being the Göta Canal, connecting Göteborg and Stockholm *viâ* Lakes Vänern and Vättern.

Constitution.—The executive power is vested in the hereditary king, who is advised by a Council of State responsible to the parliament (*riksdag*). The king shares the legislative power with the parliament. He possesses the right of initiative and of veto, except in the matter of taxation. The parliamentary constitution was considerably modified in 1907-9, and again in 1918-21, when the franchise was extended to women. There are two houses, which enjoy equal powers, but sit and vote separately. In both, elections are made by proportional representation, the members are paid, and both sexes are eligible for membership. The First Chamber (150) is elected for eight years (one-eighth being elected each year) by the provincial councils and the municipal councils of certain large towns,

and the members are required to be over the age of 35 and to have a money qualification. The Second Chamber (230) is elected for four years, all at one time, by universal suffrage of both sexes over the age of 23, every elector being eligible for membership. A special committee of the Riksdag is appointed to deal with foreign affairs. The twenty-four provinces and the city of Stockholm are each administered by a governor, or prefect, and a provincial council. The communes (parishes and towns) enjoy a liberal measure of self-government through their own local councils. As a whole, Sweden has become increasingly more democratic in the 20th century.

Justice is administered in the towns by the municipal magistrates and in each rural district by a judge appointed by the king acting with twelve (elected) local assessors, whose verdict, if unanimous, overturns the decision of the judge. Press offences alone are tried by jury. There are three high-court districts, besides the Royal Supreme Court of Stockholm.

Defence.—Military service is compulsory for all Swedes between the ages of 20 and 42. Eleven years are passed in the first line and four years in the second line of the active army (*Bewärning*), and eight years in the reserve (*Landstorm*). Altogether, some 600,000 men could be mobilised in event of war, but the regular peace footing is about 35,000. There is a navy, consisting mostly of destroyers and torpedo-boats for coast-defence. In 1926 an independent air force was created.

Finance.—Since 1920 the budget has been balanced at about £48,000,000 per annum. The chief sources of revenue are the customs and excise duties and the income and property taxes, while the chief items of expenditure are defence and education. Most of the national debt has been incurred for railway-building. Only the Riksbank, the national bank, has the right to issue notes. There are about two and a half million depositors in the savings banks (exclusive of Post-office). A return to a gold standard was made in 1924.

See the official *Historical and Statistical Handbook*, ed. by Guinchard (2d ed. 2 vols. 1914); the annual trade year-books, &c.; the publications of the Swedish Touring Club; Ahlenius and Sjögren, *Sverige, geografisk, topografisk, statistisk beskrifning* (1908 et seq.); Drachmann and Westergaard, *Industrial Development of the Scandinavian Countries* (1915); Sundbärg, *Sweden, its People and its Industry* (1904); P. Fahlbeck, *Regierungsform Schwedens* (1911); H. Key, *La vie économique de la Suède*, (1913); Lundberg and others, *The Swedish Nation* (1921); and books of travel in French by Bellesort (1911), and in English by Du Chaillu (1881) and Steveni (1925).

History.—The early inhabitants of Sweden were in all probability Lapps or kindred Finnish tribes. The modern Swedes are almost pure Nordics, though other elements can be traced. Their ancestors seem to have crossed over to the southern parts of Sweden during the Stone Age, some time before 1500 B.C. They drove the aborigines before them into the forests of the north and settled in their lands. At the dawn of the historic period Sweden was occupied by two Teutonic races, the Götar (the *Geatas* of *Beowulf*, often confused with the Goths) in the extreme south (Gothland or Götaland) and the Swedes (*Svear*) in the lake-region (*Svealand*). Their manners and customs were the same; they spoke dialects almost identical; and their kings, elected by the freemen of the tribes, recognised as their common supreme head the priest-king of the great temple of Wodan at Sigtuna on Lake Mälaren (but at Uppsala from the tenth year of the Christian era). These priest-kings ruled for more than one thousand years from the Christian era. The first dynasty was that of the Ynglings; the last king of which, Ingjald Illrede (died 623), perished

amid efforts to reduce the minor kings to the position of vassal princes. The next dynasty, that of the Skjoldungs, was founded by Ivar Vidfadme (died 647), a mighty conqueror. The most memorable of his successors were the famous Viking kings Harald Hildetand (died 735), Ragnar Lodbrok (794), Björn Jernsida (804), and Olaf Skatkonung (1026). During this long period the Swedes were in the countries round the Baltic what the Danes and Norsemen were on the shores of the North Sea (see NORTHMEN). In the 9th century, however, Scania was conquered by the Danes; and, except for certain short periods, it remained Danish down to the 17th century. Christianity was first preached in Sweden by Ansgar (q.v.) in the 9th century. From the middle of the ensuing century, for fully two hundred years, the Swedes, who clung fanatically to their heathen faith, and the Götar, who, nominally at least, professed Christianity, were generally arrayed in hostile camps. And this in spite of the fact, or rather in great part because of the fact, that an arrangement was come to by which each race should alternately elect the supreme pontiff-king at Uppsala. Nor did the enmity cease after the Swedes became converted to Christianity under St Erik (IX.), whose religious zeal spurred him on to conquer great part of Finland (1155-60), a country that remained an appanage of the Swedish crown for 650 years. For the next century the Goths and Swedes had separate kings; and the clergy turned the ceaseless strife that ensued to their own account. Earl Birger, a man of great ability and conqueror of the rest of Finland, was the real ruler of the country during the reign of Erik XI. (died 1250), the last prince of the Swedish dynasty, as well as during the reign of his own son Waldemar, who was elected—the first of the Folkung kings—to succeed Erik. From the accession of Waldemar the animosities of the Swedes and Götar began to subside, and they gradually melted into one nation.

In the meantime, however, a new source of internal discord had grown up: the incessant wars had fostered the growth of a strong and ambitious nobility, who, with their natural allies, the higher ecclesiastics, not only treated the peasantry with great oppression, and even cruelty, but often either warred upon their king or made him little better than a puppet in their hands. King Magnus I. (1279-90), after deposing and imprisoning his incapable brother Waldemar, governed vigorously, and on the whole justly; he promoted the interests of all classes of his subjects and taught them to respect the law. As his son Birger (1290-1319) was only eleven years of age when he was placed on the throne, the reins of government fell into the wise and able hands of Torkel Knutsson, who added considerably to the territory of Finland and at home simplified the laws. But at length the king, instigated thereto by his brothers, committed a judicial murder upon Knutsson, and began to act arbitrarily. The patriotic party rallied round Mats Ketilmundsson, who guided his country to prosperity through the remaining year or two of Birger's reign and down to his own death in the seventeenth year of the reign of Birger's nephew Magnus II. (1319-63). This sovereign suffered himself to be influenced by unworthy favourites, who involved him in profitless wars abroad and led him into odious tyranny at home. In the end his subjects deposed him and conferred the crown upon his nephew Albert of Mecklenburg (1363-97). But Albert was equally unfitted to govern the turbulent nobles of Sweden; he surrounded himself with German courtiers and soldiers, and in order to support them raised revenues by unjust means, till at length the men whose ambitions he slighted offered the crown (1389) to Margaret (q.v.) of

Denmark, wife of Haco of Norway. This caused strife again; but by the union of Calmar (1397) and the accession of Margaret's grandnephew Eric XIII. the crowns of the three Scandinavian kingdoms became united on one royal head.

During the greater part of the 13th and 14th centuries Sweden was torn by almost constant internal conflicts. Her kings were grasping of power, sometimes incapable, generally tyrannical, and often cruel. Her nobles and ecclesiastics were fierce, turbulent, and unrefined; her people ignorant and rude. Agriculture was much neglected; industry there was none; trade was monopolised by the Hanseatic merchants; literature, learning, and culture scarcely existed at all.

The Swedes' acquiescence in the union of Kalmar was, however, little more than a matter of form. In their hearts all were hostile to it, and they could only be kept tolerably quiet so long as they were governed by native viceroys. Even then they frequently forced to take up arms against the Danes, and many bloody battles were fought; for the king of Denmark had a strong party amongst the Swedish nobles and higher ecclesiastics, whilst the people (peasantry) and certain of the nobles were enthusiastically national. The chief events of the long contest, which lasted until 1524, may be summarily related. In 1434 the peasants of Dalecarlia, the most patriotic and liberty-loving in the country, rose in revolt under a clever mine-owner, Engelbrechtsson. They were quieted by the appointment of Karl Knudson, a Swedish noble, as viceroy of Sweden, to govern in co-operation with Engelbrechtsson. On the death of King Erik's successor (Christopher), in 1448, Knudson was crowned king as Charles VIII. After reigning nine years he was driven out of the country by Christian I. of Denmark, assisted by Archbishop Bengtsson; but he returned in 1467 and reigned till his death in 1470. During the next thirty-three years Sweden was ruled, in an able and enlightened manner, by Knudson's nephew Sten Sture (q.v.). He was succeeded by his nephew Svante Sture (1503-12), and Svante by his son Sten Sture the Younger (1512-20). This ruler, as patriotic and able as his predecessors, was mortally wounded in battle with Christian II. of Denmark. That savage monarch, on 8th November 1520, for the purpose of striking terror into the hearts of the Swedish people, caused ninety-four persons, mostly of noble rank, to be massacred at Stockholm ('the Blood-bath'), and followed up this atrocity by doing to death throughout the country fully five hundred more of the influential among the national party. These deeds roused the Dalecarlians to action: putting themselves under the leadership of Gustavus (q.v.) Vasa, they drove the hated oppressors out of the country, crowned Gustavus king (1523), and tore (1524) to shreds the union of Calmar. The most momentous event in the reign of this the ablest prince who had yet ruled over the Swedes was the adoption of the Reformed doctrines, principally through the exertions of Olaus and Laurentius Petri (q.v.) and the deliberate policy of Gustavus, who in reforming the church took care that the clergy did not make themselves too powerful.

Gustavus so endeared himself to his subjects that they declared (1544) that the throne, instead of being elective as hitherto, should be hereditary in the House of Vasa. Accordingly on his death the crown was given to his son Eric XIV. (1560). In a reign of eight years this prince did many foolish things, and even some arbitrary and cruel acts; he was at length deposed by his brother John III. John, without openly breaking with the Protestant Church, warmly countenanced the

Jesuits in their attempts to recover Sweden for the Roman see. His son Sigismund, who had been chosen king of Poland in 1587, and assumed the Swedish crown in 1592, pursued the same policy, but in a more undisguised and resolute manner. The Protestant party, however, rallying round Sigismund's uncle, made (1600) him King Charles IX. in his nephew's stead. Charles re-established the Lutheran creed, curtailed the privileges of the nobility, fostered mining, laid out seaports, and made the weight of his influence felt in Russia and Germany. His successor was his illustrious son Gustavus (q.v.) Adolphus (1611-32). After his heroic death at Lützen the crown passed to his daughter Christina (q.v.), though for some time the real ruler was the great Oxenstierna (q.v.). By the acquisition, through the treaty of Westphalia (1648), of the ecclesiastical domains of Bremen and Verden, and the greater part of Pomerania, Sweden became a member of the empire. Further, a war with Denmark brought to the Swedish crown certain of the Baltic islands and the three southern provinces of Sweden (Scania). But in 1654 Christina resigned the crown to her cousin Charles (X.), Palgrave of Zweibrücken. Having crushed his Polish rival of the House of Sigismund in a terrible battle near Warsaw (1656), this king finally expelled the Danes from the Swedish continent. The accession of his youthful son Charles XI. in 1660 was signalled by an agreement with the Polish branch, who not only abandoned their claim to the Swedish crown, but gave up Livonia and Esthonia. In the course of an ill-advised war against Denmark and Brandenburg combined the Swedes suffered several military disasters (notably at Fehrbellin in 1675). The king, concluding peace in 1679, set himself energetically to remove the causes of this national humiliation and weakness, and at his death (1697) left his country once more prosperous and powerful. But the ancient foes of Sweden—Denmark, Poland, and Russia—deeming the accession of the youthful Charles XII. (q.v.) a favourable opportunity to recover what they had lost, made common cause against him. As Charles left no heir the nobles conferred the crown upon his sister, Ulrica Eleonore (1718-20), but utilised the opportunity to wrest much of the royal prerogative from her. The new council of state which the nobility chose from their own order made peace with the enemies of Sweden by selling to them the provinces beyond sea, e.g. Bremen and Verden to Hanover, part of Hither Pomerania to Prussia (Further Pomerania was already lost), and Livonia, Esthonia, Ingermanland, and Karelia to Russia. Thus Sweden fell from the rank of a first-rate power which she had held for about a century. All through the reign of Ulrica and her consort, Frederick of Hesse (crowned king in 1720), as well as throughout the long reign of the weak-kneed Adolphus Frederick (1751-71), the kingdom was dominated by the nobles, who, however, were divided into two parties, the Caps, advocates of peace and opponents of royal absolutism, and the Hats, the war party, who were infected with French ideas. Gustavus III. (q.v.), shortly after his accession, abolished the council of state and restored the constitution that had been in force before Ulrica's accession. But neither he nor his son Gustavus IV. (q.v.), in spite of all they did for Sweden, can be called a wise and successful king.

The principal figure in the reign of the next sovereign, Charles XIII. (1809-18), was the French general Bernadotte, who was adopted as heir to the Swedish crown in 1810, and the principal event the acquisition of Norway (1814). Bernadotte succeeded as Charles XIV. (q.v.) in 1818, and in a reign of twenty-six years directed his energies to such schemes as the making of roads and canals, the

cultivation of barren tracts of country, the improvement of the finances and of education. Constitutional reform, replacing the old diet of four estates by a parliament elected largely from peasantry and bourgeoisie, was not carried under Oscar I. (1844-59), but midway through the reign of Charles XV. (1859-72). Sweden has enjoyed uninterrupted peace since 1814, although she came within sight of war with Prussia (on behalf of Denmark) in 1848, with Russia at the Crimean war and the Polish rising of 1863, with Prussia and Austria in 1864, and with Norway in 1905. Oscar II. (1872-1907) was personally popular. But the relations between democratic Norway and aristocratic Sweden had never been very cordial; the Norwegians, thinking that the Swedes did not give them perfect equality, had latterly insisted on separate consular representation abroad; and when in 1905 the Norwegian Storting formally claimed this right, the king vetoed it. Thereupon the Storting declared the union dissolved. The Swedes protested, but amicable arrangements were made by both countries to make the separation formal; and by the end of the year the kingdom of Norway had its new (Danish) king (see NORWAY).

The history of the first quarter of the 20th century can be divided into four heads. (1) The growth of industrialism (see *Occupations and Industries*) has been accompanied by the inevitable rise of trade unions and of employers' associations, while the state has associated itself with many important enterprises. After the Great War, Germany entered the lists again as a serious competitor for Swedish trade. (2) As regards the liquor question, drunkenness, formerly the great national weakness, has now enormously decreased, all traffic in drink being now regulated by the state or by the local authorities. Chiefly owing to the efforts of a preacher, Peter Wieselgren, the 'Göteborg system' of selling liquor was first put into practice in 1855 (the principle being that all profits, beyond interest on the capital, go to the state), but it was made general only by 20th century legislation and endeavour chiefly through the scheme of G. Bratt. See LIQUOR LAWS. (3) The Great War forced Sweden into a state of armed neutrality, but, owing to her geographical position, she suffered severely from the blockade of the Allies. Recourse was had to food-rationing, and the cost of living went up. Costs of production and wages increased rapidly, but the inevitable reaction and depression brought about the serious economic crisis of 1920-21. (4) The problem of national defence has occupied much attention. Owing, firstly, to pre-war Russian activities in Finland, and then to the close proximity of belligerents of both sides during 1914-18, the Swedish defence forces had to be maintained on a large scale, with a consequent drain on the treasury, but in 1925 reductions in the personnel of both army and navy were made. The dispute with Finland over the Åland Islands (q.v.) was settled by the League of Nations in 1921 in favour of Finland.

See the standard native histories of Fryxell (1831), Geijer, Malinström (1893-1901), and Hildebrand and Stavenow (1921, *et seq.*); various works by R. N. Bain, including *History of Scandinavia, 1515-1900* (1905); Stefansson, *History of Denmark and Sweden* (1916); Maury, *Problèmes scandinaves, 1914-18* (1918); and works in German by Arnheim (1917) and Kjellén (1918), and in French by Coussange (1914).

Literature.—Setting aside what was written in the Old Norse tongue (see ICELAND, DENMARK, RUNES), there is very little Swedish literature before the Reformation, except a few provincial law-codes, translations of French romances, some folk-songs, chronicles, religious and devotional

works, and translations of parts of the Bible Olaus and Laurentius Petri (q.v.) brought the Reformation doctrines into Sweden, translated the Bible into good Swedish, and manifested an enlightened regard for their mother-tongue. For several years the principal books were theological and historical, such as the sermons of Matthiä (1592-1670) and Svedberg (1653-1735), which are still read. King Gustavus Adolphus founded the library at Upsala and gave direct encouragement to historical research, as by employing Schroderus (died c. 1650) to translate foreign historical works. Messenius (1579-1637) wrote an ambitious history of Sweden in Latin, and illustrated it by a series of historical plays in Swedish, that stood in high repute for more than a century. Political pamphlets and newspapers began to appear about the time of the Thirty Years' War. Bure or Buræus (1568-1652), besides constructing a fantastic scheme of universal knowledge, did sound work in Swedish mythology and language (runes).

But the title of 'Father of Swedish Literature' is usually accorded to Stjernhjelm (1598-1672), who composed didactic and humorous poems in the style of the classic epics. Baron Rosenhane (1619-84), in sonnets (*Venerid*), songs, and lyrics, composed in the manner of the French and Italian Renaissance writers, and 'Eurelius' or Dahlstjerna (1658-1709), in a patriotic epic (*The King's Poet*), and in heroic songs, strove to improve the current standards of literature. The Finlander Frese (1691-1728), who wrote very fair poetry, and Sweden's first satirist, Triewald (died 1743), who attacked the older writers, carry us on to Dalin (1708-63), who used his mother-tongue with an elegance and ease never previously attained. The *Argus* was conducted by him in the style of Addison's *Spectator*, and of his other works may be mentioned the witty allegories *Swedish Freedom and Saga about a Horse*. Hedvig Nordenflycht (1718-63) won great fame by her *Sorrowing Turtle-Dove*, a collection of *in memoriam* lyrics. After Dalin's death the leading poets were Count Creutz (1729-85), a Finlander, whose pastoral idyll *Atis and Camilla* was long admired, and Count G. F. Gyllenberg (1731-1808), though none of his books take very high rank. In prose the most notable writers were Mörk (died 1763), author of a didactic romance in the French style, *Adalrik and Göthilda*; Wallenberg (1746-78), who wrote an original work of travel (*My Son at the Galleys*), and the best tragedy (*Susanna*) in the pseudo-classic style since Dalin; and Count von Höpken (1712-89), composer of elegant *éloges* and rhetorical addresses.

But the strength of Swedish intellect in the 18th century seems to have been chiefly expended in the departments of science, as the following names conclusively attest—the Elder Rudbeck (1630-1702), a man of universal scientific attainments and author of *Atlantid or Manheim* (in both Swedish and Latin), a book, learned, bold, imaginative, written to prove the identity of Sweden with the Paradise of the Bible as well as with the Atlantis of Plato; the Younger Rudbeck (1660-1740), a botanist; Celsius (1701-44), whose name is perpetuated in the thermometric scale; the traveller Forskål (1732-6); Rosén or Rosenstein (1706-73), the founder of Swedish medicine; the great Linnæus (1707-78); the chemists Bergmann (1735-84) and Scheele (1742-86); and Ihre (1707-80), who compiled the first Swedish dictionary. The mystic Swedenborg (1688-1772), who, however, wrote in Latin, also belongs to this period.

The golden age of Swedish literature is coincident with the reigns of Gustavus III. and IV. (1771-1809). On its threshold stands Bellman (1740-95), an improvisatore of the highest genius. His finest work is *Fredman's Epistles*, songs that for gay

humour and witty observation are unmatched in the language. Gustavus III., besides the direct and substantial encouragement he gave to the best literary talent amongst his subjects, founded the Swedish Academy (1786), and tried his royal hand at the drama. The foremost *littérateur* of his reign was Kellgren (1751-95), who made the *Stockholm Post* the supreme organ of literary taste in Sweden. In its pages a memorable feud was fought out between the writers of the old (Lutheran) school and the champions of revolutionary views borrowed in great part from the French encyclopædists. With this, however, a purely literary conflict was intertwined, carried on between the partisans of the pseudo-classic standards and the advocates of nature and romanticism. Kellgren, who adhered to the pseudo-classic (French) models, excelled in satiric and lyric poems: his *New Creation* is esteemed one of the finest poems in the language; and in conjunction with the king he composed two lyric dramas, *Gustaf Vasa* and *Christina*. Kellgren's ablest ally was Leopold (1756-1829), a master of polished prose, an excellent critic, and formidable and unsparing satirist, who wrote also in verse—odes, narrative and didactic poems, and weak pseudo-classic dramas. Their principal opponent was Thorild (1759-1808), who urged his contemporaries to cultivate something besides mere form, to emancipate themselves from the trammels of rule and law, and draw inspiration directly from nature. Nevertheless the standards of his rivals, although somewhat modified, continued for many years, chiefly through the Academy, to govern the taste of Swedish writers. Besides the three principal contestants the following participated in the fray: Rosenstein (1752-1824), who wrote on æsthetic and popular philosophic themes; Adlerbeth (1751-1818), author of some successful classic dramas and of greatly admired translations of Virgil, Horace, and Ovid; Count Ehrensvärd (1745-1800), whose æsthetic writings are couched in excellent Swedish prose; Count Oxenstjerna (1750-1818), famous for poetic descriptions of nature and humorous and didactic poems, as well as for a good translation of *Paradise Lost*; the poet Lidner (1759-90); and a couple of humorous writers—Kexél (1748-96) and Hallman (1732-1800). Lindegren (died 1815) wrote comedies in the light and sentimental style of Kotzebue. Höijer (1767-1812) is perhaps the ablest and most original philosophical thinker Sweden has produced.

After Leopold's death the mantle of his literary dictatorship was divided between Anna Lenngren (1754-1817) and the Finlander Franzén (1772-1847). The lady, a typical Swedish nature, celebrated the virtues of domestic life with great truth and much poetic feeling. Franzén's lyrics excel in the best qualities of the poets of Finland—a pious naïveté, depth and refinement of feeling, simplicity and clearness of language, and great beauty of versification. Moreover he wrote very good prose (biographies). He is the main link between the Gustavian Academicians and the romantic schools. Archbishop Wallin (1779-1839), besides other poetry, wrote admirable hymns.

Very early in the 19th century ideas akin to those of the German romantic school were promulgated in Sweden by Hammarsköld (1785-1827), a good critic and historian of literature; Livijn (died 1844), author of some extravagant romances and songs; and Askelöf (1787-1848), editor of the magazine *Polyfem*, which, until it was supplanted by *Fosforos*, was the literary organ of the new school. These innovators encountered a good deal of ridicule from the old school, especially from Wallmark (died 1858); and for a time another literary war was waged. But this time the new way of looking at things proved too strong for the

Academic champions. The romanticists received valuable support from Atterbom (1790-1855), one of the best lyric poets (cf. *Fågel Blå, Sångertott, &c.*) of Sweden; from Palmblad (1788-1852), who wrote good romances (*Falkensvärd* and *Aurora Königsmarek*) and clever polemical and miscellaneous works; Dahlgren (1791-1844), whose satire approaches Leopold's and Kellgren's in wit and polish, and whose humorous poems and novels recall Bellman's happiest effusions; Börjesson (1790-1866), the author of one of the best dramas (*Erik XIV.*) in the Swedish tongue; and Agadh (1785-1859), a distinguished publicist. This movement dethroned didactic and pastoral in favour of lyric and epic poetry. There was, however, a richer and more momentous tendency operating contemporaneously with the romantic movement. Atterbom indeed directed attention to the ancient Scandinavian mythology, but it was Geijer (q.v.), no less eminent as a poet than as a historian, who pointed to the manly virtues of the Swedes' ancestors as models for imitation and sources of poetic inspiration. Tegnér (q.v.) showed in his early poems considerable sympathy with the approved Academic standards; but eventually he moved into line with Geijer, and thus stationed himself midway between the pseudo-classic and romantic schools. Around these great leaders of the 'Gothic revival' were grouped a crowd of less gifted writers, the more noteworthy of whom were Ling (1776-1839), who, although he wrote one good drama (*Agne*) and some poems, is best remembered as having convinced his countrymen of the educative importance of gymnastics; Nicander (1799-1839), a lyric poet and author of a promising tragedy; Beskow (1796-1868), a biographer and excellent dramatist (*Thorke Knutsson*); Afzelius (1785-1871), who composed sentimental tales in melodious verse and along with Geijer edited the first collection of Swedish folk-songs; and Gumælius (1789-1877), the writer of a first-rate historical novel (*Thord Bonde*, in 1828). Next came half-a-dozen authors who stood more or less apart, each by himself. Almqvist (1793-1866), a man of brilliant genius and almost universal knowledge, and master of an exquisite style, excelled, despite his ultra-romanticism, in nearly all departments of literature; his best books are novels (*Book of the Rose* and *The Palace*). Stagnelius (1793-1823), another pronounced romanticist, is esteemed one of Sweden's best lyric poets, chiefly on the strength of the mystic *Lilies in Sharon*; an almost equal excellence distinguishes the grand epic *Vladimir the Great* and the dramas *The Bacchantes* and *The Martyrs*. The satires of Sjöberg or 'Vitalis' (1794-1828) compare not unfavourably with those of Leopold. Satire, too, is the principal note in Bishop Fahlcrantz's (1790-1866) *Noah's Ark*, and in the witty but often coarse improvisations of Wadman (1777-1837) and Detlof von Braun (1813-60). Cederborgh (1784-1835), although he wrote celebrated romances (*Uno von Trasenberg*, *Ottar Tralling*), does not belong to the romantic school. Böttiger (1807-78) and B. E. Malmström (1816-65) published poetry of more than average merit. 'Talis Qualis' or Strandberg (1818-77), besides writing the satirical and fiery *Songs in Harness*, made an excellent translation of Byron. Wennerberg's (born 1817) student-songs take the same place in Sweden as Von Scheffel's do in Germany.

But a long way the most illustrious poet of the 19th century was the Finlander Runeberg (q.v.), a man of almost the highest poetic genius, but Rydberg (1828-95) was also much admired for his beautiful lyrics. Amongst the remaining poets of the same idealist period may be mentioned Sturzen-Becker or 'Orvar Odd' (1811-69), King

Oscar II. (1829-1907), Count Snoilsky (1841-1904), Af Wirsén (1842-1912), and Bååth (1853-1912). The 19th century more than atoned for the paucity of novelists in its predecessors. Amongst the earliest to write in the modern realist spirit was Sophia von Knorring (1797-1848), who described the domestic life of aristocratic circles. But she is overshadowed by Frederika Bremer (q.v.) and Emilie Flygare-Carlén (1807-92), whose stories of the western skerries (*A Merchant's House in the Skerries*, *The Rose of Tistelön*) were deservedly very popular. Of the other sex Mellin (1803-76) and Sparre (1790-1871) cultivated the historical novel with more or less success. Wetterbergh or 'Uncle Adam' (1804-89) was a warm favourite for his democratic tales and his simple and humorous *Genre Pictures* of Swedish life. Rydberg the poet won fame also for his semi-historical novels (*The Last Athenian*, *Roman Days*) and learned work on Scandinavian mythology. Crusenstolpe (1795-1865) and 'Orvar Odd' are, like Rydberg, held up as models of Swedish prose—the former in novels, the latter in sketches and vignettes of Swedish life and in essays and critical papers. The poet Topelius (1818-98) produced perhaps the most artistic historical novels in modern Swedish literature: his (prose) *Army Surgeon's Stories* ranks with Runeberg's *Ensign Stål's Tales*.

The light comedies of Blanche (1811-68) and of Jolin (1818-84), as well as the short stories and sketches of the former, run in the same vein of practical liberalism that distinguishes the novels of 'Uncle Adam' and the verse of 'Talis Qualis' and 'Orvar Odd.' The plays of Frans Hedberg (1826-1908) are somewhat more serious in aim. F. A. Dahlgren (1816-95) translated Shakespeare, Calderon, and Heiberg, and wrote a good popular play (*The Vermlanders*) and memoirs of the Stockholm stage. The poet Bäckström (1841-86) wrote some good lyric dramas.

At the end of the 19th century a whole literature grew up out of the social problems and discussions of the day, especially the questions of literary realism *versus* idealism, and of the relations of the sexes. The novel and the drama were the favourite forms of this literature; and deep earnestness, often bitter and pessimistic in mood, and a keen spirit of contention characterised most of its writers. The foremost in this 'modern' movement was Strindberg (q.v.); his fellow-workers, or more frequently antagonists, were Af Geijerstam (1858-1909); Tor Hedberg (1861); Fru Agrell (1849), a playwright; Victoria Benedictsson or 'Ernst Ahlgren' (1850-88), in the excellent novels *Fru Marianne* and *Money*; Anna Leffler (1849-92), novelist and playwright; and Selma Lagerlöf (q.v.), authoress of *Gösta Berlings Saga* and a writer of great poetic imagination and psychological intuition. In opposition to the sombre Naturalistic school may be set the romantic novelist von Heidenstam (1859) and the poets Oskar Levertin (1862-1906) and Fröding (1860-1911), whose works are full of richness of colour. Other names worth mentioning are those of the dramatist Molander (1858-1900), the poet Ossianmilsson (1875), the short-story writer Hallström (1866), the essayist Ellen Key (1849), and the novelists Hansson (1860), Söderberg (1869), and Melsted (1875).

The chief representatives of the more special departments of literature during the 19th and 20th centuries can only be briefly enumerated. Historians: Geijer (q.v.), Fryxell (q.v.), Strinnholm (1786-1826), Carlsson (1811-87), Axelsson, Odliner, and Bååth; the principal historians of literature are quoted in the bibliography subjoined to this article. Literary critics: Olof Hansson and the Finlander Vasenius. The ancient civilisation and antiquities of Sweden: Montelius (born 1843), H.

Hildebrand (1842), B. E. Hildebrand (1806-84), Nilsson (1787-1883), Rydberg, and Nyström. Church History: Cornelius, Reuterdaahl (1795-1870), and Anjou (1803-84). Bostrom (1797-1866) was an able philosopher. The most popular writers of devotional and religious books have been the poet Franzén, Schartau (1757-1825), Wallin, and Thomander (1798-1865). Philology boasts of Rydqvist (1800-78), Sive (1812-76), and Reitz (1815-68); law and jurisprudence of Schlyter (1795-1888) and Holmsbergsson (1764-1842); painting of Larsson (1853) and Anders Zorn (1860-1920); sculpture of Karl Milles and Karl Eldh (1873); ethnology of Retzius (1796-1860) and Hazelius (1833-1901); botany of Fries (q.v.); zoology of Nilsson (1787-1883); chemistry of Berzelius (q.v.) and Arrhenius (1859); and geographical exploration of Andrée (1854-97), Norden-skiöld (q.v.), and Sven Hedin (1865). Sweden has taken a very special part in the culture of the world by the Nobel prizes, first presented in 1901 out of the foundation left by the inventor Nobel (q.v.).

There are two large standard histories of Swedish literature, both in Swedish, that of Schück and Warburg (illustrated, 1896), and that of Böök, Castren, Steffen, and Sylwan (new ed. 1926). See also the standard native works of Ljunggren (1818-19), Fryxell, Malmström (1866-68), and Nyblom (1873-84); various studies by Vasenius (1887), Schück, Warburg, Hansson, Levertin (1904), and Böök; Schweitzer, *Geschichte der skandinavischen Literatur* (1886-89); Boyeson, *Essays on Nineteenth-Century Scandinavian Literature* (1895); Hofberg's Biographical Dictionary, in Swedish (1906); *The Oxford Book of Scandinavian Verse*, ed. Gosse and Craigie (1925).

Swedenborg, EMANUEL, was born in Stockholm, 29th January 1688, and died in London, 29th March 1772. His father was Jesper Svedberg, subsequently Bishop of Skara. Swedenborg's lifetime divides itself into two distinct periods; the first, ending with his fifty-fifth year, was given to business, science, and philosophy; the second, of nearly thirty years, was devoted to theology and spiritual communion. Swedenborg was educated at Uppsala, and subsequently travelled for four years in England, Holland, France, and Germany. On his return to Sweden he was appointed by Charles XII. an assessor in the College of Mines, and rendered some service to that monarch at the siege of Frederikshall as military engineer. The family was ennobled in 1719, and the name changed from Svedberg to Swedenborg. Swedenborg is sometimes styled Count or Baron, but erroneously; he was neither, though he had a seat in the Swedish House of Nobles as the head of his family. His mind at this time was busy with mechanical and economical projects. He published short treatises on algebra, giving the first account in Swedish of the differential and integral calculus; on a mode of finding the longitude at sea by the moon; on decimal money and measures; on the motion and position of the earth and planets; on the depth of the sea, and greater force of the tides in the ancient world; on docks, sluices, and salt-works; and on chemistry as atomic geometry. In 1724 he was offered the professorship of mathematics at Uppsala, which he declined from a dislike of non-practical science. Abandoning desultory studies, he devoted himself for ten years to the duties of his assessorship and to a systematic study of the methods of mining and smelting at home and abroad, and to the construction of a theory of the origin of creation. The result appeared at Leipzig, at the expense of the Duke of Brunswick, in 1734, in three massive folios, beautifully illustrated, entitled *Opera Philosophica et Mineralia*. The second and third volumes describe the best

methods employed in the manufacture of iron, copper, and brass. The first volume, entitled *Principia, or the First Principles of Natural Things, being new Attempts towards a Philosophical Explanation of the Elementary World*, is an elaborate deduction of matter from 'points of pure motion produced immediately from the Infinite.' This was followed in the same year by *Philosophical Argument on the Infinite, and the Final Cause of Creation; and on the Mechanism of the Operation of Soul and Body*, carrying the doctrine of the *Principia* into higher regions, and resolving the soul into points of motion, the soul being treated as one in substance with the sun. Dissatisfied with his conclusions, he determined to track the soul to its inmost recesses in the body. His studies in human anatomy and physiology with this end in view were embodied in his *Economy of the Animal Kingdom* (2 vols. 1741) and his *Animal Kingdom* (3 vols. unfinished, 1744-45).

At this point his course as a natural philosopher was arrested, and he entered on his career as spiritual seer. The particulars of the transition are recorded in his diary for 1743-44, and comprise a variety of curious dreams and strange communications; he now professed to enjoy free access to the spiritual world. He resigned his assessorship in 1747, that he might devote himself to the office to which the Lord had called him. In 1749 he made his first public utterance in his new character in the issue in London of the *Heavenly Arcana* (1749-56, 8 vols. 4to.). His life henceforward was spent chiefly between Stockholm, London, and Amsterdam, in writing and printing a variety of works in exposition of his experience and doctrines. There is little in any of these which is not to be found in outline at least in the *Heavenly Arcana*, and a note of its contents may serve, therefore, as a general description of the whole. With many digressions, the *Heavenly Arcana* is a revelation of the internal or spiritual sense of Genesis and Exodus. The early chapters of Genesis are a fragment of an older Word, preserved at this day in Tartary, and are an allegorical and not a literal history. Adam signifies the Most Ancient Church, and the Flood its dissolution; Noah, the Ancient Church, which falling into idolatry was superseded by the Jewish. The spiritual sense pervades the Scriptures, which are the genuine Word of God, as the soul does the body. The exceptions are Ruth, the Chronicles, Ezra, Nehemiah, Esther, Job, Proverbs, Ecclesiastes, the Song of Solomon, the Acts of the Apostles, and the Epistles. These books have an edifying natural sense like other good productions of human authors, but, inasmuch as they do not possess the internal sense, they are not held to be inspired. The Scriptures are read in heaven in their spiritual sense, but, as that sense treats exclusively of God and man as a spiritual being, it is void of every reference to earthly scenes, persons, and events. By reason of its symbolism of the inward sense, the letter of Scripture is holy in every jot and tittle, and has been preserved in immaculate perfection since the hour of its Divine dictation. The Jewish dispensation having reached its period, God appeared in Jesus Christ; He assumed human nature in its humblest condition in the Virgin, wrought it into conformity with Himself, 'glorified and made it Divine.' The effluence from the Lord's Divine humanity is the Holy Spirit. In a sense the reverse of Socinian, Swedenborg was a Unitarian; he saw God in the Saviour, and regarded Him as the sole object of worship. The church initiated by the Divine Advent came to an end in the 18th century, and Swedenborg witnessed the Last Judgment effected in the year 1757 in the World of

Spirits. Then commenced a new dispensation, signified by the New Jerusalem in the Revelation, of which Swedenborg was the precursor, and his writings contain the doctrine. To the objection, that the doctrine is strange and novel, he replied that mankind were not prepared for its reception before that time, and that the early Christians were too simple to understand it.

One object of his mission was the revival of the lost science of correspondences—the science of sciences in the most ancient times. The law of correspondence is universal; the natural world is the outbirth of the spiritual world, and the spiritual world of the invisible mental world. Unseen evil is manifested in things hurtful and ugly, unseen good in things useful and beautiful. Man is a summary of nature; nature is man in diffusion; all things, therefore, in nature—fire, air, earth, and water—every beast, bird, fish, insect, and reptile—every tree, herb, fruit, and flower—represent and express unseen things in the mind of man. The Scriptures are written according to correspondences, and by aid of the science their mysteries are unlocked. By it, too, the constitution of heaven and hell is revealed. There are three heavens, consisting of three orders of angels: the first distinguished for love, the second for wisdom, and the last for obedience. All angels have lived on earth; none were created such. They are men and women in every respect; they marry and live in societies in cities and countries just as in the world, but in happiness and glory ineffable. All in whom love to God and man is the ruling principle go to heaven at death. Between heaven and hell a perfect equilibrium is maintained. As there are three heavens so there are three hells, and every angelic society has an infernal opposite. Hell, as a whole, is called the Devil and Satan; there is no individual bearing that name. All in whom self-love is the ruling motive go to hell. There is no resurrection of the earthly body. Every one passes to his final lot at death, some making a short sojourn in an intermediate state, designated the World of Spirits, where the good are cured of their superficial infirmities and intellectual errors, and where the evil are stripped of all their pretences to good. Swedenborg's other notable works (all first published in Latin) are *Heaven and Hell*, *The New Jerusalem and its Heavenly Doctrine*, *Angelic Wisdom concerning the Divine Love and the Divine Wisdom*, *Angelic Wisdom concerning the Divine Providence*, *The Apocalypse Revealed*, and *The Delights of Wisdom concerning Conjugal Love*; his whole translated theological works numbering forty volumes of a good size.

Swedenborg professed to enjoy acquaintance with many departed celebrities, and some of his verdicts on character reverse the estimates of history. Nor was his intercourse confined to spirits from earth, but extended to souls from the moon and the planets. For these visions, experienced whilst sitting in his chamber, he had this explanation: although in the spiritual world there are *appearances* of space, there is nothing of the objective reality which here divides London from Melbourne. If one spirit desires to see another, the desire instantly brings them together. A good man is, as to his mind, in heaven, and an evil man in hell; and supposing the spiritual sight of either were opened—i.e. if the eyes of the spiritual body, which transfuse and animate the material ones, were disengaged from their fleshly vesture—he would see his spiritual companions and the country where he would abide after death.

The grand and distinctive principle of Swedenborgian theology, next to the doctrine of the Divine Humanity, is the doctrine of life. God alone lives. Creation is dead—man is dead; and their appar-

ent life is from the Divine presence. God is everywhere the same. It fallaciously appears as if He were different in one man and in another. The difference is in the recipients; by one He is not received in the same degree as another. A man more adequately manifests God than a tree; that is the only distinction. The life of devils is God's presence perverted in disorderly forms. 'All things, and each of them to the very uttermost, exist and subsist instantly from God. If the connection of anything with Him were broken for a moment it would instantly vanish; for existence is perpetual subsistence, and preservation is perpetual creation.' By this law of life is explained man's self-consciousness, freedom, and personality—notions communicated from God to man.

Swedenborg made no attempt to establish a sect. When he proclaimed the Christian Church at an end, his expectation was that a new church would be raised up among the Gentiles; but towards the close of his life he spent his energies in attacking orthodox theology, Catholic and Protestant, as if bent on the conversion of Christian lands, but especially of northern Europe. All his works were written in Latin, and received small measure of attention from his contemporaries. Swedenborg was shrewd in worldly affairs, affable in society, and discussed politics and finance in the Swedish Diet like a man of the world, and that for nearly a score of years after he began to write and publish his theological works. He was never married. His diet was chiefly but not wholly vegetarian. In 1908 his body was removed from St George's-in-the-East in London to Stockholm for reinterment.

The Swedenborgians—properly 'The New Church signified by the New Jerusalem in the Revelation'—were first organised as a distinct denomination in 1788 by Robert Hindmarsh (1759–1835), a printer in Clerkenwell, who became one of the first ministers. The church, which accepted Swedenborg's voluminous theological writings as containing a revelation from heaven, gradually increased in numbers. There have always been a number of receivers of the doctrines of Swedenborg among the clergy of the Church of England. The first translator of the *Heavenly Arcana* and many of the other theological writings of Swedenborg was the Rev. John Clowes (1743–1831), rector of St John's, Manchester, for sixty-two years, who both in the pulpit and in his numerous publications made no secret of his faith. From the first, those who accepted Swedenborg's teachings have been divided into separatists and non-separatists.

See the Lives by Wilkinson (1849), White (1867), and Trobridge (1907); Tafel, *Documents concerning the Life and Character of Swedenborg* (3 vols. 1875–77); the Handbook to Swedenborg's Philosophy, by Warren (1885); and the Bibliography collected by Hyde (1906).

Sweeps are oars of great length used during a calm or in still water, either to assist the rudder or to propel the vessel. See also CHIMNEY.

Sweepstakes, a method of gambling by which several persons contribute each certain stakes, the whole of which fall to one when a certain event happens. In the case of horseraces, each contributor gets either a horse or a blank (by lot or otherwise), and the one whose horse wins takes the stakes, though often the other horses that are 'placed' secure a share for those who have drawn them. Raffles and sweeps are illegal, though constantly carried on without interference from the authorities (see GAMBLING). The Pari-Mutuel is a kind of sweepstakes (see BETTING).

Sweet, HENRY, born in London, 15th September 1845, studied at Heidelberg and Oxford. He published many Old and Middle English texts, readers, and primers, and works on comparative philology

and phonetics, including *An Anglo-Saxon Reader* (1876-87), *Oldest English Texts* (1885), texts of King Alfred, *A History of English Sounds* (1874; new ed. 1888), *Elementarbuch des Gesprochenen Englisch* (1885), *The Student's Dictionary of Anglo-Saxon* (1897); and did much to introduce rigorously scientific conceptions and methods in philology from Germany to England. He died 30th April 1912. His *Collected Papers* were edited by H. C. Wyld (1913).

Sweet Bay. See LAUREL. For Sweet Brier, see ROSE; and for Sweet Flag, CALAMUS.

Sweetbread. See PANCREAS.

Sweet Pea. See LATHYRUS.

Sweet Potato (*Ipomœa Batatas*), a twining or climbing plant of the Convolvulaceæ, with stems 5 or 6 feet long trailing on the ground or clambering over neighbouring shrubs. The leaves are 5 or 6 inches long, heart-shaped at the base; the flowers pale purple, closely resembling those of the common convolvulus or bind-weed. It has been long cultivated in the tropical and subtropical countries of both hemispheres, and its native country is a matter of conjecture. It appears to be first mentioned by Pigafetta, an author of the 16th century, who found the root much used by the Indians of Brazil as an



Sweet Potato (*Ipomœa Batatas*).

article of food. It was introduced into Spain about 1519, and the roots were known in England some time before the introduction of the potato, with which they were often confounded by the earlier writers on the latter. English supplies in those times were obtained from Spain and the Canary Islands, and the roots, when steeped in wine or made into sweetmeats, were regarded as restorative of failing vigour. The plant is cultivated in India, China, Japan, the Malayan Archipelago, throughout tropical America, and in the southern United States, in southern Europe, the Canary Islands, Madeira, and North Africa. The roots grow to a great size—to as much as 50 lb. weight, according to some authorities, in Java, but the ordinary average is from 3 to 12 lb. In favourable conditions in the United States the yield per acre is from 200 to 300 bushels. The taste of the roots is sweetish and agreeable, and they are considered to be superior to the common potato in flesh-forming matters. *I. Jalapa*, a species of Mexico, though purgative, is not the source of the true jalap of the pharmacopœia, as its name suggests, but is so called on account of its being very common in the vicinity of the Mexican town Jalapa. *B. digitata*, which has a very wide geographic

distribution, is commonly cultivated for food in western tropical Africa. The South-west African *I. Seineri* has tubers of several hundredweights, eaten by the natives, but neither palatable nor digestible for Europeans. It has a cream-coloured milky juice. From the seeds of another species the textile material named Natal Cotton is obtained; it has some resemblance to the true cotton. For *I. Purga*, see JALAP. See also IPOMœA.

Sweet William. See PINK.

Swetchine, MADAME (*née* Soymanof), was born at Moscow in 1782, joined the Roman Catholic communion under the influence of Joseph de Maistre in November 1815, and settled in France about the end of 1816, dying at Paris in 1857. For about forty years she maintained at Paris a famous salon, characterised by the remarkable peculiarity of a distinctly theological bias. Her husband, General Swetchine, was a quiet, inoffensive man, twenty-five years her senior; she herself was small and plain, with a Calmuck nose and ill-matched eyes; yet she possessed a spiritual beauty and a charm of personality of altogether unusual kind. Her passionate nature had early found safety and perhaps happiness in rigidity of principle and an austere love of heaven; she never had a child; and almost from youth until the end her life was marked with more than the enthusiasm of the convert. Yet she tempered the ardour of zealous and propagandist orthodoxy with all the courtesy of the great world. The church had granted her the rare indulgence of a private chapel in her house, and from the dialectic play of intellect in the salon she passed easily to rapt worship and spiritual communion with God. Her letters and writings, such as those on *Old Age and Resignation*, show subtle thought and elevation of tone, if scarcely distinction of style, but lack the peculiar charm that belonged to her personality, and scarcely justify the enthusiasm of her group of friends whose admiration soon passed into worship.

See M. de Falloux, *Madame Swetchine, sa Vie et ses Œuvres* (2 vols. 1860), and her *Lettres*, by the same editor (2 vols. 1861); also Sainte-Beuve, in *Nouveaux Lundis*, vol. i., and E. Scherer, in *Études sur la Littérature Contemporaine*, vol. i.

Swietenia. See MAHOGANY.

Swift, a genus (*Cypselus*) and family (*Cypselidæ*) of Picarian birds, resembling the swallows in general appearance and habits, but most closely allied by anatomical structure to the humming-birds. They may be distinguished by external characters from swallows thus: 'the swifts have ten primaries, not more than seven secondaries, and only ten tail-feathers, while the swallows have but nine primaries, at least nine secondaries, and twelve tail-feathers.' They have long pointed wings, a short tail, and possess remarkable powers of rapid and prolonged flight. The bill is short, depressed, and weak; the gape wide and fringed by bristles. The legs and toes are short and weak. In distribution the swifts are almost cosmopolitan, but are absent from New Zealand. Two groups are recognised, (*a*) the *Micropodinae*, or true swifts, with the first toe directed more or less forwards, and a reduced number of phalanges in the third and fourth toes, and (*b*) the *Chaeturinae*, with the first toe directed backwards and the normal number of phalanges in the third and fourth toes. The Common Swift (*Cypselus apus*) is common in almost all parts of the north of Europe and Asia in summer, retiring to tropical or subtropical regions in winter, extending its migrations to the extreme south of Africa. It occurs even in Lapland. Its residence in its summer quarters is much shorter than that of swallows; and it is worthy of

notice that the swift is seldom to be seen along with any of the swallows or martins, the different kinds choosing different localities, even although very close together. The swift is easily recognised in its flight by the remarkably sickle-shaped wings, and its slight scream is very different from the twitter of the swallow. It is bronzed blackish brown, with a white throat; bill, toes, and claws black. It makes its nest in holes in rocks and walls, often in the thatch of houses, crevices in sea-cliffs, quarries, chalk-pits, and trees. The nest is formed of bits of straw, dry blades of grass and bents, feathers, and other such substances, which are apparently glued together by a viscid secretion. The eggs are two in number, and as a rule only one brood is hatched in a season. The swift, like the swallow, seems to return to the same place to nest year after year, and repairs the old nest instead of making a new one. Sometimes it robs martins, sparrows, and even starlings of their nests. Its chief food consists of insects, and the undigested remains are ejected in the form of pellets. The Alpine Swift, or White-bellied



Common Swift (*Cypselus apus*).

Swift (*C. alpinus*), is rarely seen in Britain, but is common in summer on all the high mountain-ranges of southern and central Europe. Eastwards it ranges through Asia Minor and Persia to many parts of India and Ceylon. It is supposed to breed in the extreme south of Africa, where it is common. It builds in high rocks, sometimes in steeples, notably in the cathedral at Bern. It is larger than the common swift, and has a louder note and flies more powerfully. The Needle-tailed Swift (*Acanthylis caudacuta*), an Asiatic species, has been twice found in England, each time in the month of July, but nowhere else in Europe. It is common during summer in south-eastern Siberia, Mongolia, Japan, China, and Tibet; while in winter it migrates as far south as to Eastern Australia and Tasmania. The American Swift (*Chaetura pelagica*) has the hind-toe directed backwards, and the tail-feathers stiff and pointed, as in woodpeckers. It is a small bird, not above $4\frac{1}{2}$ inches in entire length, but one foot in extent of wing. The general colour is brownish black, with greenish reflections, the throat grayish white, the under parts grayish brown. The nest is made of small dry twigs, which the bird breaks off from the tree, and carries away in its feet; and they are attached by means of a viscid secretion to the rock, wall, or hollow tree where the nest is made. From its frequently building in chimneys this

species is known as the *Chimney-swift* in North America, where it is a regular migrant in many parts, wintering in Mexico. Great numbers often build together, sometimes choosing for this purpose an unused chimney in a town. The Swiftlets, genus *Collocalia*, found from India to the Malay Archipelago and in many of the Polynesian islands, one species even in Madagascar, are the builders of edible Nests (q.v.). They breed in deep caves and fix their gelatinous-looking nests, made of mucus unmixed with any vegetable product, to the walls. The nest of one of the true swifts (*Panyptila sancti-hieronymi*) discovered in Guatemala is perhaps still more remarkable, being composed entirely of the seeds of a plant secured together and hung from the under surface of an overhanging rock by the saliva of the bird. 'The whole forms a tube 2 feet 2 inches long by about 6 inches in diameter. The entrance is through the lower end of the tube, and the eggs are placed on a shelf at the top. About the middle of the tube, on the external side, is a protruding eave as if overvaulting an entrance; but there is no hole, and it has the appearance as if it was placed there on purpose in order to deceive some enemy, such as a snake or lizard,' especially during the period of incubation. The Palm Swift of Jamaica (*Micropus phenicobia*) is also a remarkable nest-builder, attaching its nest of feathers and silk-cotton, felted together, to the surface of a spathe or of a leaf by means of its salivary secretion.

Swift, JONATHAN, Dean of St Patrick's, and the greatest of English prose satirists, came of a Yorkshire clerical family on the side of his father (a lawyer and steward of the King's Inns, Dublin); while his mother was Abigail Erick, of Leicestershire stock. He was thus related to two English poets, as a Swift to Dryden—for his grandmother was niece to the poet's grandfather, and as an Erick or Herrick to the author of the *Hesperides*. Jonathan Swift was born on 30th November 1667, seven months after his father's early death, at 7 Hoey's Court, which formerly stood near the Castle at Dublin. The only other child was his elder sister Jane. Left with the miserable provision of twenty pounds a year, his mother returned to her family in Leicester, leaving her son's education to the care of his uncle Godwin Swift, who sent him at the age of six to Kilkenny School (then the best in Ireland), where he had Congreve for a schoolfellow, and in 1682 entered him at the age of fourteen at Trinity College, Dublin. His college career was desultory, probably wild, and certainly unsuccessful; and he only obtained his degree *speciali gratia* in 1686. Two years later the turmoil of the Revolution drove him to England, where in 1689 he was received as secretary into the household of the distinguished statesman Sir William Temple (q.v.)—a distant connection of his mother—at Moor Park in Surrey. His proud and independent nature, however, rebelled against the subserviency of the occupation, and after declining a captaincy of horse offered him by William III., who visited Temple's house, and also a clerkship in the Irish Rolls Office tendered by his employer, he left Moor Park for Dublin, where he took orders (deacon, October 1694; priest, January 1695), and was presented by the Lord Deputy to the prebend of Kilroot, near Belfast, of the value of £100 a year. Country obscurity soon proved even less to his taste than waiting upon a great man's literary inspirations, and he was not sorry in 1696 to resign his prebend and accept Temple's invitation to return to Moor Park, and help him with his papers. By this time Esther Johnson (born at Sheen, 13th March 1681, and baptised with the name 'Hester')—immortalised by Swift under the name of 'Stella'—the daughter of a

gentlewoman who acted as companion to Lady Giffard, Temple's widowed sister, had grown into a charming, beautiful, and intelligent girl, and the kindly solicitude of the young Irishman who guided her education was developing into the enduring affection which became the happiness of their two lives. Swift remained at Moor Park till Temple's death in 1699, when he received a legacy of £100 and the privilege of publishing Sir William's posthumous works (which he brought out between 1700 and 1720). His long residence in the house of a cultivated man of the world, despite the subordination that chafed his sensitive pride, had been useful to him. He had found leisure to study; he read enormously in classical and historical literature; he had been brought into personal relations with the king and the ministers, and had learned the business of the politician, which he was soon to practise with signal success. Moreover, the quiet retirement of Temple's house and the solitude of his Irish cure had given him time to produce a masterpiece and a brilliant *tour de force*—the *Tale of a Tub*, and the *Battle of the Books*. The former is held by some critics to be the greatest of Swift's satires; in style and as an artistic whole it certainly stands first. In none of his works is the satire more pointed, the thought more vigorous, the language more nervous and sustained. The cant of religion, the pretensions of letters, the hypocrisies of every form of false virtue or genius are exposed with the keen enjoyment of the iconoclast; the mask is torn from the solemn shams of the world amid derisive laughter. The young genius rejoices in its strength, and spares nothing in its destructive work; and there is something repellent and sacrilegious in its handling of time-honoured beliefs and institutions, though possibly no profanity was intended. The *Battle of the Books*, an admirable travesty of the idle controversy then waging between Temple, Wotton, Boyle, and Bentley, concerning the comparative merits of ancient and modern writers, is a much slighter work, but full of exuberant vitality and humour. Both were published anonymously, like almost all Swift's works, in 1704.

Soon after Temple's death, failing in his application to the court for preferment, Swift became secretary to Lord Berkeley, one of the Lords Deputies to Ireland, and his wit enlivened the society of Dublin Castle by such jests as the *Petition of Mrs Frances Harris* (1700), in verse, and the parody of Boyle, *A Meditation upon a Broomstick* (1704), in prose. After being disappointed of the deanery of Derry, he was given the vicarage of Laracor, near Trim, in West Meath, in 1700, and presented to a prebend in St Patrick's Cathedral; and in 1701 he took his doctor's degree at Trinity College, Dublin. From 1701 to 1710 he divided his time between Laracor and London, where he was employed on ecclesiastical business by the Archbishop of Dublin, and where he contrived to live for half each year on £60. His reputation as a wit, and his suspected authorship of the *Tale of a Tub* and the *Battle of the Books* (to say nothing of his earliest publication, the *Dissensions in Athens and Rome*, a defence of Lord Berkeley, 1701), assured his position in society and in the clubs and coffee-houses, where he constantly spent his evenings with Addison, Rowe, Prior, Congreve, and every one else worth meeting, and found himself ever more and more in request. He now wrote his humorous squibs on the unlucky almanac-maker, Partridge, under the pseudonym of Isaac Bickerstaff, and vindicated his position and opinions as a churchman (sorely damaged by the free speaking of the *Tale of a Tub*) in the *Argument to Prove the Inconvenience of Abolishing Christianity*, the *Project for the Advancement of Religion*, and the

Sentiments of a Church of England Man (all in 1708). At Laracor he busied himself with improving the vicarage, church, glebe, and garden, of which he was fond. 'I stayed above half the time,' he says, 'in one scurvy acre of ground, and I always left it with regret.' The regret was heightened by the circumstance that Stella, who, by Swift's advice, had come to Ireland with her companion, Rebecca Dingley, passed much of her time between Trim and Dublin.

For the next three years, from September 1710 to June 1713, Swift was chiefly in London, incessantly engaged in political work. The Whigs had done nothing for him, and he detested their war-policy and their views on the church establishment. The Tories, on the other hand, were full of civility and deference, and longed to win his pungent pen to their cause. Moreover, Swift was personally attracted by the character of Harley, the Lord Treasurer, and a warm friendship soon sprang up between these utterly dissimilar natures. So Swift abandoned his neutral position and became a Tory, and taking over the editorship of the *Examiner*, which had languished in its early days under Bolingbroke and Atterbury, converted it into a deadly weapon of attack against the Whigs. Swift's *Examiners*, thirty-three in number (November 1710 to June 1711), may almost be said to have created the 'leading article' and established the power of the press. They are not remarkable for rhetoric or eloquence, but are simple plain trenchant statements of policy and criticisms of opponents, such as the honest country squire could understand, and would have made himself if he had known how. The backbone of Swift's policy was denunciation of the war party as a ring of Whig stockjobbers, who cared nothing for the country, but out of self-interest played into the hands of the Emperor and the Allies. He urged this view, together with his firm belief in the landed interest and the establishment, in numerous brief and telling skits and broadsides in prose and verse, besides several elaborate argumentative pamphlets, such as the *Advice to the October Club* (1712), *Remarks on the Barrier Treaty* (1712), and the *Public Spirit of the Whigs*, a crushing reply to Steele's *Crisis* (1714); but nowhere so ably and forcibly as in his political masterpiece *The Conduct of the Allies*, published on November 27, 1711, of which the second edition was sold out in five hours on December 1, and a seventh edition reached in the new year. These writings undoubtedly contributed to the overthrow of Marlborough and the conclusion of the peace of Utrecht in 1713. Among slighter satires of this time may be mentioned *The Virtues of Sir Isaac Newton's Rod* (1710), directed against Godolphin, and the *Windsor Prophecy* (1711). Swift was also engaged preparing his *History of the Last Four Years of Queen Anne*, a laboured production, which was not published till much later; and he also wrote, under his own name, a *Proposal for correcting, &c. the English Tongue* (1712), which includes the oft-suggested notion of a national academy of letters. His life during these three eventful and laborious years is minutely recorded in his wonderful *Journal to Stella*, the most faithful and fascinating diary the world has ever seen, in which all his hopes and fears, his daily work and occupations, his growing influence with ministers, everything in short that he did and all that he thought, are set down in perfect honesty and with no thought of publication, but only for the sympathetic interest of his life-companion Esther Johnson. High affairs of state mingle with playful tenderness and the sweet familiarity of the 'little language,' with a natural charm and frankness which make the *Journal* unique.

Swift's reward for his unwearied labour on behalf of the Tory administration was poor enough. He had throughout kept his independence, and declined to accept the pay of the government like a hired hack. He waited for ecclesiastical preferment; but the queen would not bestow a bishopric on the author of the *Tale of a Tub*. At last in the evil days that preceded the fall of the ministry he was given the Deanery of St Patrick's at Dublin (April 1713), though he would rather have been sent anywhere else. A year later the crisis came; Harley (now Earl of Oxford) resigned, the queen died, the Whigs came into office, and Swift's prospect of political influence in London was gone forever.

A romantic episode in his London life had been the passion he inspired in Esther Vanhomrigh (born not in 1692, but in 1687 or 1688), whom in his usual fashion he called 'Vanessa,' a young girl whom he grew to know intimately at her mother's house in London in 1709-13. He had a fatal habit of playing the mentor to women without looking to the consequences, and there can be no doubt that he behaved with little circumspection in his relations with Vanessa. When he went to Ireland she followed him, and lived sometimes at Dublin and sometimes at a place she had inherited at Celbridge. Whether Swift was married to Stella or not (and there is no satisfactory evidence for the alleged marriage in 1716), the presence of Vanessa in Turnstile Alley, and of Stella in Ormond Quay, on the other side of the Liffey, must have been extremely embarrassing to him; and there is no doubt that he tried to repress Vanessa's passion. She died of a consumption in 1723, and by her testamentary directions Swift's metrical version of their romance was published, with the title *Cadenus* [i.e. *Decanus*] and *Vanessa* (1726). But what his real relations were with the two women, why he did not marry, or, if he did eventually go through the mere ceremony with Stella, as the legend tells, why he kept his marriage a profound secret, and why they never lived together, remain mysteries still, in spite of more than one plausible explanation. The theory that he believed himself tainted with hereditary madness, supported by the fact that he suffered from mysterious attacks in the head due to a disease in the ear, appears to furnish a possible clue to his determination to abjure the privilege of fatherhood; and another reason for his abstinence, compatible with this, has been deduced from the fact that he seems to have never experienced the ordinary emotion of passion. Whatever his passing feeling for Vanessa, there can be no doubt that he was devotedly attached to Stella to her dying day (28th January 1728), and that, in all senses but one, few women have been better loved.

When his hopes of further political work in England were demolished by the accession of King George and the Whigs, Swift, now a man of forty-seven, retired to his deanery, and with the exception of two journeys to England in 1726 and 1727, and occasional visits to friends in Ireland, remained there for nearly thirty years. But political influence and activity were essential to his masterful nature, and accordingly he devoted his energies to the wrongs of Ireland, which were then very real indeed. He did this from no love of the land of his exile, nor out of sympathy with the true Irish: he considered Dublin merely 'a good enough place to die in,' and his voice was raised chiefly on behalf of the narrow Ireland of the Englishry. He defended Ireland only out of 'a perfect hatred of tyranny and oppression' wherever it was found. Nevertheless his ungracious mediation and his unpalatable home-truths bore marvellous fruit throughout the country; he created and guided popular

opinion and for a while made it a power; and the generous impulsive populace worshipped him. His Irish tracts (of which the famous *Drapier's Letters*, 1724, directed against a supposed fraudulent introduction of a copper currency known as 'Wood's halfpence'; the *Proposal for the Universal Use of Irish Manufactures*, 1720; and the audacious *Modest Proposal* for utilising children as articles of food, 1729, are among the best examples) possess all the merits of his style and method, his apparent logic, his delightful reductions to absurdity, his burning indignation, his tremendous scorn, and his unsparing virulence in attack. He brought the law upon his printer more than once, but he won the day. 'Wood's halfpence' were suppressed, and the Lord-lieutenant had to confess good-humouredly that he governed 'by permission of Dr Swift.'

Besides his Irish tracts, a good deal of light verse—never rising to the level of true poetry, and often exceedingly coarse—and his *Polite Conversation* (1738), a witty parody of small-talk, and *Directions to Servants*, a savage satire on menial incapacity, Swift's Irish period is notable for the completion of the most famous of all his works: *Gulliver's Travels* appeared in 1726, and was immediately on the lips of all the world. This immortal satire needs no description or criticism. In it we see Swift's genius in its full maturity, less impetuous and fiery than in the *Tale of a Tub*, but sterner, more earnest, more majestic in its scorn. It is the terrible earnestness of Swift's indignation at the cant and shams of the world that gives his work its unique force and fire. But with all its deadly satire *Gulliver* is a wonderful story-book, and its daring fancy joined to a strange sobriety and plausibility, its bizarre situations, its inherent possibility, and its delightful playfulness make it a classic favourite with children, as well as men, to whom the scourge is more apparent than the jest. Swift's style is here seen in its perfection; pointed and direct, simple, masculine, absolutely free from affectation, logical and lucid, it always says just what it means, with never a word wasted; its shafts hit the mark fair in the centre with unerring precision.

Of his life during his later years a record is found in his voluminous correspondence with English friends like Pope, Gay, Arbuthnot, Bolingbroke, and his Irish crony, Dr Sheridan, to name no more. As letters alone they are quite admirable; but as biographical materials they are priceless. No man was stauncher in his friendships than Swift, and in spite of his bitter moods he hardly ever lost a friend. They were all he had to live for after Stella's death, except his duties and charities among the poor in the Liberties of St Patrick, where he was adored. His life had become very lonely and sad, and he dwelt in constant dread of that mental overthrow which he felt was coming. In 1740 his brain disease drove him to the verge of madness, but after two years clouded by periods of unspeakable torment he sank into a helpless, speechless lethargy, and so gradually faded out of life. The long misery and despair, and lonely exile, and final torpor came to an end 19th October 1745, when the most commanding intellect of his time passed from its dreary prison of imbecility to where in the words of his own epitaph, his *sæva indignatio cor ulterius lacerare nequit*; and the body of the great dean was laid beside Stella, in the same grave, in the cathedral over which he had reigned for thirty years.

The standard edition of the works was Sir Walter Scott's (19 vols. Edin. 1814; 2d ed. 1824), which included most of what was valuable in the earlier collected editions of Hawkesworth and Sheridan. It is now superseded by Temple Scott's edition of the *Prose Works* (12 vols. 1897-1908); W. E. Browning's of the *Poems* (2 vols. 1910);

and F. Elrington Ball's of the *Correspondence* (6 vols. 1910-15). Numerous selections from the works have been made; amongst them are those by S. Lane-Poole, in two volumes, *Prose Writings and Journals and Letters* (Parchment Library, 1884 and 1885), with introductions, criticisms, and notes, which have been used in this article; by W. Lewin (Camelot Classics, 1886); by H. Morley (Carisbroke Library, 1889-90); and H. Craik (Clarendon Press, 1892). John Forster published the first volume of an exhaustive *Life* in 1875; that by Sir Henry Craik (1882; new ed. 1894) became the standard. See also the short *Life* by Leslie Stephen (1882); the *Life* by Churton Collins (1893); Moriarty, *Dean Swift and his Writings* (1893); and Herbert Paul's *Swift* ('Men of Letters,' 1901). The evidence for the supposed marriage with Stella has been sifted with a lawyer's acumen in *Blackwood's Magazine*, May 1876, by J. Paget, who decides against it. The same conclusion was reached by S. Lane-Poole, *Fortnightly Review*, February 1910. Dr Bernard, Dean of St Patrick's, afterwards Bishop of Ossory, took a view more favourable to the marriage legend in his Introduction to Ball's edition of the *Correspondence*, vol. i. For separate editions of Swift's works, and where preserved, see *Notes for a Bibliography of Swift*, by Lane-Poole (1884); and the much fuller bibliography by W. S. Jackson, in vol. xii. of Temple Scott's edition. Portraits of Swift are to be seen at the Bodleian Library, Oxford, by Jervas, at the Deanery of St Patrick's, at Howth Castle, in Lord Orrery's *Remarks*, and in Nichols's edition of the works.

Swilly, LOUGH, a long narrow inlet of the Atlantic on the north coast of Donegal, Ireland, enters between Dunaff Head on the east and Fanad Point, on which there is a lighthouse (fixed light visible 14 miles), on the west. A second lighthouse, on Dunree Head, has a fixed light visible for 13 miles. The entrance is protected by forts. Lough Swilly penetrates about 25 miles inland, and has a width of 3 to 4 miles. On the eastern shore is the small town of Buncrana, much resorted to for sea-bathing. On its waters a French fleet under Bompart was destroyed in 1798; and in 1811 H.M.S. *Saldanha* foundered at the entrance in a storm, and 300 lives were lost.

Swimming. From time immemorial the great usefulness of swimming has been universally acknowledged, and the ease with which the art of supporting the human body in water can be acquired is a statement as old as the hills. The absolute correctness of the assertion that there is no difficulty in the way of the individual who would become a swimmer is open to question, but it is certain that the number of those who surmount all obstacles grows larger year by year. This is due in no small measure to the greatly increased facilities for the pursuit of this most healthful and pleasurable pastime afforded by the erection of many additional and improved public baths; also to the extensive encouragement the sport receives from the numerous swimming clubs in existence and to the very excellent efforts of the Royal Life Saving Society, and of the Amateur Swimming Association. Valuable aid is given to those wishing to know how to swim by many works on the subject of swimming; but there is no teaching equal to that which is to be obtained in the water with a proficient as guide. The pupil's every movement is watched, mistakes pointed out, and a bad style avoided—a great thing if one wishes to share in the delights of competition, of which there are now so many opportunities.

Opinions vary very considerably as to the best methods to employ in teaching an absolute beginner. In the first place, so much depends on age, temperament, and physical characteristics; some people are endowed with a natural confidence in water, while others must acquire it, often very laboriously. Moreover, there has been such development in swimming strokes in recent years that methods of teaching which used to be regarded almost as

fundamental principles of the art are now considered by many coaches to be obsolete. The same thing applies to the strokes themselves; as new ones have been evolved, the old have been gradually superseded, at any rate for competitive purposes. In this way the breast-stroke, which used to be regarded as the foundation of swimming, has largely gone out of fashion, and is now taught by many coaches only after other strokes have been mastered. Yet the breast-stroke remains one of the most graceful and pleasurable, and withal useful, methods of propulsion through the water, and will always find favour with those who wish to enjoy swimming merely as a healthful pastime and not as a competitive sport. Its great advantages over other strokes are that it enables the swimmer to maintain a natural and comfortable position, to keep the head above water all the time, and to breathe easily; it can be made as strenuous or leisurely as the swimmer wishes, and, though it is not conducive to speed, its value in cases of life-saving has been proved again and again. The first serious rival to the breast-stroke was the under-arm side-stroke, which for a time became very fashionable for racing purposes, but eventually it was superseded by the over-arm side-stroke. When properly executed, this is perhaps the most graceful of all swimming strokes; it is also a general utility stroke of the greatest value, being applicable to long-distance swimming or to the attainment of some amount of pace over shorter distances. It is the stroke that has been largely favoured by Channel swimmers from W. T. Burgess onwards. It differs in every respect from the breast-stroke. First, the body is turned sideways in the water, thus lessening the resistance; secondly, the arms are utilised alternately, instead of both together; and thirdly, the legs perform a sort of scissor action instead of the definitely propulsive action used in the breast-stroke. The perfect co-ordination of the movements embodied in the side-stroke requires considerable practice, and many individual swimmers have developed little improvements of their own; but it says much for its effectiveness that it has so far held its own against the more modern variations of the trudgeon and crawl strokes. It was in the seventies of last century that J. Trudgen, returning to this country from South America, introduced the stroke which was named after him, though it is said that a stroke very similar to his was practised by the Assyrians more than two thousand years ago. Though it involved a return to the breast position, and, more or less, the breast-stroke leg-action, the short over-arm strokes with each arm without any rolling of the body gave a speed which revolutionised racing methods. After the trudgeon came the crawl, an importation from Australia. This is without a doubt the fastest stroke so far known, and its popularity has spread far and wide. Its success as a racing stroke is due largely to the fact that the body is less submerged than in any other stroke; the action is more that of pulling the body over the water than propelling it under the surface. In its early days it was regarded mainly as a sprint-stroke, unsuitable for longer distances; but in its modern development it has become almost as fashionable with long-distance swimmers as with competitors in short-distance races. Even our Channel swimmers make use of it. The necessity for all swimmers to be able to float and swim on the back is too obvious to need stressing. Some people float better than others, but every one should be able easily to acquire the back-stroke, which is a particularly invaluable aid in life-saving.

It is only natural that with the modern development of speed-strokes has come almost a plethora of record-making. The period since the war has seen

new amateur records established for almost every recognised distance, both by men and women swimmers, and no one can say that finality has been reached. Among such record-makers the names of J. Weismuller (U.S.A.) and Arne Borg (Sweden) stand out with particular prominence. These two swimmers have between them held most of the free-style world's records in recent years, and the list passed (Dec. 1926) by the Fédération Internationale de Natation Amateur is as follows: J. Weismuller—100 yards (52 sec.) at Seattle, 1925; 100 metres (57½ sec.) in Florida, 1924; 150 yards (1 min. 26½ sec.) in Illinois, 1925; 200 metres (2 min. 15½ sec.) and 220 yards (2 min. 15½ sec.), both at Honolulu in 1922. Arne Borg—300 yards (3 min. 16½ sec.), 300 metres (3 min. 33½ sec.), 400 metres (4 min. 50½ sec.), 440 yards (4 min. 52½ sec.), 500 yards (5 min. 38½ sec.), 500 metres (6 min. 8½ sec.), all at Stockholm in 1925; 880 yards (10 min. 37½ sec.) at Harnäs, 1925; 1000 yards (12 min. 16½ sec.) at Gothenburg, 1924; 1000 metres (13 min. 4½ sec.) at Oslo, 1925; 1500 metres (20 min. 4½ sec.) at Budapest, 1926; one mile (21 min. 41½ sec.) at Göttingen, 1925.

The world's amateur records for ladies are at present shared by six swimmers as follows: Miss M. Wehselan (U.S.A.)—100 yards (1 min. 3 sec.) in Hawaii, 1923; 100 metres (1 min. 12½ sec.) in Paris, 1924. Miss G. Ederle (U.S.A.)—150 yards (1 min. 45 sec.) at Bernuda, 1922; 200 metres (2 min. 45½ sec.) at Brooklyn, N.Y., 1923; 300 yards (3 min. 58½ sec.) at Brighton Beach, N.Y., 1922; and 400 metres (5 min. 53½ sec.), 440 yards (5 min. 54½ sec.), 500 yards (6 min. 45½ sec.), and 500 metres (7 min. 22½ sec.) all at Indianapolis in 1922. Miss E. Mayne (Great Britain)—1000 yards (14 min. 47 sec.), 1000 metres (15 min. 49½ sec.), 1500 metres (24 min. ½ sec.), one mile (25 min. 46 sec.), all at Exmouth in 1926. Miss H. M. James (Great Britain)—220 yards (2 min. 46½ sec.) at Seacombe in 1923. Miss H. Wainwright (U.S.A.)—300 metres (4 min. 19½ sec.) in Florida in 1924. Miss E. McGavy (U.S.A.)—880 yards (12 min. 56 sec.) at Indianapolis in 1925.

British amateur records are as follows: 100 yards (54½ sec.) by D. P. Kahanamoku (Honolulu) at Exeter, 1920; 150 yards (1 min. 32½ sec.) by C. M. Daniels (U.S.A.) at Manchester, 1908; 220 yards (2 min. 24½ sec.) and 300 yards (3 min. 24½ sec.) by Norman Ross (U.S.A.) at Exeter, 1920; 440 yards (5 min. 18 sec.) and 500 yards (6 min. 1 sec.), by Arne Borg (Sweden) at Weston-super-Mare, 1921; 880 yards (11 min. 25½ sec.) by H. Taylor (Great Britain) at Runcorn, 1906; 1000 yards (13 min. 33½ sec.) by H. E. Annison (Great Britain) at Hastings, 1924; one mile (24 min. 1½ sec.) by T. S. Battersby (Great Britain) at Southport, 1909; 150 yards back stroke (1 min. 48½ sec.) by A. Rawlinson (Great Britain) at Southport, 1924; 200 yards breast-stroke (2 min. 41 sec.) by P. Courtman at Garston, 1914. Ladies—100 yards (1 min. 4½ sec.) by Miss C. M. Jeans (Great Britain) at Nottingham, 1925; 150 yards (1 min. 46½ sec.) by Miss H. M. James (U.S.A.) at Southport, 1923; 220 yards (2 min. 46½ sec.), 300 yards (3 min. 58½ sec.), 440 yards (6 min. 1½ sec.), 500 yards (6 min. 57½ sec.) by Miss James at Seacombe, 1923; 880 yards (13 min. 1½ sec.), 1000 yards (14 min. 47 sec.), and one mile (25 min. 46 sec.) by Miss E. M. Mayne (Great Britain) at Exmouth, 1926; 150 yards back stroke (2 min. 4 sec.) by Miss E. King at Croydon, 1925; 200 yards breast stroke (3 min. 2½ sec.) by Miss L. Gilbert at Garston, 1922. The plunging record for men was held for twenty years by Major W. Taylor, of Bootle, Liverpool, with 82 feet 7 in., but was beaten in September 1926 by F. W. Parrington of Liverpool, who accomplished 85 feet 6 in. The

ladies' record is 71 feet, by Miss Hilda Dand, of Westminster, in 1925.

Perhaps the most remarkable developments in long-distance swimming in recent years have been seen in the many attempts to swim the English Channel, as the following record of successes shows:

	Hrs.	Min.
1875 (Aug. 25), Captain Webb.....	21	45
1911 (Sept. 6), T. W. Burgess.....	22	35
1923 (Aug. 6), H. Sullivan.....	27	25
1923 (Aug. 12), S. Tiraboschi.....	16	35
1923 (Sept. 9), C. Toth.....	16	54
1926 (Aug. 6), Miss G. Ederle.....	14	30
1926 (Aug. 28), Mrs Corson.....	15	28
1926 (Aug. 30), H. Wierkotter.....	12	40
1926 (Sept. 10), G. Michel.....	11	5
1926 (Sept. 17), N. L. Derham.....	13	56

The authenticity of these records has been generally accepted, though in most cases the swims have been accomplished without the presence of properly appointed officials. It may be noted that Captain Webb, Burgess, and Sullivan all swam from the English shore; the others all swam from France. It would seem that the difficulties presented by the currents from the French side have now been fairly mastered. It has been shown that speed as well as endurance is an important factor in Channel-swimming, going far to help the swimmer to beat the turns of the tide, which have baffled so many aspirants.

See Wilson's *Swimming Instructor* (1883), Cobbett's *Swimming* (1889), Frank Sachs's *The Complete Swimmer* (revised edition, 1923), the *Badminton Book* by Sinclair and Henry (1893; 3d ed. 1900), and that by Ralph Thomas (1904); also CRAMP, RESPIRATION (ARTIFICIAL), DROWNING, and HUMANE SOCIETY.

Swinburne, ALGERNON CHARLES, was born in London on 5th April 1837, but belonged to an old Northumbrian family, being the son of Admiral Swinburne and of Lady Jane Henrietta, the daughter of the Earl of Ashburnham. He was educated at Eton and at Balliol College, Oxford, which he entered in 1857, and which he left without taking a degree. Though in the domain of literature, he read omnivorously. He became closely associated with Burne Jones, D. G. Rossetti, Wm. Morris, Meredith, and Whistler, and spent some time in travelling on the Continent, in 1864 visiting Walter Savage Landor at Florence. His first book, two plays, entitled *The Queen Mother* and *Rosamund*, was published in 1860, but did not excite much attention. It was otherwise with *Atalanta in Calydon*, which appeared in 1865, and proved that a new singer with an exquisitely lyrical gift had arisen. Swinburne produced no poem of similar length so full of beauties as *Atalanta*; and there are some, and these, perhaps, not the least competent judges of his verse, by whom this drama is even now more dearly prized than any other of its author's works. The tragedy of *Chastelard* was deservedly far less successful, but in 1866 the first series of *Poems and Ballads* made him the most talked-of man in England. The finest pieces, *Hesperia*, *Itylus*, *A Match*, *The Garden of Proserpine*, the *Hymn to Proserpine*, *The Triumph of Time*—these, to name but these, were a revelation to students of English verse. The writer struck a note which none had struck before. One might object to the erotic tone of certain passages, but there is no resisting the lyric fire and the consummate artistry, the magnificence of the rhythm, the new, strange sweetness of the music. About this time his illness, a kind of epilepsy, began to manifest itself in rather an alarming manner. *A Song of Italy* appeared in 1867 and an *Ode on the Proclamation of the French Republic* in 1871. By the publication in the latter year of *Songs before Sunrise* the author was again exposed to censure, extravagant in part and in part not unmerited. There is much admirable verse—fiery and ringing

and technically perfect—in the volume; but to most readers the revolutionary political opinions underlying it, derived largely from Mazzini and Victor Hugo, appear to be visionary and crude, and to be often intemperately urged. In 1871 Robert Buchanan attacked Dante Rossetti and Swinburne on the score of the alleged immoral tendency of their verse; the accuser's pamphlet, *The Fleshly School*, drawing forth a counter-pamphlet, *Under the Microscope*, from Swinburne. *Bothwell*, a long chronicle play, without any attempt at theatrical structure, in which historic truth, so far as understood by the poet, was made the primary quest, appeared in 1874; *Erechtheus*, a noble lyric drama, extremely unlike *Atalanta*, inasmuch as it was written with great exactitude (even as to the number of its verses) upon the lines of a Greek drama, in 1875; and a second series of *Poems and Ballads* in 1878. In 1879 occurred a decisive event in Swinburne's life, the removal to 'The Pines,' Putney, the home of the critic Watts Dunton (q.v.), who had become acquainted with the poet some years previously. Though this sifted his genius—for practically all Swinburne's best poetry dates from the earlier part of his life—yet at the time it was probably the only thing that could have saved him from a complete breakdown, as during the fifteen years of his life in London his health, aggravated by excesses, had been growing steadily worse, and deafness made intercourse with society difficult. The record of the next thirty years is one of peaceful life in Suburbia, during which volume after volume was sent to the press with almost monotonous regularity. His later collections of poems include *Studies in Song*; *Songs of the Springtides*; *Heptalogia*, essays in parody; *A Century of Roundels*; a third series of *Poems and Ballads* (1887), containing the superb 'Armada'; *Astrophel*; *The Tale of Balen*; and *A Channel Passage*. Among his later plays may be mentioned *Mary Stuart*, which completes the trilogy begun in *Chastelard* and continued in *Bothwell*; *Marino Faliero*; *The Sisters*, a short tragedy of modern life; and *Tristram of Lyonesse*, a fine narrative poem in decasyllabic couplets. As a prose-writer, Swinburne published several volumes of critical essays, separate studies on Charlotte Brontë, Blake, Chapman, Dickens, Shakespeare, and Victor Hugo, and a novel, *Love's Cross Currents*, written in 1887 and published in 1905. He died at Putney, 10th April 1909.

Swinburne was the greatest metrical inventor in English literature. Other poets have equalled him in melody, but none other has revealed the tunefulness and pliancy, the majesty and grace of the English speech in such a variety of lyrical forms. He can impart dignity and distinction to the simplest measures, and move with faultless ease in the most elaborate. He can give rapid and graceful movement to heavy-laden, long-drawn metres which other artists in verse would find unworkably cumbrous. He can stir the blood by the rush and resonance of a battle-chorus, or charm the ear by the music of a love-lyric as sweet as the songs of spring. His music is like no other man's, and whether the verses are running lightly, marching proudly, or swinging impetuously, the music is alike irresistible. The charges of tautology and obscurity must, of course, be brought against his tendency to use redundant phrases and unfamiliar inversions, and to carry alliteration to excess, especially in the later works, where often the reader is lost in the maze of rhythms and is lulled into a state of uncritical stupor. In dealing with nature his endeavour was not to produce a minute transcript, but to render the spirit of a scene, to catch and convey the elusive haunting secret of its loveliness or its terror. *The Garden of Cymodoce*

admirably illustrates his descriptive method. You feel at first as if the meaning of certain phrases were escaping you; but as you read, the charm, at once daunting and seductive, of the wonderful seahall—the magic of the lovely crimson glimmer and of the gloom which seems to dilate above the black silent water—is borne in upon you by the suggestion of the music, the subtle verbal colouring and shading, the premeditated vagueness of certain lines, as it could never have been by any number of direct and minute descriptive touches. The poem is as perfect in one way as Keats's *Hymn to Pan* is in another. Of all our poets Swinburne was the poet of the sea. He knew the ocean in all its moods, and rendered with equal perfection the revel of storming surges, the magnificent rolling of deep sea billows, the soft glow of the bowers of the water-world, the sensuous delight of a swimmer swimming out as the morning breaks over the green rippling deep. The difference between Swinburne's earlier and his later work is only too apparent; the outburst of soaring song and lyric fire in *Atalanta*, and the splendour of rhythm, the witchery of phrase, the passionate imaginative glow of the first two series of *Poems and Ballads* were never surpassed nor even equalled. The plays, especially the monstrous trilogy of *Mary, Queen of Scots*, are, on the whole, inferior to his lyrics, though they contain some noble passages of poetry. As a critic Swinburne had one pre-eminent excellence, the faculty of discerning and giving the most generous recognition to literary merit in its most dissimilar forms—in Congreve as in Wordsworth, in Pope as in Webster, in Anthony Trollope as in Cyril Tourneur. His knowledge of Elizabethan and of French literature was unrivalled, but his idolatry of Victor Hugo not only found expression in immoderate eulogy, but prompted him now and then to belittle the works of other poets. The merits and defects of his prose style are as striking as those of his poetry. The splendid glow and ornate grace of the diction, and the magnificent command of epithet, tended to degenerate into super-emphasis and the employment of figures only admissible in verse. Much of Swinburne's best critical work, however, dates from Putney, where the man of letters found fuller scope than the poet. In personal appearance, Swinburne was small and slightly built, but with a large head emphasised by a mass of reddish hair. His constitution was strong above the average, though a peculiarly nervous temperament made him quickly responsive to the emotions or inspirations of the moment. A probable explanation of his curiously unbalanced life may be found, if he be regarded as a case of 'arrested development.' He never advanced intellectually or poetically beyond the ideas and influences of the early twenties. In absolute maturity and in complete command over the technique of verse, he wrote his masterpiece, *Atalanta*, at the age of twenty-six. Further, while he sublimated liberty almost into a religion, paradoxically no one was held more captive than he in the thralls of hero-worship. The fact remains, however, that Swinburne, almost more than anyone else, enriched English poetry with an infinite variety of sounds and rhythms to warrant Tennyson's just dictum, that 'he is a reed through which all things blow into music.'

A complete edition of Swinburne's poems, including some posthumous work, was published, 6 vols., in 1917. His *Complete Works* in 20 vols. (ed. Gosse and Wise) began to appear in 1926. See *Life* by Gosse (1917); studies by Mackail (1909), Thomas (1912), Paul de Reul (1922), Welby (1926), and Nicolson (1926); Mrs Leith (his cousin), *The Boyhood of Swinburne* (1917); *Recollections* by Kernahan (1917-19); *Letters*, ed. Gosse and Wise (1918); and a bibliography by Wise (1926).

Swindon, a municipal borough of Wiltshire, 77 miles W. of London and 29 ENE. of Bath, consists of Old Swindon (*Svindune* in Domesday), on an eminence $1\frac{1}{2}$ mile S., and New Swindon, which originated in the transference hither in 1841 from Wootton-Bassett of the engineering works of the Great Western Railway. The former is rather a picturesque place, with a good Decorated parish church (rebuilt by Sir G. G. Scott in 1851), a town-hall (1852), assembly rooms (1850), and a corn exchange (1867). New Swindon has a mechanics' institute (1843), theatres, hospitals, &c. Pop. (1861) 6856; (1881) 22,374; (1921) 54,920.

Swine. See **PIG**.

Swinemünde, a fortified seaport of Prussia, on Usedom Island, at the entrance of the narrow channel of the Swine, connecting the Grosses Haff (into which the Oder flows) with the Baltic. It forms the outer port of Stettin, is entered by large numbers of vessels, and has valuable fisheries and excellent sea-bathing. Pop. 16,000.

Swing, a cognomen assumed by senders of threatening letters during the period when the irritation of the agricultural labourers of England against their employers was at its height, namely from 1830 to 1833. This arose from a widespread belief on the part of the labourers that the use of machinery would greatly lessen the demand for labour, and consequently produce a general reduction of wages; it was also intensified by the savage severity with which the game-laws were enforced, and by other hardships to which the labouring classes were subjected. As disregard by landlords or farmers of the demands contained in these threatening letters was constantly followed by the burning of stacks and farm-buildings, the employers of labour became so terrified that in very many cases almost implicit obedience was paid to the dictates of 'Captain Swing.'

Swinton, (1) a town in the West Riding of Yorkshire, 5 miles NNE. of Rotherham. It has manufactures of bottles, iron, pottery, &c. Pop. 14,000.—(2) A town of Lancashire, $4\frac{1}{2}$ miles WNW. of Manchester, with cotton-mills and brick-fields. Pop. of Swinton and Pendlebury urban district (1871) 14,052; (1921) 30,924.

Swiss Guards, a celebrated corps or regiment of Swiss mercenaries in the French army of the old régime, constituted 'Gardes' by royal decree in 1616. Mercenaries as they were, they were ever unswerving in their fidelity to the Bourbon kings, and their courage never blazed more brightly than on the steps of the Tuileries, 10th August 1792. They had been ordered to leave Paris by a decree of the Assembly on July 17th, but had not yet been sent farther than their barracks, when on August 8th, in anticipation of insurrection, they were ordered to march to the Tuileries. Michelet gives their number as 1330; Challamel, Pollio, and Marcel in *Le Bataillon du Dix Août* (1881) as 1200; Louis Blanc as 950; Mortimer-Ternaux as 900 to 950. But the number may now be taken definitely as nearly 800, including the ordinary guard of the king (see Captain de Durler's *MS. Relation* printed by Mr H. Morse Stephens in *Eng. Hist. Review* for April 1887). In anticipation of a storm Mandat had made admirable arrangements to defend the palace, but the National Guards fraternised with the insurgents, and Mandat himself was murdered on the steps of the Hôtel de Ville, whither he had gone by the king's command on a summons from the municipality. Meanwhile a growing mob under Santerre, with the famous 500 men of Marseilles at their head, marched on the Tuileries. But before they reached the palace Roederer had persuaded the king to leave the

Tuileries and place himself and the royal family under the protection of the National Assembly. He was accompanied thither by 150 Swiss, besides two hundred gentlemen and about a hundred National Guards. The remainder were left without orders, uncertain what to do, and when Westermann with his Marseillais and a raging mob made their way through the gate of the Tuileries and across the court the 650 Swiss under Captain Durler faced them on the great staircase, knowing only the orders of the night before that they were not to suffer themselves to be forced. Westermann, an Alsatian, tried to win them over by speaking to them in German, but it was not so that these men had learned duty. Some one fired a shot, and the struggle began. The Swiss had already driven back Westermann with about a hundred dead, when the king hearing the firing sent them orders to leave the palace. They fought their retreat across the gardens, while the mob swarmed into the palace and murdered a few wounded men they found there. Those under Durler made their way to the Assembly, were disarmed and placed in the neighbouring church of the Feuillants; but those who were posted in the corridors and rooms of the palace did not hear the order to retreat, and were speedily attacked, overpowered by the mob, and hunted to death. A few fought their way out across the gardens only to find the drawbridge up, whereupon they made for the Place Louis XV., formed a square under the statue of the king, and were cut to pieces where they stood. Few but those who found refuge in the church of the Feuillants survived that fatal day. Fifty-four were sent to the Abbaye and were among the first to perish in the atrocious September massacres. The heroism of the Swiss Guards was fittingly commemorated in 1821 by the great lion outside one of the gates of Lucerne, cut out of the rock after a model by Thorwaldsen.

See Pfyffer d'Altishofen's *Récit de la Conduite des Gardes Suisses* (Lucerne, 1824); Durler's *Relation* already quoted; vol. ii. (1891) of H. Morse Stephens' *History of the French Revolution*; also the article **MERCENARIES**.

Switchback, a term applied to a zigzagging, alternate back and forward mode of progression up a slope. A 'switchback railway' originally meant one where the ascent is up a steep incline simplified by curving the track backwards and forwards (and upwards) on the face of the slope. Afterwards the term came to be applied to a railway where (as at Mauch Chunk, q.v.) the movement of the carriages is largely effected by their own weight alone, the descents by gravity and the ascents by a stationary engine. (This railway, once used for carrying coal, was superseded in this capacity by a tunnel, and subsequently reserved for pleasure excursions.) Hence the application to the well-known apparatus for amusing the public at watering-places, fairs, and exhibitions: a short length of elevated railway with a series of rounded inclines, so that the car gains enough of momentum descending the first steep incline to ascend one or more smaller inclines till it gradually and more slowly works its way to the original level at the far end of the course. Thence it returns in the same way. Sometimes these switchbacks are made circular. Very similar were the so-called *Montagnes Russes*, elevated wooden frames with (wheeled) cars rushing down and up the slopes again, designed to represent Russian snow-slides, which were introduced into Paris as a popular amusement about 1815. The 'Flying Mountains' of St Petersburg had been described by Lord Baltimore in his *Gaudia Poetica* (1770). Thomas Moore's *Epicurean*, published in 1827, and based on some knowledge of the *Montagnes Russes*, describes very nearly the modern switchback.

Swithin, or SWITHUN, St, Bishop of Winchester from 852 to 862. The 11th century Life attributed to Gotzelin may contain elements of historical truth, and according to it he was tutor to Egbert's son Ethelwulf, under whom he was made bishop. He was a devoted builder of churches, and a man of unusual piety and humility. He built a bridge at the east side of the city, and here he used to sit and watch his workmen. One day some of them broke an old woman's basket of eggs, whereupon the bishop miraculously restored them. He died in 862 and was buried in the churchyard of Winchester, having asked, says William of Malmesbury, to be laid where 'passers by might tread on his grave, and where the rain from the eaves might fall on it.' A century later he was canonised, and the monks exhumed his body to deposit it in the cathedral; but this translation, which was to have taken place on the 15th July, is said, though unfortunately not by contemporary chroniclers, to have been delayed in consequence of violent rains. Hence the still current belief that if rain fall on the 15th July it will continue to rain for forty days. Unhappily Professor Earle has exploded the ingenious legend about the saint's displeasure, and shown that a much more probable origin is to be found in some primeval pagan belief regarding the meteorologically prophetic character of some day about the same period of the year as St Swithin's. In France the watery saints' days are those of St Médard (8th June), and St Gervais and St Protais (19th June). The rainy saint in Flanders is St Godelieve (6th July), and in Germany among the saints' days to which this belief attaches is that of the Seven Sleepers (27th June).

Switzerland is a confederation of twenty-two cantons, forming a historic republic without a homogeneous nationality or natural geographical frontiers on any side, lying practically in the very centre of Europe, between France, Germany, Austria, and Italy. The greatest length from east to west is 216 miles, the width from north to south being 137 miles; area, 15,940 sq. m. The population in 1850 was 2,392,740; in 1895, 2,986,848; in 1920, 3,880,320.

Cantons.	Admitted to the Confederation.	Area in sq. m.	Pop. in 1920.
Aargau (Fr. Argovie), G.....	1803	548	240,776
Appenzell—			
Ausser Rhoden (Rh. Extérieur), G., P.....	1513	93	55,354
Inner Rhoden (Rh. Intérieur), G., R.C.....		72	14,614
Basel (Fr. Bâle)—			
Stadt (Ville), G., P.....	1501	14	140,708
Land (Campagne), G., P.....		163	82,390
Bern (Fr. Berne), G.....	1353	2,657	674,894
Fribourg (Ger. Freiburg), F.G., R.C.....	1481	644	143,055
Genève (Ger. Genf), F.....	1814	108	171,000
Glarus (Fr. Glaris), G., P.....	1352	264	33,834
Graubünden (Fr. Grisons), G.F.....	1803	2,746	119,854
Luzern (Fr. Lucerne), G., R.C.....	1332	575	177,073
Neuchâtel (Ger. Neuenburg), F.....	1814	305	131,349
Sankt Gallen (Fr. St Gall), G.....	1803	785	295,543
Schaffhausen (Fr. Schaffhouse), G., P.....	1501	114	50,428
Schwyz, G., R.C.....	1291	348	59,731
Solothurn (Fr. Soleure), G., R.C.....	1481	305	131,849
Thurgau (Fr. Thurgovie), G.....	1803	386	135,933
Ticino (Fr. and Ger. Tessin), Ital.....	1803	1,085	152,256
Unterwalden—			
Obwald (Le Haut), G., R.C.....	1291	189	17,567
Nidwald (Le Bas), G., R.C.....		106	13,956
Uri, G.....	1291	415	23,973
Valais (Ger. Wallis), F.G.....	1814	2,020	128,246
Vaud (Ger. Waadt), F.....	1803	1,238	317,498
Zug (Fr. Zoug), G., R.C.....	1352	92	31,569
Zürich (Fr. Zurich), G., P.....	1351	667	538,602
Total.....		15,940	3,880,320

In the above table the name used by the majority is put first, followed by the French name in the German cantons, and by the German in the French ones. F. or G. or F.G. indicates that the majority

speak French, or German, or both. When neither P. nor R.C. is appended, it is to be understood that the canton is partly Protestant and partly Catholic.

There were thirteen towns in 1920 with population over 20,000, the chief of which were Zürich (207,161), Basel (135,976), Geneva (135,059), Bern (104,626), Sankt Gallen (70,437), Lausanne (68,533), Winterthur (49,969), and Lucerne (44,029). Bern is the federal capital.

Surface.—The area of Switzerland is distributed over four river-basins—those of the Rhine, the Rhone, the Inn, and the Ticino, a tributary of the Po. The Confederation is bounded on the S. by a part of the main chain of the Eastern Alps, running from south-west to north-east; on the W. and NW. by the Jura; and on the N. by the Rhine. The Pennine Chain of the Alps lies to the south of the valley of the Rhone, on the north of which valley are the Bernese Alps extending from the Lake of Geneva to the Grimsel. East of the Bernese Alps is the St Gotthard group, with its ramifications in the direction of Lucerne and Glarus. The Rhaetian Alps are east of the Pennine Chain. A broad fertile plain extends from the Lake of Geneva to the Lake of Constance. The lowest level on Swiss territory is 646 feet, on the banks of Lake Lugano; the highest is 15,217, the summit of Monte Rosa. The lakes of Switzerland, of which the largest are those of Geneva and Constance, cover an area of some 535 sq. m. There are numerous waterfalls, the highest (1002 feet) being the Staubbach in the Bernese Oberland. The Falls of the Rhine at Schaffhausen are upwards of 80 feet in height, and have been called a 'miniature Niagara.' There are about 470 glaciers, the largest being the Gross Aletsch, 15 miles in length. In Valais a greater surface is covered by glaciers than in any other canton; there are, however, no glaciers in eleven cantons. In the Central Alps the limit of perpetual snow varies from 9250 to 9020 feet.

Geology.—The geological structure, assisted by denudation, gives the country its picturesque character. In the south the chain of the Western and Central Alps consists of a series of crystalline masses lying south-west and north-east, covered on the northern slope by sedimentary rocks belonging to the Triassic, Jurassic, and Cretaceous formations. These coverings of sedimentary rocks are much folded, and overlap, forming limestone cliffs (Wetterhorn, Eiger, Jungfrau, &c.). To the north is the Jura range, a chain of regularly folded and anticlinal hills with longitudinal valleys often intersected by ravines. The wide plateau between the Jura and the Alps consists of Tertiary deposits of sandstone and clay, partly lake and sea deposits; it is covered also by deposits of ancient glacial moraines and gravels of the last glacial epoch. Few metallic deposits are to be found in Switzerland; those which exist cannot be worked owing to the irregularity of the veins. In Valais there are coal-formations metamorphosed into crystalline rocks, the coal being changed into anthracite of very irregular size. Salt is obtained in the valley of the Rhine at Rheinfelden. See ALPS, JURA, &c.

Climate.—In a country where the height above the sea-level is from 646 feet—where the almond, the fig, and the olive ripen in the open air—to 25,217, the region of perpetual snow, there is great variety in the climate. There is a variation of about 34½° in the mean temperature; at Bellinzona it is 54½° F.; at Geneva, 49½°; Interlaken, 48½°; at the Hospice on the Great St Bernard it falls to 30°, and on the Theodule Pass to 20°.

Race and Language.—The population is predominantly of the Alpine race, with a strong Nordic element especially in the north and centre. About 71 per cent. of the population (in 1920,

2,750,622) speak German; about 21 (824,320) French; about 6 (238,544) Italian; about 1 (42,940) Romansch; while the remainder speak other languages.

Religion.—By the federal constitution liberty of conscience and belief is declared to be inviolable, and the free exercise of worship is guaranteed within the limits compatible with public order and decency. No bishopric can be established in Switzerland without the consent of the Confederation, the order of Jesuits cannot be received in the republic, and the foundation of new convents or religious orders is forbidden. There is no federal church, each canton has its own ecclesiastical constitution and organisation, and the majority of the citizens can dispose of the church funds (derived from a variety of sources) belonging to the canton. The Roman Catholic priests are more numerous than the Protestant clergy, and are under five bishops. About 57 per cent. of the population (in 1920, 2,230,597) are Protestants (mostly Calvinists); about 41 (1,585,311) are Roman Catholics; about 0.5 (20,979) are Jews; while the remainder belong to other faiths, Christian Catholics, &c.

Constitution and Government.—The republic of Switzerland became a federal state (*Bundestaat*) in 1848: previously it consisted of a league of semi-independent states or cantons. The present constitution, based on laws passed in 1848 and revised in 1874, was constructed with the view of satisfying both cantonal and national elements, and is therefore essentially a work of compromise. It is the first constitution which was entirely the work of the Swiss without foreign influence, although its authors studied that of the United States. The political structure of Switzerland is built up in three tiers—the Commune, the Canton, and the Federal Assembly. In the communes, which are the real political divisions of the country, 3164 in all, local matters are administered by two governing bodies—the Communal Assembly, composed of all male citizens who have attained the age of twenty, and the Communal Council, with a president, the executive of the Assembly, by whom it is elected. The communes carry out cantonal and federal decrees, and are mostly grouped together (*Amtsbezirke*) under prefects (*Regierungsstatthalter*) appointed by the cantonal government. Each canton has its own constitution and local government. The constitutions of the several cantons vary considerably, but all are based on the principle of the absolute sovereignty of the people, subject to certain restrictions chiefly regarding military and legal matters imposed by the federal constitution: they are subject also to the ratification of the Confederation. Each canton has its own legislative and executive. In Uri, Unterwalden, Appenzell, and in Glarus there still exists the ancient *Landsgemeinde*, an open-air gathering of all those possessing votes, who meet every spring to legislate on cantonal affairs. The other cantons elect by universal suffrage a legislative body (*Grossrat*), varying in numbers according to the population. The executive (*Regierungsrat*) is elected by popular vote. This executive superintends all cantonal affairs and the government of the communes, and also transacts business with the federal government and with that of other cantons. The supreme legislative authority of the Confederation is vested in a parliament of two chambers, the Council of the States (*Ständerat*) and the National Council (*Nationalrat*), always under reserve of the *referendum* and *initiative* (see next paragraph). The Council of the States consists of forty-four members, each canton having two representatives, and each half-canton one. The regulations as to their election, remuneration, and duration of term of office differ

in each canton. The National Council consists of 198 members, elected by proportional representation in each canton, one deputy for every 20,000 of the population. The electoral districts cannot be made up of parts of different cantons, and are fixed by the Federal Assembly after every census; the election takes place once every three years. Every male who has attained the age of twenty and possesses the rights of citizenship according to the constitution of his canton, is entitled to vote, and any voter other than a clergyman or an official appointed by the Federal Council is eligible for election as a representative. Members are paid at a general rate for every day of attendance, and receive travelling expenses. The Council of States and the National Council each elect a president and vice-president, and meet at Bern, together forming the Federal Assembly (*Bundesversammlung*). The executive authority of the Federal Assembly is deputed to the Federal Council (*Bundesrat*) composed of seven members, elected for a period of three years. Federal councillors cannot be at the same time members of any cantonal or federal assembly, nor must they engage in any trade or business. No canton can have more than one citizen in this council; its duties are divided among seven departments, one member being charged with the direction of each. The Federal Assembly and Council together form the Federal Government, which is supreme in matters of peace and war, and has control over the army, railways, and the postal system. The president of the Federal Council, who is also president of the Confederation, is chosen annually at a united meeting of the Council of the States and the National Council from among the members of the Federal Council. The president and the vice-president (who is chosen at the same time) are elected for one year, and cannot be re-elected within twelve months of the expiration of their term of office, but usually the vice-president succeeds the president. The president has no special power in virtue of his peculiar office, his position resembling that of chairman of a board of directors.

Referendum and Initiative.—In 1831 an article was introduced into the constitution of Sankt Gallen, declaring the 'sovereignty of the people, who have the right not only to pass their own laws, but also to veto them.' This paved the way for the referendum, which has now spread throughout the whole Confederation, and by means of which all legislative acts passed in the Federal or Cantonal Assemblies may be referred to the people *en masse*. It is of two kinds, compulsory and optional, both as regards federal and cantonal matters. In some cantons all laws adopted by the representative body of the canton must be submitted to the people; in others it may be demanded by a certain number of votes. Cantonal referendum exists in those cantons where there is no *Landsgemeinde*. In most of the cantons 5000 signatures are required in order to obtain a referendum for cantonal laws. The compulsory referendum regarding federal legislation was established in 1848, but was then limited to the revision of the constitution. That of 1874 contains an article extending the exercise of the popular vote, when demanded by 30,000 citizens or eight cantons, to all laws and resolutions of a general nature passed by the Federal Assembly, this being the optional form of the federal referendum. Since the referendum was fully developed in 1874 it has been put in operation on an average once a year; the decisions have generally shown a conservative rather than a radical tendency on the part of the people.

Initiative is the exercise of the right granted to voters to initiate proposals for the enactment of new laws or for the alteration or abolition of old

ones. By this means 'the sovereign people' have always the power to bring forward the discussion of legislative matters, even in the event of their representatives in the government being unwilling to do so. Fifty thousand signatures are required to obtain the initiative regarding federal legislation, and in the majority of cantons 5000 for cantonal matters.

Law and Justice.—Each canton has its own procedure and system, both for civil and for criminal matters. In the French cantons, with the exception of Geneva, the civil codes are based upon the *Code Napoléon*, while in the German cantons they differ considerably from each other, and are for the most part original. In ten cantons capital punishment exists. By the federal constitution, 'no sentence of death can be pronounced for a political offence.' The Federal Tribunal (*Bundesgericht*) sits at Lausanne, and has original and final jurisdiction in suits in which the Confederation or cantons are concerned, and in cases of a certain importance between individuals; it also acts as a Final Court of Appeal.

Revenue and Expenditure.—In the years immediately after the Great War, debit balances became the rule. The customs, by far the main source of revenue, decreased in amount, while the expenditure, especially that of the army, increased; further, raw products had to be obtained from foreign countries at greatly enhanced prices. Recourse was had to borrowing, but at heavy rates of interest. It is tried to balance the federal budget at about 12 million sterling per annum, but in 1920 the expenditure exceeded the revenue by as much as 4 million sterling. The Swiss currency, however, remained at par. The proceeds of the federal alcohol monopoly are divided among the cantons. Each canton has its own budget of revenue and expenditure and debts. The cantons obtain their revenue more from direct taxation and the Confederation from indirect taxation.

Army.—Military service is compulsory and universal. The army, however, is essentially a citizen force drawn from all classes of the people, being intended only for defensive purposes and to secure the neutrality of the country. It is divided into three classes—the *Auszug*, or *Elite*, in which all citizens are liable to serve from the age of twenty to thirty-two; the *Landwehr*, from thirty-two to forty; and the *Landsturm*, from forty to forty-eight. After the first year, training is limited to a few days annually. The army, which was kept on constant active service during the Great War, numbers altogether about 300,000, but the number of men permanently under arms is very small.

Education.—Primary instruction is compulsory, unsectarian, and provided gratuitously at the cost of each canton, whose officials control the administration and inspection of the schools; thus the details of organisation vary considerably. There are over half a million pupils at the primary schools. There are also secondary, complementary (almost equivalent to extension courses), and higher schools, as well as commercial, administrative, art, technical, and agricultural colleges. There are seven universities on the German model—Basel (1460), Bern, Zürich, Geneva, Lausanne, Fribourg, and Neuchâtel, all with four faculties, except the two last, which have no faculty of medicine. In theology, Fribourg is Roman Catholic; Bern, Christian Catholic and Protestant; and the rest are Protestant. The Polytechnic at Zürich is under the control of the federal authorities, and, inclusive of this technical school, there are nearly 7000 students at the Swiss universities.

Occupations and Industries.—Of the total area of the country, about one-quarter is classed as 'unproductive,' being covered by rocks, glaciers,

lakes, towns, &c., about one-quarter is occupied with forest, about one-third with pasture, and about one-sixth with arable land. There is considerable equality in the distribution of wealth, and it is estimated that there are over 200,000 peasant proprietors. Wheat, vines, and tobacco are cultivated, but quite inadequately for the wants of the people. Cattle-breeding is very important, there being altogether about a million and a half head of cattle in the country. The Swiss possess two excellent breeds, the parti-coloured and the dark-brown; the former are amongst the heaviest in Europe, the milk being admirably adapted for making cheese and butter. There are some thousands of cheese-making establishments, and the making of chocolate and condensed milk is also considerable. The forests, once greatly wasted, are now better cared for, and in a great part of the country are under the Federal Government. Many industries flourish in Switzerland, the most important being the textiles, especially silk and cotton. Watch-making (established at Geneva in 1587), embroidery, wood-carving, and brewing are also carried on, there are manufactures of machinery and chemicals, and there is some salt-mining. It is estimated that several millions of pounds sterling are brought annually by tourists into the 'Playground of Europe.' The railways, mostly the property of the Confederation, are over 3600 miles in length, and the process of electrification is proceeding rapidly. To dispense with imported coal as much as possible, Switzerland is making a determined effort to utilise her rich water-power.

Commerce.—Little or no coal is to be found in the Confederation, there are no canals or navigable rivers, the country is situated far from the seacoast, and nearly the whole of the raw material and half-finished goods have to be imported. Still, in spite not only of these drawbacks but of the protective policy adopted by the neighbouring powers, there is a larger general trade per head of the population than in almost any other European country. The chief imports are cereals, raw cotton, silk, wool, &c., minerals and iron, and the chief exports, manufactured textiles, dairy produce, machinery, and clocks. Most of the trade is with France, Germany, Great Britain, the United States, and Italy.

History.—Stone implements of Mousterian character (see STONE AGE) have been found at Cotencher and Wildkirchli. Schweizersbild, Kesslerloch, and other stations have yielded bones and artefacts of Upper Palæolithic Age. The Lake-dwellings (q.v.) bring us from the Neolithic into the Bronze Age (q.v.). At the time of the Roman invasion the two principal tribes in possession of the country were the Celtic Helvetii and the Rhetii (of doubtful affinities). In 58 B.C. the Helvetii were partially subdued by Julius Cæsar, but it was not till 15 B.C. that they were completely subjugated by Augustus. These became part of the Roman empire, and during the three following centuries trade was developed and military roads were constructed, e.g. the St Gotthard, the Great St Bernard, and that crossing the Julier. The chief Roman settlements were *Aventicum* (Avenches), *Augusta Rauracorum* (Kaiser Augst), and *Vindonissa* (Königsfelden). After the conquest of Gaul Helvetia was invaded by the Burgundians and the Alemanni 450 A.D. The former took possession of western Switzerland, and the latter settled east of the Aar, in the district since known as 'La Suisse Romande.' In the 7th century, during the domination of the Frank kings of the Merovingian dynasty, order was restored, and Christianity preached by SS. Gallus, Columbanus, and others. About this period the great monasteries of Einsiedeln, Disentis, Sankt Gallen, and Pfäfers were founded, which soon became

centres of progress and learning. Much of what later became Switzerland then formed part of the Holy Roman Empire, for which it was ruled by wealthy abbots and nobles, among whom were the Counts of Zähringen. This powerful family became extinct in 1218, and the country was distracted by internal wars. In 1273 Rudolph of Hapsburg (whose castle was situated in what is now the canton of Aargau) was raised to the imperial throne; after his death (1291) a short period of anarchy ensued in the empire. The inhabitants of Uri, Schwyz, and Unterwalden then felt the necessity of joining together in order to defend their common interests. The Confederates (*Eidgenossen*) did not, however, throw off their allegiance to the emperor; their hostility was rather directed against the despotic power exercised by the bailiffs or middlemen, some of whose acts of tyranny have been described in Schiller's *Wilhelm Tell*, which is founded on the legends belonging to that period (see TELL). Out of this defensive alliance sprang that pact which constituted the germ of the present Swiss Confederation, but which from 1291 to 1874 has passed through seven distinct phases—viz.: (1) The League of the Three Communities, 1291; (2) The Confederation of eight cantons, 1353; (3) The Confederation of thirteen cantons, 1513; (4) The Helvetic Republic, 1798; (5) The Act of Mediation, with nineteen cantons, 1803; (6) The Federal Pact, with twenty-two cantons, 1815; (7) The Federal Constitution of 1848, revised in 1874.

In 1307 it is stated that Werner Stauffacher of Schwyz, Walter Furst of Uri, and Arnold of the Melchthal in Unterwalden (representatives of the three leagued cantons) met together in the meadow of Grütli by the Lake of Lucerne, and took an oath to free their soil from the Austrian oppressors. They swore that they would be 'all for each, and each for all,' which still remains the motto of the Confederation. Five years later the Confederates were called upon to vindicate this oath, and defend their country against Leopold of Austria. In 1315, while marching at the head of a powerful army through a defile beneath the heights of Morgarten, he was surprised by the Swiss, who hurled down stones and trunks of trees, completely routing their opponents. In 1332 Lucerne joined the alliance of the Three Communities, and the League was increased to four Forest States or Cantons (*Vierwaldstätten*). Bern and Zürich had become imperial fiefs, and the growing importance of the former excited jealousy in western Switzerland, with the result that in 1339 a large force laid siege to Laupen, but were defeated by the Bernese under Rudolph von Erlach. By 1353 Bern, Zürich, Glarus, and Zug joined the Confederation, which thus attained its second phase of eight cantons. The Austrians were again routed at Sempach in 1386, and in 1388 at Näfels; and subsequently in 1393, with the view of strengthening the federal sovereignty, the confederates drew up the document known as the 'Convention of Sempach.' The Swiss were next engaged in a struggle on the French frontier with Charles the Bold; they defeated him at Grandson in 1476, again at Morat, and finally in 1477 before the walls of Nancy, where Charles himself was slain. The unequal distribution of the booty taken at Grandson and Morat occasioned much jealousy between the five rural states or cantons and the cities of Zürich, Bern, and Lucerne; the dissolution of the Confederation seemed imminent, but owing to the intervention of Nicholas von der Flüe an understanding was effected at the Diet of Stanz in 1481, laws were made as to the admission of new cantons, and separate alliances between them were prohibited. By 1513 Fribourg, Solothurn, Basel, Schaffhausen, and Appenzel were

added to the Confederation, this being the third phase of its history. In addition to these were associated and protected states, as well as subject territories, belonging to one or other of the various cantons. Valais, the Grisons, Geneva, Biel, and Mülhausen were republics. The principality of Neuchâtel, the lands of the Abbey of Sankt Gallen, and the bishopric of Basel were ruled by lay or ecclesiastical sovereigns.

The 16th century saw the rise of Protestantism. Zwingli led the van in Zürich, whence the Reformation spread, first to Bern and then northwards; the Forest Cantons, with Zug, Fribourg, and Solothurn, however, remained faithful to the Church of Rome. In 1531 war broke out between the Protestants and Catholics, and at the battle of Kappel, where Zwingli was killed, the Zürichers were defeated by the Forest Cantons. The episcopal and imperial city of Geneva, which had allied itself with Bern and Fribourg against the Dukes of Savoy, became a republic in 1535, and accepted a new civil and ecclesiastical legislation under Calvin. In the following year the Pays du Vaud, long subject to the Dukes of Savoy, was conquered by Bern; the inhabitants became Protestant, and the Reformed doctrines spread into western Switzerland. During the Thirty Years' War Zürich and Bern successfully helped to maintain the neutrality of Switzerland, and by the treaty of Westphalia in 1648 the country was acknowledged by the great powers as an independent state. Bern, since the conquest of Vaud, had become the most powerful canton; the wealthy inhabitants of the city constituted themselves into a close corporation or guild, to which no new members were admitted, and, as in Lucerne, Fribourg, and Solothurn, all official posts were in the hands of the patrician families.

Zürich, Basel, and Schaffhausen were 'semi-aristocratic' cantons, the burghers having a share in the elections, from which, however, the country-people were excluded. The remaining six cantons ruled themselves in the *Landsgemeinden* or popular assemblies. The internal state of the cantons, however, owing in many cases to a tyrannical administration, showed a need of reform. The subject-territories had particularly to complain of the arbitrary conduct of the bailiffs by whom they were ruled, as well as of the inequality which existed between the inhabitants of town and country. It only required the impetus imparted by the French Revolution to produce a wide-spread rising in Switzerland. In 1798 Vaud declared its independence against Bern, and a French army came to her aid. In other parts of Switzerland similar outbreaks occurred; the French routed the troops of the Forest Cantons and those of the Bernese under General von Erlach at Fraubrunnen and Grauholz, the city of Bern was taken, and the ancient Swiss Confederation came to an end.

Till 1798 there had simply been alliances between the different cantons; no real constitution existed, and the establishment of the Helvetic Republic (the fourth phase of the Confederation) was the first attempt at a federal constitution. It was extremely unpopular; not only was it imposed by foreign pressure, but it was against the traditions of the Swiss people. The whole country was torn by two hostile factions till 1803, when Napoleon summoned representatives from both parties to Paris, and gave Switzerland a new constitution, termed the Act of Mediation. Sankt Gallen, the Grisons, Aargau, Thurgau, Ticino, and Vaud were added, making nineteen cantons in all, this being the fifth phase of the Confederation. The downfall of Napoleon brought with it the destruction of his work in Switzerland, whose perpetual neutrality as well as the inviolability of her territory was recognised by the congress of Vienna in 1815.

Valais, Neuchâtel, and Geneva, which had been annexed to France under the Directory, were added to the existing cantons, which thus became twenty-two in number; each of them was represented at a diet which met alternately at Bern, Zürich, and Lucerne. The decline of the Bourbons had, too, its echo in Switzerland; the patrician families lost the ascendancy they had regained at the beginning of the century, and many of the cantonal constitutions were revised, with the result that the power of the people was greatly increased. Basel, in spite of armed demonstrations, refused to grant proportional representation, with the result that the canton was divided into two half-cantons.

Religious troubles were added to these political disputes. In Aargau, where the grand council was composed of Protestants and Catholics in equal numbers, the constitution was altered upon a basis of popular representation by which the Protestants gained numerical advantages. In 1841 two thousand Catholic peasants took up arms, but were beaten by the Protestants at Villmergen; eight convents were suppressed, and much valuable property confiscated. The democrats gained ascendancy in Geneva, and in 1842 the same party obtained the upper hand in Valais. In 1844 the grand council of Lucerne entrusted the Jesuits with the direction of public instruction, with the result that the town was attacked by bands of volunteers, who demanded the expulsion of the priests. In defiance of the Federal Pact, Lucerne called to her aid the Forest Cantons, Zug, Fribourg, and Valais, together forming what is known as the *Sonderbund*, whose members declared that they would preserve this 'separate league' till the convents were re-established and the question of the Jesuits abandoned. In 1847, after the deputies of the *Sonderbund* had left the Diet, it was resolved to dissolve by force of arms this league of the Catholic cantons. The federal army under General Dufour consisted of 50,000 men, the Catholics brought about half that number into the field, and after a campaign of twenty-five days Fribourg was taken, Lucerne and the smaller cantons capitulated, and the struggle came to an end. No sooner had the *Sonderbund* been dissolved than it became necessary to revive the Federal Pact, and a constitution was adopted for the whole of Switzerland, this being the seventh phase. Owing not only to the development of commerce and industry, but to the difference between the legislature in the cantons, it became necessary in 1874 to revise this constitution, and since then it has been added to and altered. During the Great War, Switzerland performed a large amount of relief work for the prisoners and wounded of all countries, and at the same time suffered very considerably from food shortages. Her position between the entente and the central powers was extremely embarrassing for her, as she depended so largely on supplies from foreign countries. This geographical position of Switzerland, her special constitution, and the possession of three 'official' languages (German, French, and Italian), makes the country peculiarly international. Much foreign money is invested in Swiss banks, tourists and political exiles instinctively turn to Switzerland, and international organisations such as the League of Nations, the Red Cross, the International Postal and Telegraph Union have their seats in Swiss territory (see GENEVA).

Literature.—The literature of Switzerland, save the unimportant part that falls under Romansch (q.v.) or Italian, is included either in German or in French literature: Bodmer and Gessner are as certainly names of mark in German literature as Rousseau or Chéribuliez in that of France. Here it may therefore suffice to give the names of

Swiss writers, most of whom are treated in separate articles: thus to the German division belong Zwingli, Bullinger, Tschudi, Bodmer, Gessner, Zimmermann, Haller, Lavater, Pestalozzi, Johannes von Müller, Füssli, Bitzius, Keller, Meyer, Spitteler, Schaffner, Pulver, and Steffen; to the French Bonivard, Rousseau, Vattel, Bonnet, Benjamin Constant de Rebecque, Bonstetten, Sausure, Sismondi, Necker (and by origin his daughter Mme. de Staël), Dumont, Töpffer, Vinet, Chéribuliez, Amiel, and Rambert. Calvin and Beza, Voltaire and Gibbon were resident in Switzerland for varying numbers of years. The Swiss-German of the country people is a High German patois.

See ALPS, ALPINE CLIMBING, MERCENARIES, SWISS GUARDS, articles on the different cantons and towns, on mountains, passes, and tunnels, on prominent Swiss historical characters, and the books there cited. For the topography of Switzerland, see the *Dictionnaire Géographique* (also in Ger., 6 vols. 1902-10); various guide-books, &c., by Coolidge; for geology, books by Heim (in Ger. 1919 *et seq.*); for flora, Schinz and Thellung (1923); for travel, Wäber (in Ger. 1909); for general information and social life, Dauzat, *La Suisse Illustrée* (1914); books in English by Story (1902), Webb (1909), and Atherton Hill (1924); and in German by Heer (1902) and Lifschitz (1924); for economics, books by Clerget (in Fr. 1908) and Schmidt (in Ger. 1914); for the constitution generally, various works by Schollenberger, especially his *Kommentar mit Einleitung* (1905); various works by Curti, including his *Geschichte* (1885); books in French by de Salis (also in Ger., new ed. 1902), in English by Vincent (1900), Bonjour (1920), and Brooks (1920), and in German by Heusler (1920) and Frauchigee (1922); for the referendum, books by Hymens (in Fr. 1892) and Stüssi (in Ger. 1893); for the history, various works by Oechsli, including his *Quellenbuch* (new ed. 1918) and his *History, 1499-1914* (Eng. trans. 1922); works by Dierauer (in Fr. and Ger., 5 vols. 1911-17), van Muyden (in Fr., 3 vols. 1896-1901), Gagliardi (in Ger., 2 vols. 1920), and in English by Hug and Stead (new ed. 1920) and Cameron (1918); for the literature, the general histories by Bächtold (in Ger. 1892), Rossel and Jenny (in Fr. 1910), Godet (in Fr. 1889); for contemporary writers, Korrodi, *Die Junge Schweiz* (1921); *Anthologia Helvetica*, ed. Faesi (1921), an anthology of Swiss writings of all types and periods, including some in patois.

Swoon. See FAINTING.

Sword, a weapon of offence consisting of a blade fitted into a hilt or handle, with a guard, the blade being formed to cut or to pierce, generally to do both. The sword is the most highly honoured of all weapons, a symbol of military dignity and authority; and it is the instrument with which the monarch confers knightly honours. Its forms and modifications, and the names under which, in different shapes, it has been known in different lands, and in successive ages, are beyond computation. It is sufficient to say that the general term includes weapons so diverse as the short cutting and piercing daggers and poignards and the ponderous two-handed swords of the 15th century. The blade may thus vary in length from a few inches to four feet and upwards. It may be furnished with a cutting edge on one side only, or on both sides. In may be uniform in breadth throughout with a truncated end, or it may taper from the hilt to a fine point. The blade, moreover, may have a piercing point alone, as in the rapier, and it may be curved



Fig. 1.

uniform in breadth throughout with a truncated end, or it may taper from the hilt to a fine point. The blade, moreover, may have a piercing point alone, as in the rapier, and it may be curved

throughout its entire length, as in the oriental scimitar. The hilt, with its many forms of guard, grip, and pommel, similarly adds to the variations of the weapon.

The sword, of course, could not be a weapon of primitive man; but it is easy

to trace its development from the forms of weapon in use in the Stone and early Bronze Ages. The sword came into use only when men had attained considerable skill in casting and working bronze, and the ancient bronze swords, many of which have been found throughout Europe with two-edged blades measuring two feet in length, are well finished weapons (see BRONZE AGE). The early Greek sword (fig. 1, *a*) was merely a strong two-edged knife; but about 400 B.C. its form was improved and its size doubled by Iphicrates. The *gladius* of the Romans (fig. 1, *b*) was still of the same form—a straight two-edged blade, heavier and longer, however, than the Greek weapon. During the early middle ages there does not appear to have been much development in the form of the sword in Europe. As shown by the Bayeux Tapestry (q.v.) and other contemporary representations, it continued to be a short cutting weapon, with a blade of uniform breadth bluntly pointed, and to give it balance it was channelled from the hilt for about two-thirds of its length. The cross-guard, subsequently

Fig. 2.—Two-handed Sword, preserved in Duff House.

called the quillons, was short, projecting at right angles from the blade, but sometimes bent forward in the direction of the point. With the development of armour in warfare it became necessary to give much greater heaviness and strength to the sword; the blade was greatly lengthened and tapered from hilt to point, the guard and the hilt were also lengthened, and in this way the two-handed sword—the distinguishing arm of the 15th century—was evolved. In Scotland several of these ponderous weapons are preserved, and traditionally associated with the names of Wallace, Bruce, and other contemporary heroes; but such swords were really not in use at so early a period. So late as 1567 Lindsay proposed to meet Bothwell in single combat at Carberry, armed with 'the famous two-

handed sword of Archibald Bell-the-Cat.' With the introduction of the two-handed sword, the use of a shield being no longer possible, the guard gradually became more complicated, so as to give greater protection to the hands of the swordsman, and from the use of shell-guards and ring-guards, &c. the basket-hilt, as applied to lighter swords, by degrees developed. The ordinary basket-hilt sword, such as is worn by officers of Highland regiments at the present day, is of Italian origin, and grew out of the Venetian *schiaivone*. The rapier—a piercing weapon only, with a blade tapering to a fine point—came into use in the early part of the 16th century, and in the 17th century it became the weapon of fencing and duelling. From very early times Toledo, Seville, and some other Spanish towns had a high reputation for the excellence of the swords made by their armourers, and when to their own skill was added the perfect craftsmanship of their Moorish conquerors the renown of Spanish blades became supreme. In the North Italian towns also, as well as at Solingen and Passau in Germany, swords of famous quality were fabricated. In Scotland during the 17th and 18th centuries Ferrara blades were held in the highest esteem, and were a very common possession. Who the original maker of these famous blades was is not known, but in the 16th century there was a family of armourers named Ferrara (q.v.) in North Italy, one member of which, called Andrea, was born in 1555. It is, however, obvious from the long period over which the manufacture extended that 'Ferrara' became more a trade-mark than a maker's name. Many magnificently finished examples of swords from the Renaissance period downwards are preserved as art treasures in public and private collections. On the enrichment of these the highest efforts of artificers and artists have been expended, and they have been lavishly adorned with gold enamels and precious stones. Additional interest is given to some of these swords by the legends attaching to them, and by the historical importance of the personages to whom they belonged. Mythical stories are also numerous of craftsmen endowed with marvellous powers, and with whose blades unheard-of feats could be performed. In modern warfare the sword possesses little more than an honorary military significance.

See DAMASCENING, and, besides works cited at FENCING and DUELLING, James Drummond's *Ancient Scottish Weapons* (1881), Sir R. Burton's *Book of the Sword* (1884), Sir F. Pollock's *Oxford Lectures and other Discourses* (1891), various books by A. Hutton, including *Swords and Centuries* (1901), and Nimier and Laval, *Les armes blanches* (1906).

Sword-fish (*Xiphiidae*), a family of spiny-rayed Teleostean fishes, abundantly represented in

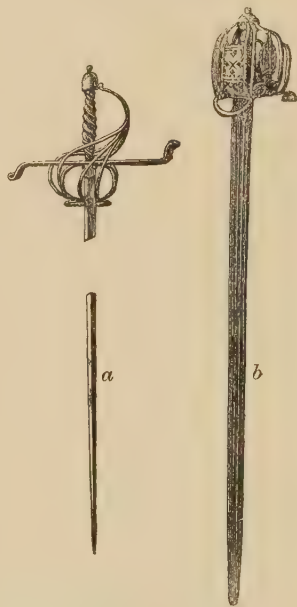


Fig. 3.—*a*, Rapier, 16th century; *b*, Basket-hilted Ferrara.

tropical and subtropical seas. They are among the largest bony fishes, sometimes measuring 12 to 15 feet in length. The sword, which may be over 3 feet long, is formed from a compressed prolongation of the upper jaw, and is often strong enough to stab whales fatally, or less advantageously to pierce the bottom of a ship or the planks of a boat. The genus *Xiphias* is well represented by the common sword-fish (*Xiphias gladius*), abundant in the Mediterranean and in



Common Sword-fish (*Xiphias gladius*).

the warmer parts of the Atlantic and Pacific, and of rare occurrence on British coasts. They are found in schools, but never in close company; they feed on such fishes as mackerel, menhaden, and herring, which they kill with the sword, and also it seems on cuttle-fish. The flesh is somewhat oily, but is highly esteemed, both fresh and salted. With the regular sword-fish fishermen, harpooning is the mode of capture. The genus *Histiophorus*, the members of which are also called sail-fishes or bill-fishes, has a greatly developed dorsal fin or sail, and has long, compressed ventral fins which are absent in *Xiphias*. As in the true sword-fish, the young, with undeveloped swords, are very different from the adults. In summer *Histiophorus* occurs in the American seas as far north as New England, but it is strictly a tropical fish. Another form—the spear-fish—of similar distribution, is generally referred to a distinct genus, *Tetrapturus*. The bony sword-fishes must not be confused with the cartilaginous Sawfishes (q.v.) belonging to the *Elasmobranch* genera *Pristis* and *Pristiophorus*.

Sybaris, an ancient city of Magna Græcia, stood on the Gulf of Tarentum, and was founded about 720 B.C. by colonists from Achæa and Trœzene. The fertility of its soil and its liberal policy favoured commerce, and the city flourished and became very prosperous. Its citizens led such luxurious and self-indulgent lives that their name became a by-word amongst the peoples of antiquity. Quarrels between the democratic and oligarchic factions led in 510 B.C. to a war with the neighbouring colony of Crotona (q.v.), in which the forces of the Sybarites were totally routed, their city captured, and the site where it stood obliterated by the victors, who turned upon its ruins the waters of the adjacent river Crathis. Excavations have so far failed to give any precise knowledge of its topography; all that has been found is two cemeteries, one of the early Iron Age, the other of 400 B.C.—the latter belonging to the period when Thuriî (q.v.) was at the height of its prosperity.

Sybel, HEINRICH VON, German historian, was born at Düsseldorf on 2d December 1817. Perhaps the most eminent of Ranke's pupils, he became

successively professor of History at Bonn (1841), Marburg (1846), Munich (1856), and Bonn again (1861), in Munich also filling the post of secretary to the Historical Commission of the Royal Academy of Sciences. At various times between 1848 and 1880 he sat in the parliaments of Hesse, the North German Confederation, and Prussia, as a National Liberal and an opponent of the Ultramontanes. In 1875 the Prussian government made him director of the state archives at Berlin; and as such he was instrumental in publishing the Political Correspondence of Frederick the Great, and in organising at Rome a 'Prussian station for Researches in German History,' besides assisting in the publication of the *Monumenta Germaniæ Historica*. Moreover he founded and edited the *Historische Zeitschrift*. Sybel's first book was a history of the First Crusade (1841), in which, applying the critical methods of his master, he destroyed the accepted opinions of centuries; his next the *Entstehung des deutschen Königthums* (1844). Then, after an interval of nine years, came his first masterpiece, *Geschichte der Revolutionszeit von 1789 bis 1795* (3 vols. 1853-58; 4th and greatly improved ed. 1877), a cool, sober, and dignified statement of the historic causes and consequences of that eventful period, based upon a critical examination of official documentary evidence. A second part or continuation, bringing the narrative down to 1800, was published in 2 vols. in 1872-74. His second great work is entitled *Die Begründung des deutschen Reichs durch Wilhelm I.* (5 vols. 1889-90; English trans., New York, 1891), exhibiting the same qualities. Von Sybel, who also published three volumes of *Kleine Historische Schriften* (1863-81), died at Marburg, 1st August 1895.

Sycamore (*Ficus Sycomorus*) is a large tree, ranging from Syria through North Africa to the Cape Verde Islands, often planted near villages for the sake of its shade, its wide-spreading head sometimes covering a space 40 yards in



Branch of *Ficus Sycomorus*;
a, fruit.

diameter. The figs are top-shaped, and grow in clustered racemes on the trunk and oldest branches. Inferior to the common fig, they are nevertheless sweet, well flavoured, and somewhat aromatic. The wood is light, porous, and of little value.

The sycamore-tree of England is a species of Maple (q.v.), and in Scotland is usually called plane-tree (though neither plane nor sycamore). In some parts of North America the name of sycamore is given to the Plane (q.v.) of that country, *Platanus occidentalis*.

Sycosis, a pustular eruption on the bearded part of the face, due to Ringworm (q.v.), Acne (q.v.), or Impetigo Contagiosa (q.v.).

Sydenham, a district in the metropolitan borough of Lewisham, is of world-wide celebrity in connection with the Crystal Palace, which, however, is really outside the county of London, on the borders of Surrey and Kent. It was erected

in 1852-54, chiefly from the materials of the building of the Great Exhibition (1851), and under the superintendence of Sir Joseph Paxton. The cost of the erection and appointment of the Crystal Palace amounted to nearly £1,500,000. The building is 1608 feet long, 390 wide across the transept, and 175 feet high, the height of the two water-towers being 282 feet. The chief arts and sciences are illustrated by collections within the Palace and in its grounds. There are two concert-rooms, within the larger of which on occasion of the triennial Handel festivals (since 1859) performances have taken place with 4000 vocalists and instrumentalists. The park and gardens occupy nearly 200 acres, and are adorned with sculptures, stone balustrades, &c., and fountains which are perhaps the finest in the world. Cricket and football matches and other sports are held in the grounds. On 30th December 1866 there was a fire in the north wing, doing damage to the amount of £150,000. The palace, whose finances have more than once been seriously embarrassed, was offered for sale in 1911, and acquired by the public in 1913-14.

Sydenham, FLOYER (1710-87), an amiable man of letters whose privations brought about the foundation of the Literary Fund, graduated at Oxford, and in his fiftieth year began the publication of an excellent translation of Plato's *Dialogues*. It had no market, neither had his dissertation on Heraclitus (1775) or his *Onomasticon Theologicum* (1784). Arrested for unpaid meals, he died in prison.

Sydenham, THOMAS, the 'sommo Ippocratista inglese' (supreme English Hippocratist), as Puccinotti styles him, was born in 1624 at Winford Eagle in Dorsetshire, and died in London, 29th December 1689. That he belonged to one of the county families; that at eighteen he was entered at Magdalen Hall, Oxford; that his studies were, after two years, interrupted by his having to serve as an officer in the parliamentarian army; that his Oxford curriculum ended in 1648 when he graduated M.B., and shortly after became a Fellow of All Souls—is the sum of our knowledge as to his youth and early manhood. For the next fifteen years we lose sight of him, though he probably spent some of them at Oxford, if not also at Montpellier. We find him in London in 1663 as a licentiate of the College of Physicians publishing his *Methodus Curandi Febres* in 1666; and ten years thereafter taking his M.D. at Pembroke Hall, Cambridge. With the College of Physicians, or even with Oxford, he seems to have had no subsequent connection; and all through his life he was not a *persona grata* with the faculty. The 'Iatro-physical' and 'Chemiatic' theories in fashion at the time he treated with scant consideration, and looked upon chemistry itself as a mere branch of the apothecary's business. But from his intimacy with John Locke and Robert Boyle we might infer his appreciation of the true philosopher and the true physicist, even if we did not know his profound mastery of the Hippocratic method and his perfect assimilation of the Hippocratic spirit. In 1668 he published a second edition of his book on fevers, adding to it a chapter on plague, with a fine poem in Latin elegiacs addressed to him by Locke. A third and enlarged edition, entitled *Observationes Medice*, appeared in 1676. In 1680 he published two *Epistolæ Responsoriæ*, the one 'On Epidemics,' and the other on the 'Lues Venerea.' His *Dissertatio Epistolaris* on confluent smallpox and hysteria (1682) was followed next year by his yet more famous *Tractatus de Podagra et Hydrope*. In 1686 appeared his *Schedula Monitoria de Novæ Febris*

Ingressu, and in 1692 his last work, *Processus Integri*, an outline of pathology and therapeutics. An acute attack of gout carried him off in his sixty-sixth year, and he was interred in St James's Church, Piccadilly, where in 1810 the College of Physicians erected a mural tablet to his memory.

Sydenham's place in the history of medicine has already been given. Seemingly behind his age in science, he was really ahead of it in practice. The new-born anatomy and physiology had with premature confidence lent itself to theories, mathematical and chemical, which were utterly at variance with the phenomena of disease as noted at the bedside. He soon satisfied himself that it was hopeless to reconcile them, and that meanwhile, with practical English sense, it was his business to get his patients well. In acute disease he read the forth-putting of that activity by which nature sought to right herself—an activity to be watched and, when possible, to be assisted. Called in to a patient who had been deplorably reduced by lowering treatment, he reversed the practice and 'ordered a roast chicken and a pint of canary.' Chronic diseases he also viewed with the eye of Hippocrates, as due to habits or errors for which we ourselves are mainly responsible, and these he met by appropriate changes in diet and mode of life. The Hippocratic 'natural history method' of looking at and treating ailments of all kinds it was his great merit to have intelligently revived. Among special contributions to nosology he may be said to have first diagnosed scarlatina and classified chorea, while Puccinotti claims for him the title of 'restorer of the curative treatment of small-pox.' Gout was another ailment on which he left a memorable mark. It was as a practitioner, however, that his powers worked most freely and most felicitously.

See the various histories of medicine; Dr W. A. Greenhill's admirably edited *Opera Omnia* of Sydenham, with Dr R. G. Latnam's rendering (both published by the Sydenham Society, founded in 1843); *Select Works* (ed. Dr J. M. Comrie, 1924); Dr John Brown's *Locke and Sydenham; Life* by Newman (1924).

Sydney, the capital of New South Wales and the oldest city in Australia, is situated on the shores of Port Jackson, a deep inlet of the Pacific Ocean. The city was named after Thomas Townshend, first Viscount Sydney (1733-1800), who was Secretary of State in charge of the Colonies when the first British settlers reached New Holland. It had been intended to make the first settlement on the shores of Botany Bay (q.v.). But Captain Phillip, who was in command of the expedition, perceived the unsuitability of this site directly he sailed into the bay; without troubling to put his party ashore, he made search along the coast to the north, and soon discovered the inland trend of Port Jackson, which Cook had thought to be a mere shallow cove like so many others along that coast. After a short exploration Phillip hit on a good stream of fresh water flowing into the deep inlet which he named Sydney Cove; and there, on 26th January 1788, he landed his expedition. The choice was both judicious and fortunate. There are few harbours in the world better fitted physically to be the sites of great commercial cities. Port Jackson is completely landlocked, accessible from the ocean by a passage a mile wide between North and South Head, from which it immediately bends southwards behind a high ridge before extending some fourteen miles westwards. From the main inlet smaller channels are thrown off like veins in a leaf to north and south, each similarly sheltered by high land which sometimes rises 200 or 300 feet above the water. No streams of any size flow into the harbour, so that no difficulty is experienced in keeping a channel of any

requisite depth. The narrow entrance might easily be made inaccessible to a hostile fleet, and the high cliffs on either side give stations for batteries which could ward off any bombardment of the inhabited quarters within. Moreover, Sydney's central position as regards the western Pacific makes it necessarily the chief emporium of both British and foreign trade with the islands of that ocean. Again, Sydney stands nearly in the centre of a great carboniferous basin about 500 miles long and 80-100 miles broad. A hundred miles north of the city, and about 40 miles south of it, are two important coalfields, and immediately underneath the harbour workable seams have been reached by a shaft over 3000 feet deep.

While thus admirably suited for the needs of overseas trade, Port Jackson is by nature ill-adapted to serve the country inland; the small area of farmlands immediately adjacent to it is cut off from the rest of the State by a wide extent of barren ridges to north, west, and south, over which (for, owing to their geological formation, there are practically no passes through them) must be hauled every ton of goods or produce sent from or to Sydney. Being, however, the official centre of the colony from the beginning, the whole transport system of New South Wales was made to converge on it at all costs, both roads and railways being constructed for many, sometimes hundreds of, miles parallel with the coast in order to concentrate trade on this single harbour. This, while acting often as a serious handicap on the progress of the colony, greatly aggrandised Sydney; in 1861 it absorbed 27 per cent. of the total population, in 1891, 34 per cent., and in 1925, 45 per cent. Great endeavours are now being made both to divert population to the farmlands and to decentralise trade by establishing ports at intervals along the sea-coast to which the produce of the interior can be sent more easily and cheaply. It is therefore probable that the city's growth in future will be slower, and less at the expense of the country; but nothing (except, perhaps, a general increase in the size of trading vessels above the draught of 40 feet which at present governs the inner entrance to the port) can displace Sydney from its position as the most important commercial centre of the Commonwealth, especially as the advent of Federation with a fiscal policy of protection has greatly altered the character of its business. Before Federation, Sydney was mainly a collecting and distributing centre, a town of warehouses, offices, and banks; it is rapidly becoming a great manufacturing centre, and the number of factory employees practically doubled between 1900 and 1910—the most important increases having taken place in the clothing, machinery, and furniture factories. To this is due the abnormal expansion of the city in recent years.

Sydney's municipal arrangements are confused, the inhabited area being divided among 41 governing bodies without any central control. The City Council controls a central area of about 3000 acres; the other councils divide among them about 115,000 acres. The principal suburbs are: on the east, Darlinghurst, Paddington, Woollahra, Waverley, Randwick, and Coogee; on the south, Redfern, Waterloo, Botany, Rockdale, and Kogarah; on the west, Newtown, Petersham, Ashfield, Burwood, and Canterbury; along the upper harbour, Balmain, Leichhardt, Drummoyne, Hunter's Hill, and Gladesville. On the ridges north of Port Jackson lie Mosman, North Sydney, and Wilmoughby-Chatswood. Manly, still farther away beyond the northern branch of the harbour, lies along the ocean beach.

The water-supply of Sydney is derived from a catchment area of 347 square miles on the upper Nepean and its eastern tributaries. Four large

dams (Cataract, holding over 20 thousand million gallons; Cordeaux, about the same; Avon, 47 thousand million; Nepean, 11½ thousand million, incomplete) conserve the flow due to a rainfall of 48 inches per annum, which is conveyed by tunnel, canal, and aqueduct to the Prospect reservoir (11 thousand million gallons) about 22 miles from the city, and thence by canal and pipes to distributing reservoirs at Potts Hill (for Sydney and the southern suburbs) and Ryde (for the northern suburbs); the water is used for domestic purposes without either filtration or chemical treatment. The average daily consumption is about 45 gallons per head, but the maximum reached in 1926 was 99 gallons daily during an exceptionally hot summer. Water-supply and sewerage are under a special board, which controls 3324 miles of water-mains and 1358 miles of sewers. Gas is provided by two private companies, one south of the harbour and the other north; electric light in the city is a municipal enterprise, but some of the suburbs prefer private companies. Parks and open spaces abound; the principal are the Domain (90 acres), Hyde Park (43 acres)—both within the city limits—Moore Park (260 acres) and Centennial Park (640 acres). About 12 miles north is Kuring-gai Chase, and about 18 miles south National Park, both reserves of wild bush about 35,000 acres in area. The old military reserves on the harbour cover about 2000 acres more, and the government is steadily resuming strips of 100 feet in depth along the harbour foreshores wherever private buildings do not already occupy the space. The larger ocean beaches at Manly, Bondi, and Coogee are devoted to surf-bathing, which is directly encouraged both by the municipalities and by the government. Evening amusements are catered for by six theatres and two music-halls, besides numerous cinematograph halls. For more serious tastes are provided the public library, the Mitchell Library (housing a unique collection of books and manuscripts concerned with Australia, to the gathering of which the late Mr D. S. Mitchell devoted a lifetime, besides endowing the library with £70,000 at his death), a municipal lending library, a technological and other museums, botanic and zoological gardens (the latter with open pits and terraces for the animals instead of cages), musical, orchestral, historical, art, Linnæan and other societies, and many important clubs.

Among the public buildings worth special notice are Government House, a building in Elizabethan style, overlooking the harbour east of Circular Quay; Parliament House, old and commonplace, and flanked on either side by the much more imposing Sydney Hospital and the Mitchell Library; various government offices, mostly bordering on Bridge Street, which connects the central business quarter of the city with Government House grounds; the post-office in Martin Place, and the series of fine banks and other private offices which face it; the Queen Victoria Markets, and the Town Hall. In the Domain stand the Conservatorium of Music and the National Art Gallery, a building carefully designed for its purpose, containing a good collection of paintings; outside the gates of the same park is the Roman Catholic cathedral, finely built and nobly placed; farther on is the Australian Museum. But the best architecture in Sydney, or in Australia, is to be found at the university, which is built along a ridge between two main roads at the city's western limit, with six affiliated colleges (Anglican, Presbyterian, Roman Catholic, Wesleyan, Women's and Teachers') on the curve of a farther ridge behind it. The front of the main building is 410 feet long, and the Great Hall at its northern end (135 feet by 45 feet, with an open-timbered roof 70 feet high)

is a fine specimen of true Perpendicular Gothic. At the southern end is the Fisher Library, an equally fine three-storied building of similar design; and the Medical School, of less ornate type, stands farther south on the ridge. For an account of the university as a teaching body, see NEW SOUTH WALES.

The city proper, a long, narrow area stretching south from Sydney Cove (now called Circular Quay) and west to the next bay, Darling Harbour, is nowadays entirely devoted to business. The great wharves lie along the two bays just mentioned and a third, Woolloomooloo Bay, about a mile east of the Quay. The six miles of shore and highland between Sydney and the 'Heads' are covered with residences, mostly belonging to the richer part of the community; opposite, along the north side of the harbour, are more residential suburbs, gradually extending and rising along a ridge north-west to a height of 600 feet at Hornsby, 12 miles away; immediately south of the city proper begin the manufacturing districts of Waterloo and Botany, the latter reaching to the shores of Botany Bay; and westwards again another series of residential suburbs covers lower ridges for a distance of nearly fourteen miles, with a second manufacturing centre at Clyde and Granville before the end of urban habitation is reached at Parramatta. Yet a fourth residential area lies along the western shore of Botany Bay, and on the heights between the two rivers—Cook's and George's—which flow into it. The huge proportion of the total area devoted to residences is accounted for by the fact that the favourite type of habitation is a one-story cottage of four to six rooms standing by itself in a small plot of ground. The mass of the artisan population is thus accommodated; and the consequent dispersal over more than 150 square miles of the people whose day's work lies concentrated in two or three very small patches of that area, while it adds much to the comfort of the worker, adds also very much to the difficulties of transport within the area. Although already served by more than 80 miles of suburban railway, nearly 200 miles of electric tramway, innumerable autobuses, and harbour ferries traversing fifteen routes and calling at over seventy wharves—the railways and tramways belong to the State, the other means of locomotion to private companies or individuals—the traffic is so congested that it has become necessary to spend huge sums on an underground railway through the city (the whole of the tunnels being hewn in the solid rock) and on a steel arched bridge across the harbour which will exceed in dimensions all existing bridges of the kind, so that its construction involves new problems in the use of structural steel. The harbour and its foreshores within the commercial area are under the control of the Sydney Harbour Trust, which has reorganised and considerably increased the wharf-space and constructed many jetties of the most modern type. All the new wharves and most of the older are connected with the main railway lines, and wheat may be loaded from up-to-date silos. Unfortunately in the course of these improvements one of Sydney's most notable advantages as a passenger port has been done away with. Whereas a few years ago all the important mailsteamers landed their passengers on Circular Quay, in the very centre of the city amid beautiful surroundings, nowadays one lands on well-equipped but cumbersome jetties in Woolloomooloo Bay, out of which both passengers and cargo must be hauled up steep hills to the city's outskirts.

Garden Island in Port Jackson, for many years the headquarters of the British navy in the Pacific, is now the home station of the Australian squadron of the Imperial navy. Cockatoo Island, farther

up the harbour, is also Federal territory, and several ships of the squadron—both cruisers and destroyers—have been built there.

See AUSTRALIA, NEW SOUTH WALES, and books mentioned thereunder. The Harbour Trust and the Water and Sewerage Board publish handbooks full of detailed information in their respective spheres.

Sydney, a town with an excellent harbour on the east coast of Cape Breton Island, Nova Scotia. There are large iron and steel works, foundries, and wood factories. Over 5,000,000 tons of coal are produced annually from the neighbourhood, and there is a considerable foreign trade. Pop. 22,500.

Sydney, ALGERNON. See SIDNEY.

Syene. See ASSUAN.

Syenite, a rock composed essentially of orthoclase and a ferromagnesian mineral, usually hornblende. It is crystalline, having the same texture as a granite. Quartz is sometimes sparingly present, and other accessory minerals may occur, such as oligoclase, sphene, zircon, apatite, ilmenite, &c. *Elæolite-syenite* is characterised by the presence of elæolite—a nepheline with greasy lustre. Syenite is an igneous rock of deep-seated origin, occurring in the form of bosses and veins. It is not common in the British Islands, but several interesting varieties occur in Sutherlandshire.

Sylhet (*Srihatta*), a British district in the extreme south of Assam (q.v.), partly a rich alluvial tract with tea-gardens, but partly uncultivable waste, has an area of 5388 sq. m. and a pop. of 2,541,000. The chief town, Sylhet, on the Surma River, has a pop. (1921) of 16,912, and some trade and manufactures.

Sylla. See SULLA.

Syllabub, a culinary preparation, formerly much used, consisted of sugar and cream, flavoured with brandy, sherry, and lemon rind and juice, worked into a froth, and served in glasses. White of egg and verjuice seem also at times to have been ingredients.

Syllabus, a term from the Greek usually applied to a compendium or abstract of a lecture or series of lectures, is specially used of the papal syllabus which accompanied the Encyclical (q.v.) *Quanta Cura*, addressed by Pius IX. to all Catholic bishops on 8th December 1864. This syllabus is a catalogue of eighty errors or heresies, and implicitly enjoins the opposite truths; and by Protestants has generally been regarded as a declaration of war against all freedom of thought, modern civilisation, and social progress, and a reassertion of the extravagant claims of the mediæval papacy to supreme authority on every subject. The syllabus is divided into ten sections, condemning (1) pantheism, naturalism, thorough-going rationalism; (2) milder rationalism; (3) latitudinarianism; (4) socialism, communism, secret societies, &c.; (5) errors as to the rights of the church; (6) as to the constitution of society; (7) as to ethics; (8) as to marriage; (9) as to the temporal power of the pope; (10) the errors of modern liberalism. The infallibility of the pope is indirectly asserted, as is the right of the Roman Catholic Church to exercise complete control over education, literature, and science. Catholics have debated amongst themselves whether the syllabus is an *ex cathedra* papal utterance, and so to be regarded as *de fide* and infallible. The syllabus of Pius X. issued in 1907 in condemnation of 'modernism' in biblical criticism and of liberal theology is a continuation of that of 1864, and was levelled primarily against Père Loisy (q.v.).

See Gladstone's *Vatican Decrees* (1875); Manning's reply, and his *Letter to the Duke of Norfolk*; and Gladstone's answer in *Vaticanism* (1875).

Syllogism. See LOGIC.

Sylphs, in the fantastic system of the Paracelsists, are the elemental spirits of the air, just as the salamanders are of fire and the gnomes of earth. They hold an intermediate place between immaterial and material beings. They eat, drink, speak, move about, beget children, and are subject to infirmities like men; but, on the other hand, they resemble spirits in being more nimble and swift in their motions, while their bodies are more diaphanous than those of the human race. They also surpass the latter in their knowledge, both of the present and the future, but have no soul, and when they die nothing is left. In form they are ruder, taller, and stronger than men, but stand nearest to them of all the elemental spirits, in consequence of which they occasionally hold intercourse with human creatures, being especially fond of children and of simple harmless people; they even marry with our race, like the Undines and the Gnomes, and the children of such a union have souls and belong to the human race. In common usage the term sylph is applied to a graceful maiden—a change of meaning probably owing to the popularity of Pope's *Rape of the Lock*, which introduced the term into the world of fashion and literature. For although even in Pope the sylph that guards Belinda is masculine, yet the poet so refined and etherialised his spiritual agents that they soon came to be identical with ideas of feminine grace and beauty.

Sylt, a narrow island, 23 miles long, off the west coast of Sleswick. The inhabitants (Frisians) decided by plebiscite in 1920 to remain German citizens.

Sylvester, name of three popes—SYLVESTER I. (314–335) is claimed to have baptised Constantine the Great, and to have received from him the famous Donation. He was canonised, his day falling on December 31.—SYLVESTER II., whose name was Gerbert, was born at Aurillac in Auvergne about 945, and early acquired from his extraordinary attainments in philosophy, but especially in mathematics and chemistry, the reputation of being in league with the Devil. Made abbot of Bobbio by Otto II., he became secretary to Adalberon, Archbishop of Reims, whom he succeeded in the archbishopric in 991. He was made archbishop of Ravenna in 998 and pope in 999, being the first Frenchman to wear the tiara, and died in 1003. The importance of Gerbert is threefold; in philosophy, he can be called one of the founders of the scholastic movement; in mathematics, he was one of the earliest links between the Arab and Western civilisations; in politics, he had enormous influence over the youthful and visionary Emperor Otto III., and encouraged him in his dreams of a true intimate union at Rome of the temporal and spiritual authorities. See various editions of his *Letters*.—SYLVESTER III. (1044–46), Anti-pope to Benedict IX., was set aside at the Synod at Sutri.

Sylvester, JAMES JOSEPH, mathematician, was born in London, 3d September 1814, studied at St John's College, Cambridge, and was successively professor in University College, London, in the University of Virginia, at Woolwich, in the Johns Hopkins University, and at Oxford (Savilian professor, 1883–94); and he published many memoirs, received many medals and honours, was LL.D., D.C.L., F.R.S., and fellow of many foreign academies. He died 15th March 1897. See his *Collected Mathematical Papers* (4 vols., 1904–12).

Sylvester, JOSHUA, was born in 1563. His life was divided betwixt merchandise and poetry, but in neither did he achieve success. Of his original works the human memory retains no trace, save perhaps only in the title of the poem

published about 1620, entitled *Tobacco Battered and the Pipes Shattered by a Volley of Holy Shot thundered from Mount Helicon*; but in virtue of the great though short-lived popularity obtained by his English version of the *Divine Weeks and Works* of Du Bartas he lives in literary history a kind of shadowy life. He led a somewhat wandering existence, and died at Middleburg in Holland in 1618. His works (1641) were reprinted by Grosart in the 'Chertsey Worthies Library' (1878).

Sylvia. See WARBLER.

Sylviculture. See FORESTRY.

Symbiosis (Gr. 'living together'), a biological term introduced by the botanist De Bary to denote an intimate, internal, mutually beneficial partnership between two organisms of different kinds. The case he had in mind was that of lichens, which are actually dual organisms, being composed of Algaoid and Fungoid components living in partnership. The pigmented partner-Algae are able to effect photosynthesis (the utilisation of the carbon dioxide of the atmosphere in the building up of carbohydrates); the partner-Fungi are able to absorb water and salts from their surroundings; the result is a lichen which thrives on rocks and stones, stems and branches, where the problem of subsistence is at its severest. Similarly, as Geddes, Brandt, and others have demonstrated, most Radiolarians of the open sea illustrate symbiosis. The transparent animal cell (or colony of cells) includes symbiotic partner-cells (the so-called 'yellow cells,' referred by most authorities to Algae, by others to Monad Infusorians), which are able in the sunlight to utilise carbon dioxide, to liberate oxygen, and to synthesise carbohydrates, such as starch. Nothing could be better for the symbions than the immediate production of carbon dioxide by their animal partner; nothing could be better for the animal than the liberation of oxygen by the enclosed green symbions. Moreover, the starch made by the symbiotic Algae may be utilised as food by the Radiolarian (see *RADIOLARIA*). The symbiotic Algae are often called technically Zooxanthellae or Zoochlorellae. Symbiotic Algae occur inside some unicellular Protozoa, such as species of Stentor and Vorticella, in some fresh-water sponges (Spongillidae), in the endoderm cells of *Hydra viridis*, in some green sea-anemones, in many Zoantharian corals, in many Aleyonarians, in the Planarian worm, *Convoluta*, and in other cases. There is considerable difficulty in deciding whether the green colour of an animal is due to the presence of chlorophyll corpuscles intrinsic to the animal, or to the presence of symbiotic green Algae, which are independent living creatures, sometimes able to fend for themselves.

When an organism simply grows on a plant, like a hydroid on a seaweed, or like one seaweed on another, it is called epiphytic. When an organism simply grows on an animal, like a hydroid on a crab's carapace, or a seaweed on a lobster, it is called epizoid. There is no appreciable partnership in such cases. But when a sea-anemone lives in partnership with a hermit-crab, cloaking or masking it, possibly stinging its enemies, but carried about by it and doubtless sharing crumbs from its repasts, there is an external mutually beneficial partnership, for which the most appropriate term is commensalism. As there are these several words, it is advantageous to restrict symbiosis to *internal* and commensalism to *external* partnerships. Consortism and mutualism are respective synonyms. It is plain enough that these associations must be connected by intergrades. Epizoid or epiphytic organisms may become commensals, and commensals might become

symbions, and symbions are always liable to become parasites (see PARASITIC ANIMALS, PARASITIC PLANTS). In some cases, as in root-tubercles, bacteria, which were perhaps parasitic to start with, may become symbiotic (see NITROGEN FIXATION). While it may be desirable to restrict the technical use of the term symbiosis applicable to cases like lichens and Radiolarians and the green *Convolvata*, there is no confusion of thought in saying that the mammalian offspring has an ante-natal symbiosis with its mother.

See COMMENSALISM, EPIPHYTES, LICHENS, PARASITIC ANIMALS; O. Hertwig, *Die Symbiose* (Jena, 1883); Geddes, *Nature*, xxv. (1882); Lankester, *Nature*, xxvii. (1882); Brandt, *Archiv. f. Anat. und Physiol.* (1882); and *Mittheilungen Zool. Stat. Neapel*, iv. (1883); and Keeble, *Plant-Animals* (Cambridge, 1910).

Symbol (Gr. *symbolon*, 'a sign') is a word that became significant in connection with a movement conspicuous at the end of the 19th and at the beginning of the 20th century in French literature, especially in poetry. The 'symbolists,' who include such writers as Rimbaud, Verlaine, Mallarmé, Henri de Régnier, and, in Belgium, Maeterlinck and Verhaeren, represent a strong reaction against what had come to be known as realism, in favour of idealism, religious feeling, the sacred, and the antique, and cherish the esoteric, the supernatural, the mystical. They rejoice in the magic charm of music and of melodious words, and seek to make verse and poetry more subtle, intimate, and musical; Wagner was an element of their inspiration, and Debussy associated himself with them, setting many of their poems to music. They even strive to harmonise and blend the functions of the several senses, to associate particular vowels with particular colours; and they court everywhere the metaphysical, transcendental, and mysterious. Many German writers, such as Dehmel, Schaukal, Rilke, Stefan George, and Hugo von Hofmannsthal, were powerfully influenced by the French symbolist school. The *Décadents*, an offshoot of this movement, drew their inspiration from Baudelaire (see Arthur Symons, *The Symbolist Movement in Literature*, 2d ed., 1908; also books in French by Kahn, 1902, and Raynaud, 1919). Symbolism, however, has also attracted writers so different as Blake and Oscar Wilde, while in art, Pre-Raphaelitism (q.v.) and, to a more limited extent, Post-Impressionism (see PAINTING) can both in their different ways be called symbolistic.

The word symbol is frequently used in a wide and general sense of arbitrary or conventional marks (such as letters of the alphabet, numbers, &c.) which greatly abbreviate methods of scientific expression, as in algebra and mathematics, and especially in chemistry (for chemical symbols, see CHEMISTRY, ATOMIC THEORY). Alchemy and Astrology (q.v.) raised a large crop of symbols; from the latter astronomy has derived not a few. But symbol is now usually almost synonymous with emblem—a concrete and visible figure standing for something moral, intellectual, or religious. A lion is the symbol of courage, a lamb of meekness, &c. Greek and Roman mythology produced a large number of symbols—the trident of Neptune, the peacock of Juno, &c. Early Christian symbolism—originating mainly in a Greek colony in Rome—may be traced in the Catacombs, and an outline of its development has been already sketched in the article CATACOMBS. The greatest number of symbols are those which represent Christ—some mere letters or combinations of letters, as the Monogram (q.v.), composed of A and Ω, of IX and ✠ (for *Christos*; see CROSS), of ΙΗΣ (initials of *Iesus*). Of another kind is the word ΙΧΘΥΣ, the Greek work for fish, the several letters standing for the initial letters of the Greek words 'Ἰησοῦς

Χριστὸς Θεοῦ Υἱὸς Σωτὴρ. The symbol of a pictured fish is also used for Christ; and some contend that this symbol, for whatever reason, was in use before the acrostic word was invented or thought of. Then there are pictures of the Good Shepherd, the True Vine, &c. (see also SAINT). So innumerable devices symbolised facts of Christian history, or aspects of Christian truth. In her ritual the Roman Catholic Church has given copious expression to religious symbolism. In architecture also symbolism appears in the cruciform shape of churches, in Orientation (q.v.), &c. In theological language it should also be noted that symbol sometimes means, like the Greek *symbolon*, a creed; hence symbolics is the study of the history and contents of Christian creeds.

See Munter, *Sinnbilder* (1825); Auber, *Histoire et théorie* (1884); Husenbeth, *Emblems of the Saints* (1882); books on Symbolism in Christian Art, by Twining (1885), Hulme (1891), and Clement (1899); Murray-Aynsley, *Symbolism of the East and West* (1900); Heath, *Romance of Symbolism* (1909); Saunier, *Légende des Symboles* (1911); Schlesinger, *Geschichte der Symbole* (1912); books on Animal and Floral Symbolism by Collins (1913) and Haig (1913) respectively; Silberer, *Problems of Mysticism and Symbolism* (1917).

Syme, JAMES, was born, the son of a Fife lawyer, in Edinburgh, 7th November 1799, and studied at the university. In 1818 he announced a method of making waterproof cloth by means of caoutchouc dissolved in coal-tar naphtha—a process for which a patent was taken out by Macintosh of Glasgow. From 1823 to 1832 he lectured on surgery, and, when refused a surgical appointment in the Edinburgh Infirmary, he established Minto House Hospital at his own expense, where he delivered a clinical course from 1829 to 1833. In 1831 appeared his well-known treatise on *The Excision of Diseased Joints*; and in 1832 his *Principles of Surgery*, which went through many editions, and which established his reputation as a teacher of the first rank. In 1833 he was elected to the chair of Clinical Surgery in the university, and in 1838 he was appointed surgeon in ordinary to the Queen in Scotland. In 1848 he gave up his Edinburgh chair to fill that vacated in London by the death of Liston; but collegiate misunderstandings induced him, after five months, to return to Edinburgh, where he was reappointed to his old chair. His life abounded in controversies. As an operator Syme had no superior; as a teacher he had no equal. His innovations in the practice of his art were characterised by so much ingenuity, controlled by such scientific caution, that they were everywhere adopted. One of the best known of his pupils, Dr John Brown, terms him (*Horæ Subsecivæ*, i.) the 'best and ablest and most beneficent of men,' and the greatest surgeon Scotland ever produced. He further calls his spoken or written style 'the perfection of terse clearness.' Syme was the author of many medical treatises. He died 26th June 1870. See the *Memoir* by Dr Paterson (1874).

Symeon. See DURHAM (SIMEON OF).

Symington, WILLIAM (1763–1831), one of the inventors of steam-navigation. See SHIPBUILDING.

Symmachus, QUINTUS AURELIUS, a distinguished Roman orator, who flourished from 340 till 402 A.D., was educated in Gaul, and became prefect of Rome in 384 under Theodosius the Great, consul in 391. He was sincerely devoted to the old religion, but his purity and nobility of character were worthy of the highest Christian type. His extant writings consist of ten books of Letters, three panegyrics on Valentinian I. and Gratian, and fragments of six senatorial orations. The fragments of the orations were first discovered by Cardinal Mai in a palimpsest, part of which is at

Milan, part at the Vatican, and were successively published in 1815 and 1825.

See Seeck's edition in the *Monumenta Germaniae Historica* (vol. vi. 1883), Morin's *Étude* (1847), Dill's *Roman Society* (1898), Glover's *Life and Letters in the 4th Century* (1904).

Symonds, JOHN ADDINGTON, English man of letters, was born at Bristol on 5th October 1840, was educated at Harrow and Balliol College, Oxford, won the Newdigate prize, and was elected a Fellow of Magdalen College in 1862. His first book, *Introduction to the Study of Dante* (1872), was a sort of commentary on the great Italian's poem; it was followed by *Studies of the Greek Poets* (2 vols. 1873-76). But his most notable achievement is *The Renaissance in Italy*, a history of an eventful period written in a highly polished style, with fairly good judgment, and an extensive knowledge of the actors and events of the epoch described. It embraces four parts and a couple of supplementary volumes—*The Age of the Despots* (1875), *The Revival of Learning* (1877), *The Fine Arts* (1877), *Italian Literature* (2 vols. 1881), and *The Catholic Reaction* (2 vols. 1886). *Shakespeare's Predecessors in the English Drama*, published in 1884, contains the results of thoughtful study in English literature. Symonds wrote, besides the books named, two or three volumes of travel sketches in Italy and elsewhere; monographs, *Shelley*, *Sir Philip Sidney*, and *Ben Jonson*; translations of the *Sonnets of Michelangelo* and *Campanella* (1878), of Benvenuto Cellini's autobiography, and of an interesting collection of students' Latin songs of the 12th century under the title of *Wine, Women, and Song: Mediæval Songs in English Verse* (1884); *Life of Michelangelo* (2 vols. 1892); some volumes of verse; and an account of his enforced residence at Davos (1892). He died at Rome, 18th April 1893.

See his *Miscellanies* (1895); *Life* by H. F. Brown (1894), who also edited his *Letters* (1923); *Out of the Past* (1925), by Margaret Symonds (Mrs Vaughan); *Study* by Brooks (1914); and *Bibliography* by Babington (1925).

Symons, ARTHUR, critic and poet, was born in Wales, of Cornish parentage, in 1865, and educated privately. He is one of the leading exponents of contemporary (especially French) literature, advocating extreme freedom in artistic expression. *Collected Poems* were published in 1901, and *Tragedies* in 1916. His chief work has been *The Symbolist Movement in Literature* (2d ed. 1908). Other volumes of criticism are *Studies in Seven Arts* (1906), *The Romantic Movement in English Poetry* (1909), *Studies in Elizabethan Drama* (1920), and *Baudelaire* (1921). His *Collected Works* (16 vols.) appeared in 1924 *et seq.*

Sympathy. See ANTIPATHY; for the Sympathetic Powder, see DIGBY; for the Sympathetic System, see NERVOUS SYSTEM.

Symphonic Poem. See PROGRAMME MUSIC.

Symphony, in Music, a form of orchestral composition. The name was originally applied to the purely instrumental portions of works primarily vocal, under it being included overtures to operas and oratorios as well as ritornelli and the introductions to choruses and arias. It received its first restrictive meaning towards the end of the 17th century when, under Lulli and Alessandro Scarlatti, the various instrumental pieces in the operas began to grow in importance: it was then reserved for the opening section or overture, which consisted of a series of contrasted movements without definite rule as to their number or arrangement. Subsequently a plan, attributed to Lulli and known as the 'ouverture à la manière française,' prescribed three movements, the first and third slow and the

middle one quick and bright. Its place was eventually taken by the 'Italian overture,' in which the three movements were retained but in inverse order, the first and last being quick and the second slow. This form was identical with that of the clavier-sonata, to which, however, the overture long remained inferior in respect of the internal structure of its movements, few composers caring to show themselves at their best in pieces to which talkative audiences paid little heed. As a further result of such inattention it seemed to be forgotten that the overture should fitly foreshadow the work which it preceded: its material, consequently, became distinct and independent, so that it was only natural that the best examples should in course of time find their way into the concert-room, where they met with a more courteous reception. A new outlet being thus provided, original works were soon forthcoming; and with the liberation of the symphony from its operative surroundings its development as an abstract form of art may be said to have begun. Meanwhile the reinforcement of the ordinary stringed orchestra by certain wind-instruments in the beginning of the 18th century introduced fresh possibilities of expression which reacted on the material of which the movements were composed. In some of Stamitz' symphonies a fourth movement is also found in the shape of a minuet and trio; and with this, the external outline reaches completion. In the works of Emanuel Bach (a son of J. S. Bach), there begins to be a greater freedom of writing between the individual instruments, which up to then tended to be treated in groups, but it was not, however, until 1788, the year in which Mozart wrote his greatest examples, that the symphony attained the rank of an important work of art. In these three works, the E flat, G minor, and C major symphonies, an extraordinary advance is visible both in expression and in richness of instrumental effect. Haydn, though born nearly twenty years before Mozart, wrote his most important symphonies during the eighteen years he survived his younger contemporary. But the symphony was brought to its most perfect stage of development by Beethoven. Not only did he determine the constitution of the symphonic orchestra and expand and elaborate the existing features of the different movements (especially the minuet and trio, which he turned into the scherzo, double the length), but to all this he added in his subject-matter a depth of human emotion such as hitherto had never come within the scope of musical expression. The essential qualities of his music are nobility of thought allied to perfection of detail, and a true balance between material and form. The *Eroica*, C minor, and A major stand as the most perfect examples of the classical symphony, while in the wonderful D minor an elaborate choral setting of one of Schiller's odes is substituted for the usual *finale*. This marks the close of the classical period. In the works of Schubert the 'colour' and 'sentiment' of Romanticism (q.v.) appeared, and in the 19th century two formidable rivals to the symphony (and to the Sonata (q.v.) generally) as the ordinary vehicle of musical expression, rose in the Programme Music (q.v.) of Liszt and Berlioz and in the music drama of Wagner. The symphonies of Mendelssohn, Schumann, Bruckner, and Mahler have, on the whole, not stood the test of time, but those of Brahms are masterpieces of thematic interest and development. Eventually the symphony came to be treated with greater boldness and freedom. Distant modulations, varied choice of keys for the different movements, varied order of the movements, and the 'cycle' scheme of introducing a 'motto' theme in different parts of the work are characteristic, especially of César Franck, Tschai-

kowsky (who was apt to let emotion run riot), and Elgar. Though the 20th century is further characterised by a cult of the *genre* (from Schumann through Grieg to Debussy), and by the elevation by the Russians of the ballet to a separate art form, D. Rák, Saint-Saëns, Glazunov, and Rachmaninov all more or less worked along classical lines. Sibelius and Skriabin both made the symphony thoroughly individual, and moulded it to suit their own peculiar artistic concepts, while the symphonies of Strauss (*Domestic, Alpine*) and Vaughan Williams (*London, Pastoral*) are conceived rather along the lines of programme music. See articles on the various composers, and the books there cited.

Symplegades. See ARGONAUTS.

Synagogue (Gr. *synagōgē*, 'assembly,' or 'place of assembly,' answering to Heb. *keneseth* or *beth-hakkeneseth*), a Jewish place of worship. The origin of this institution is probably to be traced to the period of the Babylonian captivity, although tradition finds it in the patriarchal times. When, through Ezra's instrumentality, the ancient order of things was restored in Judea, synagogues were established in all the towns for the benefit of those who could not take part oftener than three times a year in the worship of the temple at Jerusalem, and a special ritual of readings and prayers was instituted. From the time of the Maccabees we find them even in all the villages; and Josephus, Philo, the New Testament, the Mishna, and the Talmud constantly allude to them. Common prayer and religious instruction were the purpose for which the people there met. The Sabbaths and feast-days were the principal times on which the faithful assembled in them; there were short services also on Mondays and Thursdays; and the synagogues contributed more than anything else to the people's steadfast adherence to their religion and liberty. At the same time they gradually undermined the priestly and aristocratic element that gathered round the temple, its gorgeous worship and kingly revenues. Erected out of the common funds or free gifts of the community, the synagogue had also to be supported by taxes and donations. All profane doings were strictly prohibited in it; even as to dress the reverence due to the place was enforced as rigidly as possible. It represented in miniature the form of the temple, itself an enlarged type of the tabernacle; the faces of the congregation were turned towards Jerusalem. At the extreme eastern end was the holy ark, containing several copies of the Pentateuch, from which the periodical readings were chanted. Not far from this was suspended the ever-burning lamp. On a raised platform in the middle of the synagogue was the place of the reader or preacher. The women sat separated from the men by a low partition. The affairs of the synagogue were administered by a board of 'ancients' or 'elders,' at whose head stood a chief or principal (*Rōsh hakkeneseth*; Gr. *archisynagōgos*). This college managed the inner affairs of the synagogue, and had even the power of excommunication. There was an officiating minister (*sheliach tzibbur*), whose office it was to recite the prayers aloud. The beadle, or *chazzan* (sometimes translated 'minister'), had the general charge of the sacred place and its books and implements. He had to present the scroll to the reader, and assist on other occasions. During the weekdays he had to teach the children of the town or village. This name of *chazzan*, however, at a later period came to designate the officiating minister, and it has retained that meaning until this day. Almoners or deacons collected and distributed the alms. It need hardly be pointed out that the organisation, rites, and modes of worship of the

Christian church in many respects closely resembled, if they were not modelled on, those of the synagogue.

See the articles **JEW**, **SANHEDRIN**, **RABBI**; and for the 'Men of the Great Synagogue,' see art. (s.v.) and bibliogr. by H. Engländer in Heb. Union Coll. *Jubilee Volume*, Cincinnati, 1925, pp. 145-170.

For further information in regard to **ORIGIN**, **NAME**, **HISTORY**, and **ORGANISATION** of the synagogue, see the following articles, to which bibliographies are appended: (1) Itemised references in Hastings, *E.R.E.*, xiii. 581, col. 1; (2) Concise summary by A. R. S. Kennedy (Hastings, *Dict. Bible*, 1909, p. 882); see also *Ency. Brit.*, xxvi. 291; (3) For details, see the longer articles by W. Bacher (*Jew. Ency.*, xi. 619 and Hastings, *Dict. Bible*, 1902, iv. 636), K. Kohler (Hastings, *Dict. Apostol. Ch.*, ii. 541); P. Fiebig, two articles in *Relig. in Gesch. u. Gegenwart*, Tübingen, 1913, v. 1036 and 1039; J. Peritz (*Ency. Bibl.*, iv. 4832); G. Dalman and H. L. Strack, three articles in *New Schaff-Herzog*, xi. 213, 214, and 217; R. W. Moss (*Dict. Christ and Gosp.*, ii. 689); W. Drum (to be used with caution, *Cath. Encycl.*, xiv. 379). **SYNAGOGUE ARCHITECTURE**: Refs. in Hastings, *E.R.E.*, xiii. 581, col. 1; J. Jacobs (*Jew. Ency.*, xi. 631, with many illustrations); W. G. Tachau (*Amer. Jew. Year Book 5687*, Phil. 1926, p. 155, with many illustrations). **WORSHIP AND SERVICE**: H. Loewe (Hastings, *E.R.E.*, x. 194; see also *ib.* xii. 804); W. O. E. Oesterley and G. H. Box, *Relig. and Wor. of the Syn.*, Lond. 1911; the most convenient liturgy (Hebrew and English) is S. Singer's *Authorised Daily Prayer Book* (Eyre and Spottiswoode, 2s.); a list of other editions and most rites will be found on p. 295 of S. Levy's *Jewish Year Book*, Lond. 1927. **MUSIC**: F. L. Cohen and D. M. Davis, *Voice of Prayer and Praise*, Lond. 1914; J. S. and M. Crémieu, *Chants Hébraïques*, rite of Carpentras (Marseilles); numerous articles by F. L. Cohen in *Jew. Ency.*; E. R. Jessurun in M. Gaster's *Order of Service . . . Spanish . . . Jews*, 5 vols. Lond. 1901-6. Other works in S. Levy (p. 300, *op. cit. sup.*). **ANCIENT SYNAGOGUES**: Only general indications can here be given. **GALLILEE**—*Jew. Ency.*, xi. 620; indexes to *Quart. Statements of Pal. Explor. Fund.* **EGYPT**—articles on *Genizah* and similar subjects in indexes to *Jew. Quart. Rev.*; J. Mann, *Jews in Egypt* . . ., Oxford, 1922; H. Bell, *Jews and Christians in Egypt*, Brit. Mus., 1924. **PRAGUE** and other famous **EUROPEAN** synagogues—*Jew. Ency.*, s.v. **ENGLAND**—M. Gaster, *Hist. of the Anc. Syn.*, Lond. 1901; W. Samuel, in *Jew. Hist. Soc. Trans.*, 1924 (a most important treatise on the first post-expulsion synagogue); L. N. Dembitz, on the legal aspect of the synagogues, *Jew. Ency.*, xi. 629; I. Abrahams, 'The Freedom of the Syn.' in *Stud. in Phar.*, 1st series, Camb., 1917. **MODERN SYNAGOGUES**: The United Synagogue (LONDON), I. Abrahams in *Ency. Brit.*, xxvi. 292; I. L. Bril in *Jew. Ency.*, xii. 378. Statistics and details of synagogues in **BRITISH EMPIRE**, S. Levy, *op. cit.*; in **AMERICA**, *Am. Jew. Year Book*, *op. cit.*; on the **CONTINENT**, see various congregational handbooks, e.g. *Jüd. Jahrbuch f.d. Schweiz*, Basel, annual, or Valentine's *Jewish Almanac*, Lond., annual.

Synaptase. See EMULSIN.

Syncline. See ANTICLINE.

Syncopation occurs in music when the accent in a bar is displaced from its normal position, and the rhythm becomes thereby distorted. It is characteristic of jazz and rag-time, but practically all the great classical composers, especially Schumann and Wagner, used syncopation to give interest and vitality to their themes.

Syncope. See FAINTING.

Syncretism, usually theological compromise, as between Catholics and Protestants, or more specially between Lutherans and Reformed; see CALIXTUS (GEORG).

Syndicalism, originally a French development of Trade Unionism, is discussed in the article **SOCIALISM**.

Syndicate. See ASSOCIATIONS, TRUSTS, AND CARTELS.

Synergism, a deviation from the Augustinianism of Luther and the first stage of the Reformation which was regarded as a form of Semi-Pelagianism (see PELAGIUS). Melancthon, who latterly taught expressly that the human will has 'the power of seeking grace,' and that in the work of grace there is co-operation between the Holy Spirit and man's will, was the chief representative of synergism.

Synesius, Bishop of Ptolemais in the Libyan Pentapolis, acted also the various parts of soldier, diplomatist, orator, philosopher, and poet. Born at Cyrene about 375 A.D., he studied at Alexandria under Hypatia (q.v.), whose influence over him proved lifelong. He also studied in Athens; and he returned to the Pentapolis, resolved to spend his life in study, hunting, and the other pursuits of a country gentleman. Appointed a delegate from Cyrene to the Emperor Arcadius at Constantinople, he remained in that city for three years. There, under the veil of a conflict between Osiris and Typhon, who personify Good and Evil, he wrote an allegory describing the contest then going on between Aurelian and the Scythian Gainas; incidentally dealing with the question why God permits evil, and delays so long to interfere. His perilous homeward voyage from Alexandria Synesius described in a long and delightful letter. About 403 he married; and during these years he wrote his treatise *Concerning Dreams*, a half-burlesque essay, *The Praise of Baldness* (he was bald himself), his *Dion, or on Self-discipline*, setting forth his ideal of the philosopher, the second part of his book on Providence, several *Hymns*, and a great many letters. This peaceful period was interrupted by war. The Libyan nomads made raids upon the fertile Pentapolis; there were no soldiers at Cyrene, but Synesius raised a troop of volunteers. The helpless governor Cerealius fled; Cyrene was besieged, and Synesius had to organise and direct the defence of the city.

Up to this time Synesius appears before us as a man of letters, steeped in Greek literature and philosophy, and standing quite outside of Christianity. In 409 the people of Ptolemais, fearing the appointment of a corrupt governor, fixed on Synesius as their bishop, who would be at the same time their real political leader and head of the army. Synesius was most unwilling; but at last he yielded, and was consecrated at Alexandria in 410. Doubtless the horrors of war and barbarian invasion forced upon his mind the weakness of Neoplatonism. From this time to his death his life was burdened and weighed down by constant private troubles and public calamities. On his return to Ptolemais he found the new governor Andronicus playing the tyrant, boldly excommunicated him, and secured his recall. As a bishop Synesius acted with great prudence and decision, yet his conscience troubled him, and he felt that he had been presumptuous in undertaking such an office. The Ausurians invaded the country, and Synesius had again to spend his nights on the ramparts and direct the defence. His only surviving child died. Synesius was broken with troubles, and both his philosophy and his religion appeared to fail him in his need. The city was relieved, but he fell ill; and about 413 he died. His last letter was written to Hypatia. His last *Hymn*, with its humble prayer for deliverance from indwelling sin, contrasts with the Neoplatonic doctrine of the earlier hymns, the longing of the soul to rise to intellectual communion with God. His letters reveal to us a man open-eyed, of high spirit and awake to every call of duty, sound and healthy in body and mind, passionately fond at the same time of intellectual pursuits and of sport.

See editions by Turnebus (1553), Krabinger (1825-50), Migne (1859), and Flach (1875); studies in French by Druon (1859), in English by Crawford (1901), in Italian by Terzaghi (1907), and in German by Volkmann (1869) and Grützmacher (1913); also the *Letters* translated into English with introduction by Fitzgerald (1926).

Synge, JOHN MILLINGTON (1871-1909), born at Rathfarnham, Co. Dublin, studied music, lived a good deal in Paris, and wrote a series of remarkable plays, illustrating intimately Irish peasant life and character. They include *In the Shadow of the Glen*, *Riders to the Sea*, *The Well of the Saints*, *The Playboy of the Western World*, and *Deirdre of the Sorrows*. Synge was closely associated with Lady Gregory and W. B. Yeats in the foundation of the Abbey Theatre (1904) in Dublin, one of the manifestations of the powerful twentieth-century Irish Literary Movement. His style of writing is at times fantastic and unconventional, but highly picturesque, and musical in its rhythms. See studies by Howe (1912) and Bourgeois (1913).

Synod. See COUNCIL, PRESBYTERIANISM.

Synovial Membrane is a characteristic smooth *surface* which produces a substance somewhat resembling white of egg and therefore called Synovia, which facilitates the movements of joints, the gliding of a tendon of a muscle, or of the integument over a projection of bone. Its inflamed condition is called *Synovitis*, but this term is extended to inflammation of the joint, or Arthritis. See JOINTS.

Synthesis (Gr. 'a putting together'), in Chemistry, is a term applied, in contrast to Analysis (q.v.), to the building up of compound substances from the elements they contain or from other compounds usually of less complexity than themselves. The term was formerly applied more particularly to the 'artificial' formation by the ordinary processes of the laboratory of substances which were at one time only obtainable as themselves products of the vital processes of plants or animals, or as derivatives from such products. Later the term was especially applied to the building up of complex carbon compounds; the greater part of modern organic chemistry consisting of such synthesis of new compounds of carbon.

Syntheses of new organic compounds are frequently the result of chance discoveries of new reactions, but a very large number of such reactions of more or less general applicability have been studied and classified, so that a new synthesis may be the result of a deliberate attempt to produce a new compound of a definite composition. Similarly the constitution of an important compound occurring in nature, such as, for instance, an alkaloid, is often known with tolerable certainty from the products yielded by it in a series of decompositions, and the information which has been gained from these decompositions indicates the lines upon which an attempt at synthesis may be made with a fair prospect of success. The mode of procedure indicated in the foregoing sentence has resulted in the synthetical or artificial production of numerous substances useful in the arts, in medicine, for domestic purposes, &c. As instances of substances naturally occurring in, or obtainable from, plants or animals, which have also been prepared synthetically, the following may be mentioned: indigo; alizarine, the colouring matter from madder; vanilline, the flavouring principle of the vanilla pods; citric acid, the acid of lemons; urea; uric acid, &c. Amongst the most familiar of synthetically prepared compounds not known as occurring naturally are a large number of the so-called coal-tar colours, saccharine, and many other coal-tar products.

Syntonin (also called Muscle Fibrin), a substance akin to fibrin, which is an important constituent of muscular tissue. See **MUSCLE**, **FIBRIN**, **PROTEINS**.

Syphilis is a highly contagious and inoculable disease, which runs a slow course, usually of many years, after it has gained entrance to the system. The changes which it produces in the tissues are somewhat similar to those found in tuberculosis and leprosy, which are also diseases usually of very gradual development. In addition to showing symptoms for many years, the disease is capable of being transmitted from parents to children (congenital syphilis). The disease is not only passed from one person to another by direct contagion, but the infection can also be transmitted through some vessel or towel which has been recently contaminated. Fortunately, such inanimate objects retain their infectiveness only for a very short time, as the spirochete which causes the disease, when away from a living body, dies in a short time, probably in a few hours. The disease is most commonly transmitted by venereal infection.

This disease has an interesting history. It became extraordinarily prevalent in Europe towards the end of the 15th century, having been first noticed in a wide-spread form at the siege of Naples by the French troops under Charles VIII. in the years 1494 and 1495. The disease quickly spread in an epidemic form to France and other parts of Europe. By April 1497 the disease had reached Aberdeen, and on 21st April of that year the Town Council of Aberdeen issued a statute dealing with its prevention. This appears to have been the first public notice recognising the nature of the disease. In September 1497 the Town Council of Edinburgh, apparently under the direction of King James IV., issued a stringent regulation commanding all those who were infected to betake themselves to Inchkeith for isolation treatment, under penalty of being branded and banished. Somewhat similar regulations followed in various towns of England and Scotland.

The New World had been discovered by Columbus in 1492, and there are contemporary records both of the prevalence of this disease in Hispaniola and of its occurrence among the sailors of the navigator. Various bones of American Indians also have been discovered more recently showing traces of this disease. It has, therefore, been contended that the disease was introduced into Europe from the New World by the sailors of Columbus. On the other hand, a disease is described by mediæval European writers of the 14th century, such as Guy de Chauliac, showing symptoms very similar to those of syphilis. The probability, therefore, is that a disease of this nature occurred from ancient times in the eastern hemisphere, but that a different variety occurred in the western hemisphere, which spread as an epidemic on its first introduction into Europe.

On its first appearance the disease received various names, such as the *morbus Gallicus*, French disease, Neapolitan disease, and grandgore. The name syphilis was borrowed from that of the chief character in a Latin poem by Jerome Fracastoro, published in 1530. The organism responsible for the disease was found by Schaudinn and Hoffmann in 1905 to be the *Spirochaeta pallida* (*Treponema pallidum*), and an important test for the presence of this disease was afterwards discovered by Wassermann.

The disease may be 'acquired' by contact with persons already suffering from it, or it may be 'inherited' from one or both parents. The general surface of the skin does not seem capable of being penetrated by the organisms of the disease, but the infective material apparently has the power of lodg-

ing in mucous membranes, and various secretions, as well as the blood of persons suffering from the disease, are highly infectious. The disease is frequently spoken of as occurring in three stages—primary, secondary, and tertiary—but this division is purely arbitrary. After an incubation period without symptoms, ranging from a fortnight to six weeks, though most frequently occupying about four weeks, a small ulcer with hard base appears at the site of infection. This is known as a hard chancre or primary sore, and it presents a peculiar character in its resistance to all healing treatment. A short time afterwards the lymphatic glands in the neighbourhood of the sore and, later, those all over the body become enlarged and hard. This condition lasts for several weeks as a rule, and then the sore slowly heals and the glands subside. Before this takes place, or after a period which may be about two months from the date of infection, secondary symptoms appear. These resemble the symptoms of an ordinary fever, including rise of temperature, feverishness, loss of appetite, vague pains through the body, and a faint red rash first seen on the front of the chest. The rash sometimes assumes a more scaly appearance, resembling psoriasis. The spirochetes causing the disease can be found on microscopic examination of a scraping from the primary sore, but the Wassermann test does not give a positive reaction until the secondary stage comes on. Other symptoms which now frequently present themselves are loss of hair, bloodlessness, the appearance of sores in the mouth and throat (mucous patches), headache, and inflammation of the eye (iritis). Painful swellings of the bones are frequently present at this stage, and mental deterioration, due to changes in the blood-vessels of the brain, is not uncommon. The symptoms just mentioned may last for about eighteen months, and thereafter, in the majority of cases which have been recognised and efficiently treated, the symptoms subside and the disease comes to an end. This is recognised by general improvement of health, by the fact that further symptoms do not appear, and by a negative result on carrying out the Wassermann test on the blood.

These secondary symptoms gradually pass into the tertiary stage, or, in untreated cases, tertiary symptoms may develop after the lapse of some months or years. These consist in the development here and there throughout the body of masses of cells, which may spread diffusely along the blood-vessels or may take the form of rounded growths known as 'gummata.' The gummata may appear as hard nodules in the skin or form tumour-like masses in the muscles or various internal organs, or in the brain, where their presence causes very serious symptoms. Those which lie beneath the skin or a mucous membrane may break down and form deep ulcers with characteristic thick, hard, sharply-cut edges. These ulcers, when they heal, leave rounded, brownish scars, whose nature can usually be readily recognised. When a gumma occurs in the central nervous system it gives rise to the symptoms of a tumour, and may cause great destruction. When the cellular formation takes place within or outside of the walls of arteries, as very commonly happens, symptoms result due to defective blood-supply to the organs whose blood-vessels are affected—for example, the brain. A disease of the blood-vessels known as atheroma ultimately results, which in turn is apt to produce aneurysm and premature senility.

Among the latest manifestations of the disease, occurring from five to ten years after the primary onset, are certain disorders in the nervous system, of which locomotor ataxia and general paralysis of the insane are the chief.

The inherited form of the disease may affect a child before birth, frequently leading to miscarriage or to dead-birth of the child. The disease may also show its first symptoms a few weeks after birth with symptoms of inflammation about the nose, mouth, and buttocks of the child, which generally also presents a shrivelled, badly-nourished appearance, with loose, wrinkled skin. The breathing of the child is of a characteristic 'snuffling' type, and the child is very liable to succumb. At a later stage, deafness is a common feature, due to inflammation in the delicate structures of the inner ear. Inflammation of the eye, affecting the cornea (keratitis) or iris (iritis), is apt to appear still later, about the age of twelve or fourteen, causing dimness of vision. Destruction of the bones of the nose, causing sinking and broadening of the bridge, is also a common feature; and the permanent teeth are frequently defective and peg-shaped, the central incisors being notched at the edge.

With regard to the treatment, it is important to remember that any person, whether an adult or an infant, whilst suffering from the earlier stages of this disease forms a serious source of infection to those coming in contact with him. It is, therefore, essential that precautions should be taken both to avoid infection and to effect a cure of the disease as early as possible. The discharge from any sore or abraded surface is especially contagious, and even articles used by the infected person, such as drinking utensils, towels, and clothing, are liable to carry infection. The disease is also highly transmissible to offspring so long as a parent continues to show any manifestation of its presence. With a view to securing thorough treatment, clinics have now been established by most large hospitals and by municipalities.

In the cure of the disease, maintenance of the general health at a high level by suitable dietetic and hygienic measures is of the utmost importance. The drugs which for several centuries have been found to exert a special influence in checking the disease are various salts of mercury, which have been administered by the mouth, by fumigation, by inunction in the form of ointment, or by injection into the muscles. Various forms of these are still in common use. In 1910 an organic compound of arsenic known as salvarsan or '606' was introduced by Ehrlich. This was followed a few years later by an improved preparation known as neo-salvarsan, possessing less irritating and less toxic properties; and similar preparations under a variety of names such as neokharsivan, novarsenobenzol, novarsenobillon, galyol, &c., are in common use. Still more recently a similar preparation known as tryparsamid, which can with safety be given in much larger doses, has been introduced. All these substances are administered by injection either into a vein or into the substance of a muscle. Another remedy which has been found of considerable use is metallic bismuth in a state of very fine subdivision similarly administered by injection. For the purpose of causing absorption of the products of the disease, such as gummata, thickenings in the blood-vessels, muscles, nervous system, &c., potassium iodide is largely employed in doses of 10 or 20 grains three times daily.

The effect of the various remedies used in treatment is at the present day investigated by performing the Wassermann reaction and various other tests on the blood and, in the case of affections of the nervous system, upon the cerebrospinal fluid. It is usual to carry out these tests some months after a course of treatment has been concluded, and to ascertain that their result is negative before the person can be pronounced completely free of the disease.

Syra (Gr. *Syros*), the most important, though not the largest of the Cyclades (see GREECE). It is about 10 miles long by 5 broad, has an area of 42½ sq. m., and is bare, rocky, and not very fertile. Its prosperity is of quite modern growth. During the War of Independence Syra remained neutral, hence many fugitives of commercial enterprise flocked thither from Chios and other parts of Greece. Pop. of island, 35,000. The capital, *Syra* or *Hermoupolis* (pop. 24,000), is situated on a bay on the east side of the island. It rises terrace-wise from the shore, is well built, and is the seat of government for the Cyclades, and the seat of a Roman Catholic bishop.

Syracuse, anciently a famous city of Sicily, situated on the south-eastern coast of the island, 80 miles SSW. of Messina, was founded by Corinthian settlers in 734 B.C. The colonists occupied the little isle of Ortygia, which stretches south-east from the shore, driving out the Sicels who had already occupied it. The settlement rapidly rose to prosperity, and towards the middle of the 7th century B.C. began to form outposts of its own. Little is known of the early political state of Syracuse; but about 485 the ruling families, probably descendants of the original colonists, were expelled by the lower classes of citizens. Gelon (q.v.), despot of Gela, restored the exiles, and at the same time made himself master of Syracuse. He increased both the population and the power of his new state, and won the highest prestige by a great victory over the Carthaginians at Himera. In his time Achradina, a triangular tableland of limestone rock north of Ortygia and on the adjoining mainland, was built upon. This ultimately became the most extensive and populous quarter: it contained the Agora, a temple of Zeus Olympius, the Prytaneum, with a splendid statue of Sappho and fine monuments to Timoleon and the elder Dionysius (q.v.), &c. At a later date, and possibly thus early, there were three other quarters in the city: (1) Tyche, occupying a plateau to the north-west of Achradina; (2) Neapolis (New City), stretching along the southern slopes of the plateau, and overlooking the marshes of the Anapus and the Great Harbour, a spacious and well-sheltered bay to the south-west of Ortygia; this islet, however, contained the citadel, which overlooked the docks in the Lesser Harbour on the north; (3) Epipolae occupied higher ground still further to the west, culminating in the citadel of Euryalus; while the fort of Labdalon, erected by the Athenians during the siege, was slightly to the north-east of Euryalus.

Hiero (q.v.), the brother and successor of Gelon, was celebrated throughout the Greek world as a patron of the fine arts and of men of genius, as Æschylus, Pindar, &c. In 466 B.C. the democracy again got the upper hand—Thrasylbulus, Hiero's brother and successor, a 'tyrant' of the baser sort, being expelled; and for sixty years a free and democratic government was enjoyed, under which Syracuse flourished more than it had ever done. During this period occurred the great struggle with Athens (415-414 B.C.), and the celebrated siege by the Athenian armament, a contest in which the Sicilian city came off victorious (see NICIAS). Nine years later Dionysius (q.v.) restored the 'tyranny' of Gelon, and during a reign of nearly forty years greatly increased the strength and importance of the city (see SICILY). It was he who constructed the docks in the Greater and Lesser Harbours, and surrounded the city with fortifications. His fierce war with Carthage (397 B.C.) raised the renown of Syracuse still higher. The reigns of the younger Dionysius (q.v.) and of Dion, the friend of Plato, were unsettled; but after the restoration of public liberty by Timoleon (343 B.C.) a brief season of

tranquillity ensued. In 317 B.C., twenty years after the death of the noble Timoleon, Agathocles, a rude soldier of fortune, once more restored the despotic form of government, which continued, with scarcely an interruption, through the reign (fifty-four years) of the enlightened Hiero II., the friend and ally of Rome, down to the conquest of the city by the Romans after a siege of two years, in which Archimedes perished (212 B.C.) This event was occasioned during the Hannibalic war by Hieronymus, a rash and vain young man, abandoning the prudent policy of his grandfather, Hiero (q.v.), breaking the alliance with Rome, and joining his and their foes, the Carthaginians. Under the Romans Syracuse slowly declined, though with its handsome public buildings and its artistic and intellectual culture, it always continued to be the first city of Sicily. It was captured, pillaged, and burned by the Saracens in 878 A.D., and after that sank into complete decay. For ancient Syracuse, see Freeman's *History of Sicily*.

The modern city (*Siracusa*) was until lately confined to the original limits, Ortygia, where the streets, which are defended by walls and a citadel, are, with few exceptions, narrow. Here are the baroque cathedral (built into the ancient temple of Minerva), an archaic Doric temple of Apollo, a very important museum of prehistoric and classical antiquities, numerous churches, monasteries, and nunneries, the ancient fountain of Arethusa (its waters mingled with sea-water since the earthquake of 1170), and some interesting mediæval palaces. A new quarter is now growing up on the mainland, between the railway station and the bridge leading to Ortygia. Here are scanty remains of the Agora, later the Forum of Roman days, and of the gymnasium. To the NE. in the suburb of Santa Lucia, below the Norman church of that name, are large catacombs, (2d-3d cent. A.D.), and on the shore are remains of the ancient arsenal. To the N. are the more recent catacombs (4th-6th cent.) of S. Giovanni (the catacombs of Syracuse are only second to those of Rome), and the huge quarry known as the Latomia dei Cappuccini, one of those in which the Athenian prisoners languished.

Further west, in the ancient Neapolis, are the large Roman amphitheatre, cut in the rock except on the south (460 × 390 feet); the altar erected by Hiero II. to celebrate the fall of Thrasybulus; the Latomia del Paradiso (with the celebrated grotto known as the Ear of Dionysius, which has as a fact extraordinary acoustic qualities); and the Greek theatre, the auditorium of which, 440 feet in diameter, is one of the largest in the Greek world. It, too, is almost entirely hewn in the rock. Less is left of the stage, but the whole has been the subject of a monograph (Rizzo, *Il Teatro Greco di Siracusa*), and the surroundings and the splendid view have led to the frequent use of this theatre for performances of Greek tragedies in recent years. Above it is a street of tombs, and hereabouts was an important cemetery of the ancient city. From this point the walls of Dionysius can be followed all round the edge of the plateau of Epipolæ as far as the great fortress of Euryalus, the key of the whole system recently excavated. It is protected by three large ditches on the west, connected by passages with a massive keep built of hewn stone, which joins the walls of Epipolæ on the east. These walls can also be traced along the north and east (sea) edges of the plateau. On the opposite side of the Great Harbour to Ortygia is the Temple of Zeus Olympius, of which only two columns remain, and not far off the famous spring of Cyane, where the Syrian papyrus still grows. Still further to the

south is the peninsula of Plemmyrion, between which and Ortygia was the line of ships by which the Syracusans closed the harbour against the attempts of the Athenians to force their way out. The people manufacture chemicals and pottery, and trade in fruits, olive-oil, wine (exports), wheat, timber, and petroleum (imports) Pop. (1921) 49,662.

See B. Lupus, *Topographie von Syrakus* (Strasbourg, 1887); E. Manceri, *Siracusa* (Bergamo, 1909).

Syracuse, an important city of central New York, seat of Onondaga county, lies in the beautiful Onondaga valley, stretching along Onondaga Creek to the head of the lake of the same name. It is on the Erie Canal, and is a terminus of the Oswego Canal; by rail it is 148 miles E. of Buffalo and 147 W. of Albany. Syracuse is the seat of a Methodist Episcopal university (1870), with over 6000 students. It carries on an extensive shipping business, but the production of salt, formerly its chief product, has now declined. There are manufactures of automobiles, boilers and engines, furniture, clothing, shoes, canned goods, china, typewriters, silverware, and agricultural implements. The salt-springs were visited by French missionaries as early as 1654, and began to be worked by white men in 1789; the city was incorporated in 1847. Pop. (1880) 51,792; (1900) 108,374; (1920) 182,003.

Syr-Daria. See JAXARTES.

Syria, a country of western Asia, embracing, in a wide sense, the regions that lie between the Levant and the Euphrates from Mount Taurus in the north to the southern border of Palestine, or even to the peninsula of Sinai. The eastern boundaries south of the Euphrates are not clearly defined or marked off from the wide expanse of the Arabian desert. The physical conformation of Syria is throughout simple and uniform. A range of mountains, split in the north into two parallel chains—Libanus and Anti-Libanus—fronts the Mediterranean, ranging in height from 6000 feet in the north up to 10,000 feet in the central parts, but falling again in the south to 3500 feet. Behind these mountains lies a tableland, that gradually falls away eastwards to the desert. The separate districts of Syria have been already described in geographical detail in the articles: LEBANON, PALESTINE, PHENICIA, BASHAN, HAURAN, DEAD SEA, JORDAN. The prevailing winds being westerly, the slopes of the mountains next the Mediterranean and the valleys ensconced among them, together with the immediate seaboard, get a tolerably plentiful supply of moisture during the rainy half of the year (October to May); snow even falls on the highest summits of the mountain-ranges. The climate on the plateau is generally dry, and in certain localities hot. The valley of the Jordan is remarkably hot. The soil is in many parts possessed of good fertility, and in ancient times, when irrigation was more extensively practised, yielded a much greater return than it does at the present time. Damascus is noted for its gardens and orchards. Hauran produces excellent wheat; Northern Syria, the olive. The vine grows in nearly all parts of the country. Fruit (oranges, figs, &c.) is cultivated on the coast plains. Sheep and goats are the most important of the domestic animals. The principal exports are cereals, tobacco, wine, fruits, liquorice, sesame, silk and cotton stuffs, and copper and brass goods. Among the chief imports are Manchester goods, woollen clothing, timber, hides, sacking, iron and copper goods, petroleum, and coal.

There has been a steady improvement in the roads of Syria, and there are now excellent motor roads along the coast, all over the Lebanon, from

Beirut to Damascus and around the latter city. There is a railway from Beirut to Damascus which is linked up at Rayak by a line running through Baalbek, Homs, Hama, and Aleppo, with the Turkish Baghdad Railway. South of Damascus the Hejaz railway runs, in a semi-ruined condition, to Medina, and at Daraa gives off a branch which runs westward through the valley of the Yarmuk to link up with the Palestine railways. A short line also runs between the port of Tripoli and Homs.

Since the Great War the term Syria has more than ever come to be confined to northern Syria, leaving Palestine, as has been the case in previous historic periods, as a distinct unit.

Under the French mandate Syria was originally divided into four federated autonomous states. (1) The Great Lebanon (*État du Grand Liban*), a state which includes not only the former semi-independent Lebanon (q.v.), but also Beirut (the capital), the other coastal towns—Tyre, Sidon, Juneh, and Tripoli—and most of the region *el Buq'a* (Cœle-Syria), with Baalbek (Heliopolis), famous for its wonderful ruins. The population of the Grand Lebanon now numbers over 700,000. (2) The state of the Alewites or, as we have been accustomed to call them, the Ansarich—a sect of unorthodox Moslems—whose capital is at Latikeyeh. (3) Damascus, including the Sanjaks of Homs, Hama, and the Hauran; and (4) Aleppo, with Alexandretta and Deir ez Zor. More recently the last two states have been united; their districts are now disorganised and the final arrangement has not been settled.

The population of French Syria is about 3,000,000. The larger proportion are orthodox Moslems—Arabs, with a few thousand Circassians; but there are Druzes in the Lebanon and the Jebel Druze (Hauran), Ansarich and some scattered Shiites in the north, and many Christians—chiefly Maronites, Roman Catholics, Greek Orthodox, and Armenians—in the Lebanon, and in all the larger cities. The political administration of a people so varied in interests and so mutually antagonistic in their tenaciously held beliefs is a task of extraordinary difficulty.

The earliest historical records that treat of Syria are those that relate the histories of the Hittites (q.v.), the Phœnicians (q.v.), and the Hebrews (see JEWS). The first named were for several centuries supreme in northern Syria, and at times stretched their authority southwards as far as the hills of southern Palestine. Yet they had most formidable rivals on both sides of them in Assyria and Egypt, from both of which countries their subjects derived no small share of their skill in manufacturing industry, and in the arts and manners of life. The other two peoples mentioned occupied the most prominent place in southern Syria. Nevertheless at different periods we read of flourishing Aramæan (Semitic) principalities, such as Damascus, Hamath, Zobah, and similar petty states. These, as well as most of northern Syria, were conquered during the 8th century B.C. by the kings of Assyria; the Jewish kingdoms experienced the same fate at the hands of the Babylonian kings in the 7th and 6th centuries. As previous to the 9th century B.C. Syria had been the battle-ground of the Egyptian and Hittite armies, so after that period it was, as a province of Assyria (Babylonia), involved in the struggle between that great empire and Egypt. (The Greeks first knew this region as a province of Assyria; hence the contracted name Syria.) Towards the end of the 6th century B.C. Syria fell under the dominion of the Persian empire; and two centuries later it was conquered by Alexander of Macedon. When his empire broke to pieces the Seleucidæ (q.v.) made Antioch the capital

of their empire of Syria. From the Seleucidæ it passed, through the hands of Tigranes of Armenia, to the Romans, for whom it was won by Pompey in 64 B.C. Under these new masters the country flourished and became celebrated for its thriving industries, its commercial prosperity, and its architectural magnificence (see BAALBEK, PALMYRA; also NABATÆANS). On the division of the Roman world Syria became part of the Byzantine empire, and of it remained a province until its conquest by the Mohammedan Arabs in 636. It still continued to be prosperous under the Arabs and their successors the Egyptian sovereigns, in spite of the unsettled period of the Crusades (q.v.) The first severe blow it suffered came from the Mongols in 1260, and its ruin was continued when in 1516 it passed from the Egyptians to the Ottoman Turks. In 1918 British forces, aided by Arab detachments under Colonel Lawrence, and a few French troops, cleared the Turks out of Damascus and Beirut, and pursued them northward until they sued for peace after the capture of Aleppo. The land so liberated was bestowed by mandate of the Supreme Council of the Allies upon the French. At first the cities of Damascus and Aleppo—with the country between them—was assigned as an independent Arab district under the Emir Feisal (now King of Irak), but after the Arabs attempted to break away from all control by the French, the district was occupied by the French troops and the emir was expelled (1920). Since then the French have been endeavouring to cope with the administration of the whole of Syria through a High Commissioner resident in Beirut, but so far with indifferent success. A rebellion among the Druzes, originating in want of understanding and tact on the part of the French governor, spread to the disgruntled Arabs of Damascus and other inland cities of Syria. The French have been compelled to employ considerable military forces, but the methods of violence exhibited in the bombardments of Damascus, and its environs have turned many earlier loyal friends of the French into active enemies. In the Lebanon, though there has been no active fighting, considerable dissatisfaction has been expressed by the Maronites on the one hand and the Moslems on the other at the extension of the autonomous Lebanon to include so many incompatible elements.

See Burton and Drake, *Unexplored Syria* (2 vols. Lond., 1872); Lady Burton, *Inner Life of Syria* (1875); Von Südenhorst, *Syrien und seine Bedeutung für den Welt-handel* (Vienna, 1873); Lortet, *La Syrie d'aujourd'hui* (Paris, 1884); Baedeker's *Palestine and Syria* (by Professor A. Socin); C. R. Conder, *Heth and Moab* (1883); De Vogüé, *Syrie Centrale; Architecture Civile et Religieuse du Ier au 7me Siècle* (Paris, 1865-77); Leonard Stein, *Syria* (1926); *Syrie: Revue d'art oriental et d'archéologie*; and books quoted under the various articles cited above.

The *Church of the Syrian Rite* was that portion of the oriental church which had its seat in Syria, and which was anciently comprehended in the patriarchate of Antioch and (after that of Jerusalem obtained a distinct jurisdiction) partly in the patriarchate of Jerusalem. The Syrian Church of the early centuries was exceedingly flourishing; before the end of the 4th century it numbered 119 distinct sees, with a Christian population of several millions. The first blow to its prosperity was the fatal division which arose from the controversies on the incarnation (see EUTYCHES; GREEK CHURCH, Vol. V., p. 398). The Eutychian heresy, in one or other of its forms, obtained wide extension in Syria; the Moslem conquest accelerated the ruin thus begun; and from the 7th century downwards this once flourishing church declined into a weak and spiritless

community, whose chief seat was in the mountains, and whose best security from oppression lay in the belief on the part of the conquerors of its utterly fallen and contemptible condition. See also NES-TORIUS; THOMAS (CHRISTIANS OF ST); LITURGY; SEMITES; BIBLE; O. H. Parry, *Six Months in a Syrian Monastery* (1895).

Syringa, a name properly belonging to a genus of Oleaceae, for which see LILAC, is often improperly applied to *Philadelphus coronarius* and other species of *Philadelphus*, a genus of Saxifragaceae. *Philadelphus* is a small genus of opposite-leaved shrubs, natives of the north temperate regions of both hemispheres. *P. coronarius*, the mock orange, probably of Japanese origin, has strongly scented yellowish-white flowers.

Syrmia (Serb. *Srjem*, Mag. *Szerém*), the easternmost corner of Slavonia, between the Drava and Danube and the Sava.

Syrtis, the ancient name of two gulfs of the Mediterranean Sea, on the north coast of Africa. The Syrtis Major, now called the Gulf of Sidra, lies between Tripoli and the tableland of Barca, and forms the most southerly part of the Mediterranean. The Syrtis Minor, now called the Gulf of Cades, lies between Tunis and Tripoli. The shores of both are inhospitable, and abound in quicksands.

Syrup (Fr. *sirop*, Span. *jarope*, Arab. *sharáb*, 'a beverage,' 'wine,' 'syrup'; *shrub* is a doublet; and *sherbet*, Arab. *sharbát*, is from the same root), in its simplest meaning, a saturated solution of sugar boiled to prevent fermentation; but it also means the juice of fruits saturated with sugar and many flavoured liquids, treated in the same way. In general the finest refined sugar is used; and every effort is made to get the syrup very clear and free from all feculent matter. Syrups of fruits are much used on the Continent to mingle with water for drink, and are very wholesome. The 'golden syrup' of the grocer is the uncrystallisable part finally separated in the manufacture from crystallised sugar (see SUGAR). Medicinal syrups contain with the sugary element some therapeutic agent. Parrish's Syrup contains the phosphate of iron with the phosphates of lime, potash, and soda, dissolved in dilute phosphoric acid, sugar being added. Easton's Syrup has in it phosphate of iron, with the phosphates of quinine and strychnine. There are syrups of the hypophosphites, and many others.

Syrus, EPHRAEM. See EPHRAEM SYRUS.

Syrus, PUBLIUS or PUBLILIUS, a Roman writer of mimes who flourished about 43 B.C., and was most probably a Syrian slave brought to Rome in early youth, educated, and freed by some indulgent master. After Laberius he reigned supreme on the stage, and his mimes, being as full of shrewd epigrammatic wit as broad humour, did not altogether perish with him. About two hundred apophthegms are still extant, under the title *Publii Syri Mimi Sententiæ*. One of these supplied the motto for the *Edinburgh Review*, although Sydney Smith admits that none of the young collaborators knew anything further of its author: 'Judex damnatur cum nocens absolvitur.'

Syzran, a town of Central Russia, on the river Syzran, near its confluence with the Volga, and 90 miles S. of Simbirsk (Ulianovsk). Laid out in 1685, it has tanneries and noted market-gardens, and a large trade in grain, timber, salt, and manufactured goods. Pop. 50,000.

Szygy (Gr. *syzygia*), a term used indifferently either for the Conjunction (q.v.) or opposition of the moon.

Szabadka. See SUBOTICA.

Szarvas, a town of Hungary, on the river Körös, 80 miles SE. of Budapest. A good breed of horses is cultivated here. Pop. 25,000, mostly Slovaks, who, however, speak Magyar.

Szatmar-Nemeti, a town of Rumania, on the Szamos, 68 miles by rail NE. of Debreczin, with a Roman Catholic cathedral, and a trade in wine. Pop. 35,000.

Sze-chwan, a large province of China, 220,000 sq. m. in area, is situated in the west, having Tibet on the north-west and Yunnan on the south-west. It is traversed and watered by the Yang-tze-Kiang and its affluents, is hilly throughout, mountainous in the west, and rich in natural products, including coal, iron, and other minerals. Silk, salt, sugar, medicines, tobacco, hides, musk, rhubarb, and white wax (produced by an insect) are largely exported; and European cottons and woollens are imported, while opium used to be a special crop. The capital is Cheng-tu (q.v.), the chief commercial towns Chung-king (opened to foreign trade in 1891) and Ichang (q.v.). Wansien was opened in 1917. The province was thrown into much confusion by the revolutionary movement of 1911, and by the political disturbances after the Great War. Pop. variously estimated at 23,000,000 to 50,000,000.

Szegedin, or SZEGED, the second town of Hungary, stands at the confluence of the Maros with the Theiss, 118 miles by rail SE. of Budapest. This town was almost completely destroyed by a terrible flood in March 1879, and since then it has been rebuilt, and now possesses very handsome public buildings, including a town-house, post-office, law-courts, theatre, barracks, &c., and is protected against inundations by a double ring of embankments. The Theiss is spanned by a couple of railway bridges and a fine suspension bridge (1940 feet long), designed by Eiffel. Szegedin is the commercial centre of the Alföld, the vast Hungarian plain, manufactures soap, spirits, matches, soda, tobacco, coarse cloth, &c., and carries on an extensive river-trade in wine, corn, and wool. A speciality of the place is *paprika* (see CAPSICUM). From 1526 to 1686 it was occupied by the Turks. Close by Haynau defeated the Hungarians on 3d August 1849. Pop. (1880) 73,675; (1920) 119,109.

Szeklers. See TRANSYLVANIA.

Szenta. See ZENTA.

Szentes, a town of Hungary, 30 miles N. of Szegedin, near the left bank of the Theiss. Pop. 32,000, chiefly engaged in wine-culture.

Szolnok, a town of Hungary, on the Theiss, 66 miles by rail E. by S. of Budapest, with a lively trade in tobacco, timber, and salt. Pop. 32,500.

T



the twentieth letter of our alphabet, descends from the twenty-second and last letter of the ancient Semitic alphabet. In the 9th century B.C. the letter was written **X**; its Semitic name, *tāw*, adopted by the Greeks as *tau*, coincides with the Hebrew word for a mark or sign; the related verb *tiwaw* means to make marks, scribble. The cross **X** is perhaps the most natural mark to use for distinguishing one out of a number of similar objects, and it may have been called *tāw* before the invention of the alphabet. On the other hand, the word in the sense of 'mark' may be merely a use of the name of the letter, which in that case may have been a meaningless syllable formed on the analogy of *wāw* (see the article F) to indicate the *t* sound. An early Semitic form of the letter was **†**; the Hebrew **ת** has lost all resemblance to the original shape.

In the oldest Greek inscriptions the letter already appears in the form **Τ**, which was adopted unchanged by the Romans. In Roman cursive the stem was rounded, producing the form **Ϛ**, which was variously modified in mediæval script; an ornamental variety of it survives in the English black-letter capital. In many mediæval MSS. the minuscule *t* is almost or entirely indistinguishable from *c*. To make the distinction clearer, the upright part of the letter was continued above the cross-bar, yielding the form which developed into the modern printed *t*.

The normal sound of the letter has always been some variety of the voiceless stopped point consonant, in the utterance of which the breath escapes from a stoppage produced by contact of the tongue with the gums or the palate. In English the point of contact is farther back than in other European languages. In late Hebrew and Aramaic this sound when preceded by a vowel became open, like the English *th* in *thin*. In several modern languages the letter has in certain words an abnormal pronunciation, the spelling being etymological. Thus *t* is pronounced as *s* in the French *aristocratie*, &c., as *ts* in the German *Nation*, &c., as *sh* in the English *nation*.

The Romans used **TH** in Greek proper names and in words adopted from Greek to represent the sound of the letter Θ, *thēta*, which was an aspirated *t* (= *t* + *h*). In late Latin *th* came to be pronounced as a simple *t*. Hence in French the *th* retained in certain classical and biblical names and in words derived from Greek is pronounced *t*; in the Middle Ages *th* was often written for *t* quite without reason. In English *th* is pronounced as *t* in *Thomas* and its derivatives Thom(p)son, Thoms, and in certain names in which the *h* has no etymological justification, as Thames, Anthony. In German, *th* (pronounced *t*) was formerly written in many

words, both initially as in *theuer*, *thun*, *That*, and finally and medially as in *Rath*, *Heimath*, *miethen*; but recent reforms substitute *t* in these words, though *th* remains in Greek derivatives. In modern Italian and Spanish orthography *th* is never used.

In the earliest Old English MSS. *th* was written for the voiceless interdental spirant, a sound which did not exist in Latin. The choice of this symbol may have been a result of the study of Greek, the letter *thēta* having in late Greek come to have the sound of the English spirant. Subsequently this use of *th* was discontinued (probably because the digraph was differently pronounced in Latin), and the character þ (called *thorn*) was imported from the Runic alphabet. This letter came to be used for the interdental spirant whether voiced (as in *this*) or voiceless (as in *thin*); and the letter ð (see the article D) was similarly used with both values. The ð became obsolete in the 13th century, but the 'thorn,' latterly identical in form with *y*, continued in occasional use till after the introduction of printing (as in the well-known *y^e* for *the*). In the 13th century some scribes already occasionally substituted *th* for þ; and in the end the digraph became the regular symbol for the two sounds (as in *this*, *thin*). In Welsh *th* is used for the voiceless spirant, as in *thin*.

The dotted **Ṫ** is used in Irish to express an *h* sound derived from an original *t*. In transliterated Irish and in Scottish Gaelic this sound is written *th*.

The Roman name of the letter, *tē*, is preserved in all the modern languages written in the Roman character.

Taal, AFRIKAANS, or CAPE DUTCH. See SOUTH AFRICA (*Languages*), BOERS.

Tabard (most probably, like *tippet*, ultimately from Lat. *tapete*, 'hangings'), a heavy outer coat of rough cloth once worn by poor people; also a loose cloak without sleeves worn by knights over their armour, usually embroidered with their arms—Chaucer's *cote-armour*. The latter use survives in the distinctive coat with short sleeves, worn by heralds and pursuivants, emblazoned with the royal arms.

Ṭabari, a Moslem historian. See ARABIAN LANGUAGE.

Tabasco, a state in the south of Mexico, consisting largely of a flat plain, which is sometimes partly inundated by the Gulf of Mexico. Sugar, coffee, cocoa, fruits, and rice are cultivated, and there are petroleum mines. Area 10,374 sq. m.; pop. (1921) 178,389.

Tabasheer, a substance sometimes found in the cavities or tubular parts of the stems of bamboos and other large grasses. It consists chiefly of silica with a little lime and vegetable matter, or sometimes of silica and potash, in the proportions of about 70 parts of silica and 30 of potash. It appears to be formed by extravasation of the juices of the plant, in consequence of some diseased condition of the nodes or joints. It is in high repute among the Hindus as a tonic, and is prepared by

imperfect calcination and trituration. The powder is often chewed with betel in order to renovate the constitution. There are several varieties of tabasheer, one of which, of very rare occurrence, is extremely beautiful, of a delicate azure colour by reflected light, and of a faint yellowish hue by transmitted light, easily crushed between the fingers, and of 'an aerial and unsubstantial texture, which we look for in vain in any other solid.' Other varieties are yellowish, white, and much like some varieties of opal. Tabasheer is very porous, and absorbs water and oil very rapidly; effervescence taking place when it is plunged in water. By absorption of oil the opaque varieties become transparent. When the greater part of the oil is expelled by heat the structure of the tabasheer becomes apparent; it is beautifully veined, the veins being sometimes parallel and sometimes curved.

Tabernacle (Lat. *tabernaculum*, 'tent'), the portable tent in which the Ark of the Covenant (q.v.) was conveyed, and as such the sanctuary of Israel. It seems (1 Sam. iii. 3) to have been superseded by a more permanent building at Shiloh before David's time. See **TEMPLE**.—In Roman Catholic churches the name is given to the receptacle in which the consecrated elements of the Eucharist are retained. It is commonly a small structure of marble, metal, or wood, placed over the high altar, and appropriated exclusively to the reservation of the Eucharist, no other object whatever being allowed to be kept in it. See **PYX**, and the illustration at Altar; and for the Feast of Tabernacles, see **FESTIVALS**.

Tabes Dorsalis. See **LOCOMOTOR ATAXIA**.

Tabes Mesenterica. See **MESENTERY**, and **TUBERCLE**.

Tablature, a method of musical notation, principally employed in the 15th and 16th centuries for the lute, but also used occasionally for other instruments. In tablature the lines of the stave indicate the strings on the instrument, the upper line representing the first string, the second line the second string, &c. The notes are expressed either by Arabic numerals or small letters, which denote the semitones of the chromatic scale, or the frets at which the fingers ought to be placed to stop the strings—*a* indicating the open string, *b* the first fret, *c* the second fret, and so on. The duration of the sounds is expressed by minims, crotchets, quavers, &c. placed above the stave, over the letter or letters which they are meant to affect, and each of the musical notes is held to apply to the letters immediately following, making them of the same length as the first, until some new note occurs. The method of tuning the lute must be ascertained before any particular tablature can be deciphered, as the pitch of the notes produced by the use of the frets will depend upon that of the open strings. One of the best-known tablatures is that given in the famous Skene manuscript in the Scottish National Library, Edinburgh, written at various times up to 1635.

Tableaux Vivants ('living pictures'), representations of works of painting and sculpture, or of scenes from history or fiction, by living persons. They are said to have been invented by Madame de Genlis, when she had charge of the education of the children of the Duke of Orleans. They were long common in theatres.

Tablelands, or **PLATEAUS**, are extensive elevated regions with a plain-like or undulating surface. They may be bordered by steep declivities falling more or less suddenly from the level of the plateaus to the sea or the adjacent low grounds; or they may slope down imperceptibly and thus

gradually merge with the lowlands. The tableland of the Spanish peninsula is a good example of a plateau that rises abruptly from the sea. The 'Great Plain' lying east of the Rocky Mountains, on the other hand, is a plateau that sinks gradually from a height of 6000 feet down to the low prairie lands of the Missouri. Some high tablelands are surrounded by lofty mountains, such as those of Quito, Titicaca, and Uspallata in the Andes, and that of the Pamir in Asia; while others constitute elevated platforms upon which mountain-ranges stand. Two types of tableland are recognised: (*a*) *plateaus of accumulation* and (*b*) *plateaus of denudation*. The former are built up of horizontal or approximately horizontal strata, while the latter are composed of disturbed strata which have been planed down to one general level (see **MOUNTAINS**). The chief tablelands are in Europe, central Spain; in America, Oregon, the great salt plain of Utah, the north and centre of Brazil; in Africa, the interior of Barbary; while in Asia almost the whole of the south and centre of the continent consists of plateaus, which rise terrace above terrace till they culminate in that of Tibet. Of the Asiatic plateaus the principal are those of Asia Minor (3280 feet above sea-level), Armenia (7000), Persia or Iran (3000), Mysore (4000 to 5000), Deccan (1500 to 2000), Tibet (12,000 to 17,000), and Chinese Tartary (3000 to 4300).

Table Mountain. See **CAPETOWN**.

Table turning, a phenomenon attributed, with other more eccentric movements of furniture, to the agency of spirits (see **SPIRITUALISM**), but practised also in America and Britain from about 1850 as a kind of social pastime; the motion of a table under the finger-tips of a closed circle of 'believers' standing round the edge of the table being referred to a mysterious or occult origin, and not, as by the more sceptical, to the collective but involuntary muscular action of the circle of friends.

Taboga. See **PANAMÁ**.

Taboo. See **TABU**.

Tabor, a dome-shaped, oak-clad hill of northern Palestine, 7 miles E. of Nazareth, rising solitarily in the north-eastern part of the plain of Esdraelon to a height of about 1000 feet. In the 2d century it was regarded as the Mount of Transfiguration, and the ruins of a crusading church on the summit commemorate this event. Tabor is not named in the New Testament.

Tabor, a small drum like a timbrel or tambourine without jingles, usually played with one stick and in combination with a fife.

Taborites. See **HUSS**.

Tabriz, a great and ancient city of Persia, capital of the province of Azerbaijan, 40 miles E. of Lake Urumiah, and on the Aji, which flows south-west into that lake. The interesting ruin, Kabúd Masjid, or 'blue mosque' (dating from 1450), is in part covered with blue tiles beautifully arabesqued. The citadel is a spacious edifice of burned brick, the walls of which have been cracked in many places by earthquakes. Tabriz is the seat of a varied industry, in which leather, silk, and gold and silversmith's work alone are notable, and is still a vast market and distributing centre. The chief imports are cotton fabrics, sugar, woollen cloth, and wines and spirits. The chief exports are drugs and spices, dried fruits, shawls, carpets, and raw silk. By the opening of the Transcaucasian railway between the Black Sea and the Caspian, with a branch line extended to Tabriz, the overland trade with Trebizond has rather been replaced by trade with Russia. Commerce, however, has been fluctuating, owing to 20th-century political disturbances in Russia, Armenia, and Persia.

The Anglo-Indian telegraph line passes through the city. There has been much debate about the identification of the city with an ancient *Tauris*; it was reputed to have been refounded in 791 by one of the wives of Harûn-al-Rashid. In 858, 1041, 1721, and 1854 it was devastated by earthquakes, and it has been besieged, taken by Turks, Turcomans, and Persians in succession. During the Great War it was occupied first by Turks and then by Russians. Pop. about 200,000.

Tabu, a word adopted into European languages from a Polynesian dialect in which it originally meant 'strongly marked' and was used to designate sanctity and allied notions and also the ritual prohibitions connected with things deemed sacred or unclean. In the Polynesian sense of the term the quality inherent in the person or thing tabued is communicable to the violator of the tabu, which thus spreads wider and wider. At the present day tabu is often used where there is no idea of contagious sanctity, to indicate the ritual character of a prohibition; common usage has further extended the meaning to embrace prohibitions of whatever sort.

In civilised communities there is a distinction between things sacred and things profane; but the rôle of the former is not a large one in the life of the ordinary man; he is never hampered in business or social relations by anything resulting from the existence of the non-profane. With uncivilised peoples the case is wholly different; their lives are largely regulated by considerations connected with religion, and one of the most important elements is the complex of prohibitions called tabu. It must be remembered that there is no moral quality connected with the idea of sanctity, as is clear from the fact that sanctity and uncleanness (ritual impurity) are virtually indistinguishable; the Hebrew word commonly translated 'accursed' also means 'devoted,' and the object designated by the latter term is 'most holy'; the Latin word *sacer* has the same ambiguity in meaning, for a man who removed a landmark was so termed, and he was an outlaw who might be killed by any one.

(1) Tabu in its strict sense depends upon the sacredness inherent in persons or things, either as a result of being charged with supernatural power, or as being associated with gods or spirits; and, secondly, upon the sacredness derived from things naturally tabu which infects the violator of the ritual prohibition with their own sacredness. A person strongly charged with *mana* (supernatural power) may impose a tabu and thus charge with his own power anything exposed to danger. Tabu can therefore be classified as natural or direct, and communicated. It is possible for both kinds to be concentrated on one object.

Among things naturally tabu are chiefs, priests, warriors, burial grounds, women after childbirth, &c.; the reason is twofold; the tabued person may be in some way endangered by contact with the profane world; but on the other hand it is just as probable that he will endanger the profane world if he comes in contact with it. One result of this may be seen in gradations of rank, which result in the separation of king or priest from the commons or laity by a protective wall of functionaries whose *mana* is stronger than that of the common man and therefore capable of fortifying them against the dangerous contact with the man of powerful *mana*.

The violation of a tabu may bring with it its own punishment; when Uzzah put out his hand to steady the ark he was struck dead. On the other hand the *mana* of the transgressor may be so powerful that he escapes the direct chastisement caused by the supernatural impersonal force or by the god; but in this case his less well-equipped fellows may

suffer; hence there are social sanctions for a breach to tabu, so that vengeance may fall upon the guilty and the innocent may be spared. The community may also inflict punishment on those who are themselves tabu, like mourners, if they do not observe the restrictions proper to their condition; in this case the object is to deter others as well as to punish.

Acquired tabu is not necessarily permanent, it may be got rid of by taking the proper steps; washing is a common method of desacralisation. In Tonga the common person who touched a chief purified himself by touching the foot of a higher chief and then washing; or the infection of tabu may be treated as a more material substance. In New Zealand a chief who touched his head—a specially tabu part of the body—with his fingers could make his hand fit for profane purposes by putting it to his nose and snuffing up the air as though the tabu were a kind of effluvium. Where the condition of tabu is ascribed to the action of a spirit there are also means of removing it; a Melanesian mourner may leave his village for a length of time, and the spirit of the dead man, getting tired of waiting for him, may go away and leave the man free to return.

(2) The field of tabu in the wider sense is too vast for more than the most cursory survey. Some of the ritual prohibitions incumbent on uncivilised or semi-civilised peoples all the world over may be treated as rites of transition, that is to say as ceremonies destined to protect human beings at important epochs of their lives against the dangers that lie in wait for them. If we take rites of initiation we find that the essential element is that the candidate has to be transferred from the ranks of youths to those of adult men. This is effected by, firstly, removing the youth from the profane world to an initiation 'school,' where he has to observe many ritual prohibitions in addition to acquiring new knowledge; at the termination of this period he must be transferred back from the world in which he has been living, but now enters another section of the profane world. The passage from one world to another is often symbolised by such acts as entering the 'school' by a door which marks the point at which the two worlds meet; when he passes it the youth becomes tabu, and when he passes it in the reverse direction he must undergo a rite of desacralisation. The same scheme can be applied, with appropriate modifications, to a multitude of cases; betrothal and marriage are open to a similar interpretation; through childbirth and death a being enters a, for him, new world, which sets up a complex of prohibitions; even the simple occupation of a new house must not be undertaken without removing the tabu that rests upon it; at his accession a chief or king submits to ceremonies which separate him from the common folk and fit him for his high office; the stranger, when he comes within the gates, may cause or incur all sorts of dangers and undergoes appropriate treatment; and so on. But these cases represent only a small part of those involving tabus of one kind or another. One side of Totemism (q.v.) is the system of ritual prohibitions which regulate the dealings of a man with his totem. There may be a vast complex of rules regulating a man's behaviour in many circumstances of life, such as the *nso ani* of the Ibo, which are virtually their code of morality on one side, regulating whom a man may marry, deciding what children must suffer death (e.g. twins), &c., but also dealing with such apparently trivial matters as the crawling of a child through a gutter hole.

(3) Tabu therefore presents itself from one point of view as a complex of negative injunctions, but it would be a mistake to suppose that it can be viewed as wholly negative. Not in Polynesia only, but also in Africa and other parts of the world, tabu

represents in some respects the beginning of law and order; for a chief who would not intervene to help an individual if he were asked to do so simply as a guardian of law and order is nevertheless compelled to take steps when a tabu is broken. Property is thus protected by putting on it a tabu, and if the fear of direct penalties does not deter an offender he has always to look forward to being compelled to pay an indemnity to the chief or other person whose tabu he has violated. Personal rights, no less than the rights of property, can, it is clear, be enforced in the same way, for the weakling who is protected by the tabu of a chief is as secure as he would be under a more elaborate system of law.

Tabu has also been operative in another direction long after it ceased to be a living force; the sense of moral obligation remained behind when belief in the sanctions of tabu faded away; it laid the foundations of the influence of the categorical imperative. It must, however, also be recognised that much of what is vaguely called superstition may be due to the lingering effects of dead and gone tabus; an action forbidden for fear of supernatural penalties became, in process of time, unlucky—a deed which men shrink from doing, though they can formulate no valid reason for abstaining.

Tabu has also had, at least in certain areas, great influence on language; in Minahassa a word that forms part of, e.g., a father-in-law's name, or even resembles it, may not be used by the son-in-law; among the Zulu the system of *hlonipa* in a similar way causes words to go out of use among a whole tribe; so too the names of dangerous or destructive animals tend to be replaced by synonyms or euphemisms.

Tabus of one kind or another are all but universal. Among the Jews tabus were incumbent on the high priest, the Nazarite, &c.; a leper, one who touched a corpse, and a bystander at heathen rites were tabu; iron was not to be used in the temple, a field was not to be sown with different herbs, &c. Among the Romans the *flamen dialis* and his wife had to observe all sorts of tabus. In modern times it was at its height in Polynesia at its discovery. It exists in one form or other in Melanesia, Indonesia, Australia, India, Africa, and America. In fact it is almost a necessary corollary of a belief in supernatural power.

It cannot be said that any general study of the subject exists, but reference may be made to the article in the *Encyclopædia Britannica* and the literature cited there, especially Frazer's *Golden Bough*, van Gennep's *Tabou et Totémisme à Madagascar*; descriptions of tabu in individual cases will be found in Langsdorf, *Reise um die Erde*; Codrington, *The Melanesians*; Maass, *Bei lebenswürdigen Wilden*; *Internationales Archiv für Ethnographie*, vii. 232-3; *Handbook of American Indians*, s.v. 'Taboo'; &c.

Tacahout, an Arab name for the small gall formed on the Tamarisk tree, used as one source for obtaining Gallic Acid (q.v.).

Tacamahaca. There is a good deal of confusion in botanic and commercial circles as to the trees which produce this resin, for Elemi (q.v.) and other resins are often confounded with it, most of these being produced in Brazil by different species of *Iceia*. The fragrant bitter resin from Brazil is chiefly yielded by *Protium heptaphyllum*, but other species, as *P. guianense*, *P. Icicariba*, &c., furnish a similar resin, known locally as 'almaceja,' which is used in medicine and the arts, and burned as incense in the churches. One *Tacamahaca*, from *Bursera tomentosa*, sells in Mexico at a good price, and is called *Cacicarilo* in Venezuela. *Calophyllum Calaba* and others of its genus yield East Indian *tacamahaca*, which somewhat resembles species of *olibanum*, and gives off a similar odour when heated. The Mexican *tacamahaca* is usually called shell-*tacamahaca*, but is

better known as *Elemi*. *Populus balsamifera* is termed the *Tacamahac* poplar, but it yields little or no resin, the leaf buds only being used in ointments to prevent rancidity.

Tachylite, a black opaque natural glass, which results from the rapid cooling of molten basalt. It occurs as a thin selvage to dykes and veins of intrusive basalt—the latter having cooled rapidly from contact with the adjacent rocks. In Hawaii it appears as a scoriaceous or a compact crust, 2 inches or less in thickness, upon the basic lavas of that region. Tachylite never forms lava-flows like the acidic glasses (Obsidian). See **BASALT**.

Tacitus, the historian, is known to us chiefly from autobiographical touches in his own writings and from allusions in Pliny's letters. His full name is matter of doubt—Cornelius Tacitus being his nomen and cognomen; but whether his prænomen was Publius or Gaius can only be conjectured. Born perhaps at Rome (less probably at Terni) under the Emperor Claudius between 52 and 54 A.D., we infer that his family was respectable from his education, his profession, and his marriage. He studied rhetoric in Rome under M. Aper, Julius Secundus, and, likely enough, Quintilian; rose to eminence as a pleader at the Roman bar; and in 77 or 78 married the daughter of Agricola, the conqueror and governor of Britain. To this alliance he doubtless owed the accelerated promotion which, beginning with a quaestorship under Vespasian, made him prætor in 88 A.D. and a member of one of the priestly colleges. Next year he left Rome, probably for Germany, where, doubtless as governor, he must have acquired his knowledge of the features, natural and social, of the country; and he did not return till 93, when he found his father-in-law had recently died. We know him to have been an eye-witness of Domitian's reign of terror, almost blaming himself, as a senator, for complicity in that monster's judicial murders of such exemplary citizens as Helvidius and Senecio, and we have his own testimony as to the blessed change wrought by the accession of Nerva and Trajan. Under the former emperor he became consul suffectus, succeeding the great and good Virginius Rufus, on whom he delivered in the senate a splendid *oraison funèbre*. In 99 A.D., conjointly with the younger Pliny, he prosecuted the political malefactor, Marius Priscus, and the 'characteristic dignity' with which his share of the prosecution was conducted won him the thanks of the senate. After this we lose sight of him, but may assume it as certain that he saw the close of Trajan's reign, if not the opening of Hadrian's. The high reputation he enjoyed in life is attested by the eulogistic mention of him repeatedly made in Pliny's letters, and in the third century the Emperor Tacitus, proud to claim kinship with him, built in his honour a tomb which was still standing in the later decades of the 16th century, when it was destroyed by Pope Pius V. The same emperor also issued an edict by which the works of his namesake were to be copied out ten times yearly for presentation to as many public libraries.

In spite of this multiplication of copies we possess but a moiety of what he wrote. His earliest work, the *Dialogus de Oratoribus*, treats, in conversational form, of the decline of eloquence following on the change for the worse in the education of the Roman youth under the empire. This, published in 76 or 77, was for some time suspected to be from another pen, but is now included in every edition of his works. It has reached us entire. Next comes the *Agricola*, the literary character of which it is difficult to define. Quite a library has accumulated on the question whether it is a 'laudatio funebris,' or an 'apologia' written to

shield the memory of Agricola from the charge of servility, or a historical panegyric framed for political ends. As biography it has grave defects, while it cannot be brought under any of the three above-named heads without serious deductions. But it will always be read for its elevation of style, its dramatic force, its invective and its pathos. For English readers its interest is unique. The third work, the *Germania*, or *De situ, moribus, et populis Germaniae*, is a monograph of the greatest value on the ethnography of Germany. Faulty in geographical detail, it becomes characteristically strong wherever human interest emerges. Fourth in order are the *Historia*, or the history of the empire from the accession of Galba in 69 A.D. to the assassination of Domitian in 97. Of the twelve books originally composing it only the first four and a fragment of the fifth are extant. Tacitus is at his strongest in this narrative. His material was drawn from contemporary experience; and though the imperial archives were closed to him, he had at command the personal information open to a man of his position, to say nothing of correspondence (as of Pliny), the 'laudationes funebres', the 'acta diurna' (what we should call the 'gazette'), and the 'acta Senatus', the Roman equivalent for Hansard. He had no sympathy with the empire, as indeed we gather from his earliest work. He yearned for the return of an aristocratic oligarchy—the Rome of the Scipios and the Fabii. He is, on this account, a partisan, but is able to justify the most trenchant contrasts between the greatness of Republican and the deterioration of Imperial Rome, which latter he contrasts disadvantageously with the freedom and simplicity of even barbarian Germany. To his peculiar satirical gift which often makes him a 'Juvenal in prose' he gives free rein from time to time; though even in his bitterest moods he never forgets he is a Roman—a certain *chauvinism* betraying itself in his tendency to minimise the defeats of his compatriots and even the number of their slain. He had no appreciation of the higher qualities of the Jews, and his attitude to the growth of Christianity is that of a prejudiced, if cultured Roman, who, recognising an overruling providence or supreme 'Necessitas,' will not stoop to weigh the evidence to which the new religion appealed. The qualities conspicuous in the *Historiae* are maintained in his last work, the so-called *Annales*, a history of the Julian line from Tiberius to Nero (14 A.D. to 68). Of their sixteen books only eight have come down to us entire, four are fragmentary, and the others lost. In these, as in all his writings, his avowed aim was to perpetuate virtue and to stigmatise baseness whether in word or deed; hence he professes himself so severe a censor of the imperial system; though he is not blind to the shortcomings of the later republic, under which the provinces, he admits, were worse off than under the empire. Of late, indeed, it has been maintained that as the representative of the decadent and justly superseded aristocracy, he was malignantly unfair to even the best of the imperial Caesars. Among the more obvious defects which lower his value as a historian are his weakness in geography and his carelessness as to strategic details. His style is the most strongly marked of antiquity—statuesque in outline, rich if somewhat too sombre in colouring, effective in antithesis, not seldom obscure from sheer condensation.

The standard complete editions are those of Orelli, Ritter, and Halm. Important modern English editions are those of Furneaux, and Fisher, while there are translations (with notes) by Church and Brodribb, G. G. Ramsay, and Moore. The *Lexicon Taciteum* (1903) of Gerber and Greef is useful. See also the studies by Boissier (1903; trans. 1906) and Müller (1912). The old

fable that Tacitus was a mere forgery by Poggio (q.v.) need only be mentioned. Fabia in *Les Sources de Tacite* (1895) sought to prove that Tacitus is overrated, that he makes bad omissions, and that he copies sentence after sentence from older authorities—in the *Historiae* from Pliny the elder, in the *Annales* from Aufidius Bassus and Cluvius Rufus.

Tack, a Scots law-term for Lease (q.v.).

Tacna, a province of Chile. In 1884 it was ceded by Peru for ten years, when a plebiscite was to determine which country it should belong to. As the plebiscite has never been taken, the province is still occupied by Chile (see PERU, *History*). Cession of Tacna to Bolivia would appear to be the only definite solution of the dispute. The soil is fertile, cocoa, coffee, sugar, cotton, and fruit being cultivated, and there is some sheep-rearing and mining. Area 9556 sq. m.; pop. 38,912. The capital, Tacna, 38 miles by rail N. of Arica (q.v.), has a pop. of 15,000. Here the Chileans won a victory over the Peruvians and Bolivians in 1880.

Tacoma, the third city of Washington state, stands on the east side of Puget Sound, by rail 145 miles N. of Portland, Oregon, and 18 S. by W. of Seattle. In 1880 Tacoma was a village with only 1098 inhabitants; by 1890 it was a flourishing city with miles of wide streets, large wholesale stores, numerous mills and factories, and a busy port. There are now huge planing, paper, and flour mills, and iron and lumber works. Tacoma is an extremely important port, with many steamship lines to the Orient and to South America. Pop. (1900) 37,714; (1920) 103,093. Behind the city an open valley runs towards where the beautiful volcano Tacoma (or Rainier) rises, from a ridge of snow-covered mountains, to a height of 14,444 feet.

Tactics, MILITARY, the science which enables one of two opposing bodies of troops to be stronger than the other at every crisis of an engagement. This may be due to superior numbers, favourable ground, better arms, a higher state of discipline and training, or anything else that, if used to the best advantage, will produce greater strength at the point where and time when it is most essential.

Strategy (q.v.), which has precisely the same objects, merges into tactics as the enemy comes within striking distance, and the latter science is therefore sometimes defined as the strategy of the battlefield. Modern writers use different terms for the various branches of tactical science: *grand tactics* or *manœuvre tactics* deals with the methods of putting the chief units into the battle; *minor tactics*, with the conduct of small bodies, such as advanced and rear guards, outposts, patrols, &c.; *fighting tactics*, with the formations into which the regimental units dislocate themselves on entering the zone of fire; *fire tactics*, with the best use of guns and rifles, the massing of their fire, and the selection of the target; and the special *tactics* of *cavalry*, *artillery*, or *infantry*, *combined tactics*, *siege tactics*, and *mining tactics*.

It would be impossible to enumerate all the schemes and devices which go to make up this science, varying as they must with the arms in use and the manœuvring power of the troops employed, but some illustrations may be given from ancient and modern history. In Judges xx. we read of a favourite and dangerous manœuvre, the Israelites feigning to retreat before the Benjamites, so as to draw them on until their flanks and rear were exposed to the 'liers in wait.' Hannibal at Cannæ and William the Conqueror at Hastings were among the many successful imitators of these tactics. Others, like the Duke of Burgundy in 1476 at Granson, lost their armies

through attempting it with unsteady troops. Frederick the Great owed his victory at Mollwitz to the rapid fire and steady discipline of his men, and the former was chiefly due to the introduction of iron ramrods. His later battles give us good examples of manœuvre tactics. At Leuthen he engaged the Austrians, immovable in their chosen position, with his advanced guard, while his main body, under cover of some hills and foggy weather, marched in open column of companies round their flank, wheeled into line, and rolled up their army. At Rossbach he showed how to defeat this manœuvre when the enemy put it in practice. Sending his cavalry and artillery to check the head of their marching columns, he threw his main body upon their flank and inflicted a crushing defeat. At Kolin his *linear tactics* failed because the rear of his column wheeled into line too soon, leaving the head to continue the march, so creating a wide gap in the line when formed up. At Waterloo Napoleon showed an example of *combined tactics* on a large scale. By cavalry charges he obliged the British infantry to form squares, which then became targets for his massed artillery. When under stress of this 'hard pounding' they opened out into line, a renewed charge of cavalry obliged them to take the denser formation again. At Gravelotte the German armies (some 240,000 men) showed an unparalleled instance of *grand tactics* by marching to their positions across country in seven large masses, each consisting of one complete army corps. The *minor tactics* employed by advanced or rear guards and outposts are to a certain extent stereotyped. Their object is to prevent the main body—in the first case a column, often several miles long; in the second a large camp, cantonment, or bivouac—from being attacked before it can get into fighting order. Therefore a series of small parties of two to six men lead the way, or stand sentry, some four miles in front of the main body, while larger bodies support them at a little distance, followed in their turn by still larger units, so that the enemy meets with an ever-increasing resistance until he finds himself confronted by the main body drawn up in a carefully chosen position. *Fighting tactics* must depend chiefly upon the arms in use. The mail-clad horsemen of the 15th century never succeeded in defeating the solid phalanx of pikemen opposed to them by the Swiss Confederation until the employment of artillery prevented the latter retaining such a massive formation. The English archer, protected in front by palisades and on the flanks by spearmen, destroyed the chivalry of France at Cressy and Poitiers, but at Bannockburn was ridden down by the Scottish cavalry, because the flanking spearmen had been omitted. Gustavus Adolphus, by employing cartridges, enabled his infantry to fire more quickly than his opponent and so to form on a wider front. The invention of the bayonet, doing away with the necessity for pikemen to protect the musketeers, still further increased the fire-power of infantry. The British two-deep line overthrew, by its converging fire and charge, the column formation of the French in the Peninsula and of the Russians at the Alma. In the battles of the Franco-German war of 1870–71 it was found impossible to advance against the fire of modern breech-loading rifles except by rushes of comparatively thin lines of skirmishers, constantly reinforced by supports and reserves in rear. The magazine rifle, smokeless powder, machine gun, quick-firing cannon, and enormous power of high-explosive shell still further complicate the problem, presented to the assailant, of closing with the enemy. No rules can be laid down except that there must be plenty of supports and reserves, and the closest co-operation between artillery and infantry.

In the Great War the multiplication of firearms and the vast development of entrenching led to experiments in attack. These culminated with us in the 'leap frog' system, whereby the first attackers were given limited, clearly defined objectives, company by company or platoon by platoon, further work beyond being entrusted to the next wave of assailants, and so on. In defence, the final tactics were to hold the first line lightly, so as to save men during the bombardment, and to make counter-attack from the second line before the assaulting troops had reformed in the first; at this time and place the attacker, so far successful, could not use his artillery.

Against enemy whose fire is not formidable, but the shock of whose charge is so, close order is the rule and the luring of him into the open. He is usually in superior numbers, and therefore ready enough to attack.

Cavalry tactics, now more like those of mounted infantry, consist greatly in using the horse for speed and then the rifle in the hands of dismounted troopers. Shock action is seldom possible, and differs from the charge of old days in the men riding in open order, and not boot to boot. *Artillery tactics* consist in concealment from hostile observers in air and on land, close co-operation with one's own infantry, concentration of fire at short notice on any given target, the constant provision to the batteries of unlimited ammunition.

Siege tactics have lost importance in sieges proper, which operations, in relation to permanent works, have become almost entirely a matter of sheer demolition of everything by high-explosive shells (see under SIEGE). But the siege tactics of former days, included in the words sapping and mining, have appeared in the modern attack of entrenchments, whenever it was advisable not to risk brusque assaults.

See *Field Service Regulations, Part I.* and the *Training Manuals of the War Office* for infantry and artillery; for history of the subject, see Captain Johnstone's *A History of Tactics* and E. M. Lloyd's *History of Infantry*.

Tactics, NAVAL, is the art of manœuvring ships and fleets in presence of each other for the purposes of battle; whereas naval strategy is the science of combining and employing fleets or single ships in order to carry out defined operations at sea or against an enemy's coast, for obtaining command of the sea or certain portions of it. Although fleets had existed and battles at sea been fought from the earliest periods, it was not until towards the close of the 16th century, in the reign of Queen Elizabeth, that naval war began to assume definite form. The discovery of the New World and the occupation of its richest territories by Spain, the opening up of the route to the East Indies by the Cape of Good Hope, and the efforts which English merchants began to make at this time to push their own trade gave a marvellous impetus to the sea-borne commerce of the world, which carried with it as a necessary consequence the building of larger and more seaworthy ships than had previously existed. War at sea at this time does not appear to have been carried on on any definite plan, and consisted principally, if we except the attempt of the Great Armada, of raids on the enemy's commerce and coast-towns. The first organised attempts to obtain command of the sea are to be found in the Dutch and English wars of 1652, 1665, and 1672, in which the honours were pretty evenly divided, each party striving to destroy the trade of the other; in the second war, Dutch merchant-ships were forbidden by the Dutch authorities to put to sea at all. Several efforts were made by the French, between 1690 and the defeat at Trafalgar, to obtain the command of the sea in order to effect the invasion of England. In

1690 the Earl of Torrington, forced against his better judgment, by direct orders from queen and council, to attack the vastly superior forces under Tourville, gave battle off Beachy Head. He was defeated, but skilfully drew off and fell back under shelter of the Gunfleet Shoals at the mouth of the Thames. Here, although 'beaten, inferior, and shut up behind sandbanks,' yet, from the strategic position he now held, his fleet still remained such a 'power in observation' as to paralyse the action of the victorious and superior force. Steam is often said to have revolutionised naval strategy and tactics, but this is only true in so far as changes in the motive-power of ships affect the times required to move from one position to another, and render such movements more certain; formerly the best-laid schemes were often frustrated by foul winds and gales, while now the great steam-power of battle-ships and cruisers renders them independent of wind and to a great extent of bad weather. As a set-off, however, to this, the coal endurance of ships and the replenishing of their supplies of fuel become important factors in deciding upon their movements.

The principal objects of Great Britain's naval strategy must be, first and foremost, to obtain the complete command of the sea, the destruction of the enemy's battle-fleets, and the protection of the great trade-routes. For this purpose a fleet of battle-ships strong enough to meet any hostile combination, supplemented by a proportionate number of fast cruisers, torpedo-boat destroyers and submarines, and air-craft, is indispensable. A deficiency in battle-ships might cause us to lose command of the seas round our coasts, thus opening the way to invasion and endangering our very existence as a nation; while a poverty of cruisers would mean a sweeping of the country's trade from the sea—as happened to the United States in the civil war—and deprival of breadstuffs and most of the raw materials required for our manufactures. Eighty per cent. of the sea-borne trade of the world is carried in English bottoms, and a few hostile cruisers and submarines, if not immediately hunted down, would in a short time work incalculable havoc, as was proved by the operations of the Germans in the Great War.

During the war between Spain and the United States in 1898, the Spanish Admiral Cervera, with his squadron of four armoured cruisers and two destroyers, was blockaded for more than a month in Santiago de Cuba by a much superior squadron under Rear-Admiral Sampson, whose ships were cruising on an arc of a circle some seven miles off the harbour. In the forenoon of 3d July Cervera came out and made a dash for liberty, and he would probably have succeeded in making his escape, in view of the distance Sampson's ships were keeping offshore, but for the loss of speed of his little squadron due to the foul state of their bottoms; as it was, he was intercepted and his ships driven on shore and destroyed. This was a case of genuine blockade. Observation of the enemy's ports now takes the place of close blockade; this being carried out by a chain of cruisers, submarines, air-craft, and destroyers in touch with the main body of the fleet. Such touch is now easily maintained by means of wireless telegraphy, which has been brought to such a pitch of perfection as to revolutionise the art of scouting at sea.

The triremes or galleys of the ancients were armed with formidable iron or brass beaks; propelled by oars, they were formed for attack with their bows pointing to the enemy, the aim being to destroy by an oblique blow the oars on one side of the enemy, and then ram and sink her. At Salamis (480 B.C.) the superior tactics of the numerically inferior Greek fleet inflicted a crush-

ing defeat on a vastly superior Persian force (see NAVY). The secret of tactical success is to throw an overwhelming force, if possible, on some point of the enemy's line, and destroy him in detail; as at Sluys in 1340, when Edward III., having successfully manœuvred to bring his line obliquely across the right wing of the French, completely crushed it. At Lepanto in 1571, Don John of Austria, mainly by his skilful tactical arrangements, completely defeated the Turks. He divided his fleet into three squadrons, which were formed in line abreast, with sufficient room between each for manœuvring; in rear was a reserve squadron. The Venetian admiral, before the action commenced, placed six galleasses (see GALLEYS) about half a mile in advance of the fleet, two in front of each of the three divisions; the heavy ordnance of these vessels effectually broke the shock of the Turkish onset. Taking advantage of their confusion, Don John pierced their centre, and the rout of the Turks was complete, although the commanders of both the Turkish wings displayed considerable tactical skill. The Christian left wing was for a time outflanked and placed between two fires, while the Turkish left wing passed through the Christian line, and, but for the reserve squadron by which it was immediately attacked and driven back, might have altered the fate of the day. Lepanto was the last great battle in which galleys took a prominent part. With 'great ships,' dependent on their sails alone, having their guns mounted on the broadside, a new method of organising fleets for battle came into being. It was not, however, until the wars between the Dutch and English of 1652-72 that the tactical formation of a fleet in 'line of battle' was devised. Previous to this, fighting at sea appears to have been carried on in rather an indiscriminate fashion, although from the first the obtaining of the weather-gauge seems to have been recognised as the great aim for which to manœuvre. Sir W. Monson, a distinguished sea-captain of Queen Elizabeth's time, writes: 'For the greatest advantage in a sea-fight is to get the wind of one another; for he that has the wind is out of danger of being boarded, and has the advantage where to board and how to attempt the enemy.' According to Admiral Colomb, the 'line' was first introduced by the Dutch as a means to weaken the power of fireships, and to bring the fleet under better control. The line of battle consisted in a fleet of ships being extended in a straight line either ahead or abreast one ship of another, keeping as close together as weather permitted, so that at all times every ship should be ready to sustain and relieve one another. It was directed that each ship in the line should keep within half-a-cable's length (about 50 fathoms) of one another. It was introduced into the English navy by Sir William Penn. According to Père Hoste, it was the formation taken up by both English and Dutch in the battle of the 29th July 1653, and by the Duke of York in the battle off the Texel in June 1665. But it was dropped again by Albemarle in the battle of June 1666; and, by the way Sir W. Penn speaks of it (see Pepys), it seems clear that there was still controversy as to whether a line was or was not the best formation for a fleet for fighting purposes. So, although the line was established on paper as the fighting formation soon after the outbreak of the first Dutch war, it probably did not get firm hold until the third Dutch war. However, as a recognised order of battle it was embodied in the Duke of York's fighting instructions issued in 1665. These instructions were modified by Admirals Russell and Rooke at the end of the 17th and the very beginning of the 18th century, and Rule XIX. ran: 'If the admiral and his fleet have the wind

(or weather-gauge) of the enemy, and they have stretched themselves in a line of battle, the van of the admiral's fleet is to steer with the van of the enemy's, and there to engage him, each ship from van to rear successively.' It was for acting contrary to this rule that Admiral Matthews was tried by court-martial and cashiered after his indecisive action with the French off Toulon on the 22d February 1744. His fault, for which he was condemned, was breaking (or quitting) his own line with the signal for the line of battle still flying; having formed his line, he broke it himself by running down to attack the French and Spanish centre. Admiral Lestock, the second in command, refused to obey. Both were tried, and Lestock was acquitted. These instructions were still in force in 1781, when Admiral Graves fought his action off the Chesapeake on the 5th September. And on the 5th July 1782 Sir Edward Hughes, in the East Indies, tried to engage the French fleet under Suffren according to Rule XIX. when he had the chance, but failed. According to Professor Laughton, they were not issued after that time. Admiral Rodney on the English side and Suffren on the French had shown that it might be better to leave a commander-in-chief free to act as the occasion required. These instructions also made no provision for engaging from the position to leeward. It would seem that the idea in Russell's and Rooke's minds was that the fleet to windward, whichever it was, was to engage. As a matter of fact, the French never engaged in that way, and as a rule utilised the position to windward to avoid action, as in Admiral Keppel's action in 1778, and in Rodney's two actions with Guichen in May 1780. The system of tactics put in practice by Sir George Rodney in his action with the French under the Comte de Grasse on the 12th April 1782 was by a curious coincidence used on the same day by the French admiral Suffren against the English squadron under Sir E. Hughes in the East Indies, the result of which was to free British admirals' hands, leaving it to their discretion how best to attack the enemy. This was simply concentrating the attack on a part of the enemy's fleet instead of dispersing it along the whole; there was nothing new in this or in the manœuvre by which it was effected, which was cutting through the enemy's line.

The honour of having been the first to demonstrate fully the principles on which the manœuvres of an attack against fleets to windward or to leeward depend is generally ascribed to John Clerk (q.v.) of Eldin in 1779; though English commanders cut the enemy's line as early as the middle of the 17th century. In 1652 Sir George Ayscue pierced the Dutch line from to leeward; in 1665 the Earl of Sandwich cut through the centre of the Dutch line; in 1672 Sir J. Jordan, having the weather-gauge, cut through the Dutch fleet and threw it into confusion. But it was Rodney's victory over the French in 1782 which gave the manœuvre notoriety. The idea was suggested to the admiral by Sir Charles Douglas on perceiving an opening between two of the ships near the French centre. The opportunity was seized of passing through: so narrow was the opening that the admiral's ship almost touched the French ships on each side; the ships astern followed him closely, and these kept up a powerful raking fire against the ships in the rear division of the enemy's fleet, which, being driven to leeward as the van of the British passed through, broke up and made sail before the wind to escape. At the battle of the Nile (1798) Nelson doubled on the van of the French line and attacked it on both sides, while the other ships, the whole fleet being at anchor, could afford no assistance; but at Trafalgar he

broke the enemy's line in two places, bearing down upon it in two columns. The enemy's centre and rear were overwhelmed, the van being unable to come to their assistance.

Since the introduction of steam and armour-plating there have been but few naval battles affording opportunity for the display of tactical handling of ships. In 1866 the Italian fleet under Persano, consisting of eleven ironclads, four wooden frigates, and some small vessels, was bombarding Lissa, when on the morning of the 4th July the Austrian fleet under Tegethoff was sighted. Persano formed his ironclads in line of battle—the old 'line ahead'—in single column, nearly at right angles to the course the Austrians were steering; Albini, his second in command, acting on the understanding that wooden ships should not unnecessarily engage armoured ships, kept well out of the way and practically took no part in the action. Tegethoff formed his seven ironclads in double quarter line, his flagship, the *Ferdinand Max*, leading and forming the apex of the wedge; following in the same formation, at a distance of about 1000 yards, came seven wooden ships; in rear of these again came seven gun-vessels. Persano trusted to his guns, Tegethoff to the ram. Steaming at full speed, Tegethoff, who had previously explained his plans to his captains, made the signal, 'Ironclads to rush against and sink the enemy.' The Italian line was badly formed, and the Austrians passed through a large gap in the centre. In the mêlée which ensued, the *Rè d'Italia* was rammed and sunk by the *Ferdinand Max*, the *Palestro* was set on fire and blown up, and the Italians, now thoroughly disorganised, were driven to take refuge in Ancona. Naval opinion came to the conclusion that the ram was more formidable than the gun, and that 'line ahead' was no longer suitable as a battle formation. But it was overlooked that the *Palestro* had been sunk by gun-fire, and that if the *Rè d'Italia* was rammed, it was because for the moment she had also been rendered unmanageable from the same cause. The advent of the torpedo and the vastly increased range and power of modern guns have killed ramming tactics, and the war of 1904-5 between Russia and Japan proved that, now as in the past, there is only one weapon of offence for the fighting ships, and that is the gun.

The action of 3d July 1898, off Santiago de Cuba, when Cervera's squadron was destroyed, was not a tactical engagement in any sense of the word; it was simply the chase and destruction of slower and inferior ships by faster and more powerful ones. In the two great battles between the Russian and Japanese fleets, on the 10th August 1904 and the 27th May 1905, we find: 1st, that the decisive factor in each action was not the ram, nor the torpedo, but the gun; 2d, that single column in line ahead—the one formation which allows the whole broadside of a ship to be most effectively brought into action—was the battle-ship formation adopted by both Togo and his Russian opponents. The aim of the Russian admiral on the 10th August was to break through the Japanese and escape to Vladivostok; of Togo, to foil the attempt. Rear-Admiral Vithöft led the Russian line of six battle-ships in his flagship, the *Cesarevitch*, while Togo in the *Mikasa* headed the Japanese line of four battle-ships and four armoured cruisers. Fire was at first opened at ranges varying from 11,000 to 8000 yards; later the distance was decreased to 3500 yards, and at first both sides seem to have concentrated their fire against each other's flagship, which were leading. About 6 P.M. a shell from the *Mikasa* burst close to the conning-tower of the *Cesarevitch*, killing the admiral and disabling her steering-gear; her helm jammed and the ship sheered off to port, and the whole Russian

line was at once thrown into confusion and their formation broken up. The result is known; the *Cesarevitch* found her way into the German port of Tsingtan, and the other five Russian battle-ships were forced back to Port Arthur. In the battle of the 29th May 1905, in which Togo annihilated the Russian fleet under Admiral Rozhdestvensky, the two divisions of Togo's fleet, each consisting of six armoured ships, which attacked the Russians, the one from ahead and the other from astern, were formed in single column in line ahead. The Russians opened fire about 2 P.M. at 12,000 yards, but it was quite ineffectual; the Japanese reserved their fire until within 7500 yards, and so accurate was it that by sunset three of the Russian battle-ships were sunk and the rest of the fleet hopelessly disorganised; so that, with the exception of four unarmoured cruisers, the whole fleet, which when the fighting began consisted of five first-class battle-ships, three second-class, and three coast-defence ships, with three armoured cruisers, had been sunk or captured. The Japanese fleet consisted of four first-class battle-ships, eight armoured cruisers, some smaller vessels, and a large force of torpedo-boats, which were launched with great effect against the Russian ships during the night of the 27th-28th.

During the Great War, 1914-18, the few naval actions demonstrated the value of accurate fire at very long ranges, the value of high speed, the influence on tactics of torpedo attacks by masses of torpedo-boat destroyers, and the influence of mines and submarines on the mobility of fleets. At *Coronel* Von Spee overpowered and sank Cradock's squadron by superior gun-power and speed. At *Falkland Islands* Sturdee overpowered Von Spee by superior gun-power and speed, sinking all his squadron except *Dresden*. At *Dogger Bank* Beatty chased and overtook the Germans under Von Scheer and sank *Blücher*, but owing to *Lion* being disabled, and the menace of mines and submarines causing the rest of his cruisers to abandon the chase, three German battle-cruisers escaped though injured. At *Jutland* Beatty engaged the German battle-cruisers, and fought a running action until the German main battle-fleet was sighted. He then altered course 16 points, and led them to meet Jellicoe's grand fleet, but a determined massed attack of German torpedo-boat destroyers interfered with the deployment of Jellicoe's fleet and somewhat delayed forming line ahead, and efficient range finding and range keeping was marred by mist and failing light, resulting in the Germans managing partly to evade the grand fleet and escape into harbour; but before the mist came on very considerable damage was inflicted on the Germans, who were also mauled by torpedo craft during the night of 31st May 1916, after the action, when steering for Horns Reef. The German fleet never attempted to give battle again. When ordered out to fight, the battle-ships' crews mutinied and refused to go. They finally surrendered to the grand fleet when the armistice was arranged.

In these actions line ahead formation was the battle formation, and the general idea was to manoeuvre the line so as to cross at right angles to the course of the enemy's line—called crossing his T; but when chasing it developed into quarter line, and, owing to differences of speed, intervals were lengthened. Ranges varied between 21,000 yards and 11,000. The general idea, if visibility permitted, was to keep outside torpedo range—i.e. outside about 15,000 yards, but occasionally they got within 8000 yards. Sea-planes were used by the grand fleet at Jutland during the approach, and did good service. Kite-balloons were introduced for spotting fall of shot, and the Germans used an

air-ship; but after Jutland the use of air-craft, in conjunction with the grand fleet, for scouting and for spotting fall of shot was greatly improved, and special vessels were designed and built to carry and work air-craft—e.g. *Argus*, *Renown*, &c. In future naval actions, air-craft will undoubtedly be extensively used both for scouting and bomb-dropping, and will no doubt influence tactics.

It seems clear that the gun has resumed once more its old position as the determining factor in naval battles, and the tactics of commanders must be such as to give the best effect to this weapon. Tacticians look to the single column in line ahead as giving the gun its best opportunity, and of being the best formation not only for affording mutual support, but for concentrating an overwhelming fire on one part of the enemy. The fleet that has a superiority in speed must necessarily, if well handled, have certain advantages over a slow one: it gives the power of accepting or refusing action; it enables the fleet possessing it to take up the most advantageous position as regards sun and wind. And superior speed should give the opportunity of concentrating a superior force on some given point of the enemy's line and crushing it.

See works by Bainbridge-Hoff (1884), Laughton (1887), Colomb (1891), Custance, Vignot, Mahan (1890-1908), Brassey's *Naval Annual*, Jellicoe's *Grand Fleet*, and works cited at NAVY.

Tadcaster, a market-town in the West Riding of Yorkshire, on the Wharfe, 9 miles SW. of York. At Towton, 2½ miles S., the Yorkists gained a great victory in 1461.

Tadema. See ALMA-TADEMA.

Tadmor. See PALMYRA.

Tael, a weight of silver of a certain fineness or touch used as a Chinese money of account, and represented by no actual coin. There are altogether about 170 forms of taels, of which the four principal are the *Hakwan* or customs tael, an arbitrary standard only used for calculating the duties levied by the maritime customs, worth now from 3s. 6d. to 4s., and weighing 583 grains; the *Kuping* or treasury tael, in which under the empire all dues were paid, except the customs and those paid in kind and in copper cash; the *Tsooping* or Shanghai tael, in which the banks quote foreign exchange rates; and the *Canton* tael, used for weighing bar silver in Hong-Kong, Shanghai, and Canton. The tael was originally of importance in establishing some sort of financial standard, but both before and after the revolution there reigned intense currency confusion, and it has been proposed to establish a Chinese silver dollar of uniform value throughout the country.

Tacnia. See TAPEWORM.

Taffeta, or TAFFETY (Persian *tâfta*), a term formerly applied to all plain silks simply woven by regular alternations of the warp and weft, came to be used for almost all 'plain silks,' or even for various combinations of silk and wool, and now generally means a thin glassy silk with a wavy lustre.

Taff Vale. See TRADE UNIONS (*Legal Position*).

Tafilet. See MOROCCO.

Taft, WILLIAM HOWARD, American president, was born at Cincinnati in 1853, his father having been a member of President Grant's cabinet. He studied at Yale, qualified as a barrister at Cincinnati, held numerous posts in Ohio, and in 1890 became Solicitor-general for the United States. In 1901 he was appointed first Civil Governor of

the Philippine Islands; in 1904-8, was Secretary of War; in 1906, Provisional Governor of Cuba; and as a republican was President of the United States 1909-13. He stood for a second term of office, but was defeated by Woodrow Wilson; thereafter he became Professor of Law at Yale. In 1921 he was made Chief Justice of the United States. He strongly supported the movement for reciprocity with Canada.

Taganrog, a seaport of Ukraine, in the Don country, on the north shore of the Sea of Azov. The port has now silted up considerably, but there is still an important trade in grain, linseed, &c. Telckhov was a native. Pop. 70,000.

Tagliacozzi, or **TALIACOTIUS**. See RHINO-PLASTIC OPERATIONS.

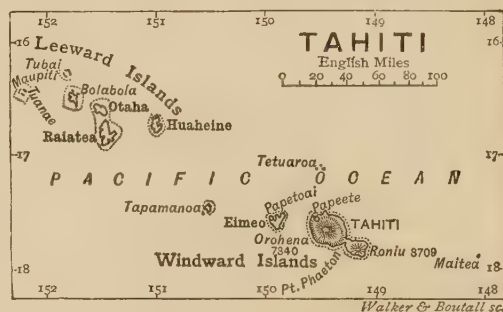
Taglioni, MARIA (1804-84), a celebrated dancer, born at Stockholm of Italian parents, her father being a ballet-master. She made her début in Paris in 1827, and appeared with enormous success in all the large European capitals. She married Comte de Voisins in 1832, and retired with a fortune, afterwards lost. Her brother Paul and his daughter Maria were also famous dancers.

Tagore, RABINDRANATH, was born in 1861, of an ancient Bengal family. For some time he managed his father's estates in the country, and later founded a school at Bolpur, near Calcutta, since developed into an international institution. In 1913 he was awarded the Nobel Literature Prize. A knighthood was conferred in 1915, which in 1919 he asked in vain to have revoked. In Bengali he has written about thirty poetical and twenty-eight prose works (novels, essays, pamphlets, &c.), some of which he has translated into English. His best-known volume of poetry is *Gitanjali*, and other books are *Fruit-Gathering*, *Sādhanā*, *The Gardener*, *The Crescent Moon*, and a volume of *Reminiscences* (1917). His writing is intimate, personal, mystical, and, on the whole, sympathetic to nationalist aims and aspirations. See Study by E. J. Thompson.

Tagus (Span. *Tajo*; Port. *Tejo*), the largest river of the Spanish Peninsula, rises on the frontier of the provinces of Guadalajara and Teruel, on the western slopes of the Muela de San Juan. It first flows north-west, then curves to the south-west, and flows mainly in that direction past Aranjuez, Toledo, and Alcántara, and in Portugal, Abrantes, Santarem, and Lisbon, entering the Atlantic about 10 miles lower down. Below Salvaterra it divides into two arms, the western Tejo Novo and the eastern Mar de Pedro, which form a delta, the Lezírias do Tejo. Both fall into the noble Bay of Lisbon, which turns to the west and joins the sea by the Entrada do Tejo. It is navigable to Abrantes, from Santarem for steamers, even ocean-going vessels. Its total length is 566 miles; its drainage area includes 31,700 sq. m.

Tahiti, an island giving name to a small archipelago, also called Society Islands, in the middle of the Pacific, more than 2000 miles NE. of New Zealand and some 3400 SSW. of San Francisco. The islands consist of Tahiti, which embraces 600 sq. m. out of a total of 900 for the entire archipelago, and a number of smaller ones, the chief being Raiatea and Eimeo (q.v.). The group is divided into two clusters, called respectively the Windward and the Leeward Islands, and stretches for about 200 miles in a north-west and south-east direction. They are composed of volcanic rocks, are mountainous (Orohena on Tahiti is 7340 feet high), and well wooded, with belts of low fertile soil along the shores. Coral-reefs encircle the separate islands, some of which are atolls, and numerous

cascares foam down the mountain-sides. The scenery is magnificent, the chief island being often called 'the Garden of the Pacific.' The climate is very moist and hot (range 70° to 84° F.), but equable and healthy. Coconuts, oranges, vanilla, and all kinds of fruit are grown, as well as some cotton and sugar. Besides these things mother-of-pearl (the most valuable of all), coconut fibre, and phosphates are exported, while the most important imports are tissues, wheat, live-stock, and metal work. The people cultivate for their own sustenance the bread-fruit, taro, yam, sweet potato, &c. There are several good harbours behind the



shelter of the reefs; the most important is Papeete, the capital of the archipelago, which stands on the north-west of Tahiti, and has a Roman Catholic cathedral, an arsenal, schools, and a population of 4600. The population of Tahiti is 7145 (1924), and of all the islands together, though more than half are wholly uninhabited, about 20,000. The people, a handsome race of the Polynesian stock, are light-hearted, polite, and gay, but very immoral and untrustworthy; formerly, before they became so thoroughly Europeanised as they are now, they were notorious for their cruelty. The group was discovered by the Spanish navigator De Quiros, but first accurately described in detail by Cook (1769-77). He gave the name of Society Islands in honour of the Royal Society of London on the occasion of his first visit; at that time the population numbered nearly a quarter of a million. The London Missionary Society commenced work in these islands in 1797. But they have had unusual difficulties to contend against, and in 1812 they had to flee for a while to Australia. In 1842 the French forced a protectorate over the eastern cluster, subsequently extended to the whole group, which was made a colony in 1897 and united in 1903 with other establishments in Oceania.

See Cook's *Voyages*; *Quest and Occupation of Tahiti* (trans. Corney, from Spanish despatches, &c., Halsluyt Soc. 1913-19); Desgraz, *Îles Taïti* (1844); Ellis, *Polynesian Researches* (1829); Williams, *Missionary Enterprise in the South Sea Islands* (1839); Pritchard, *Polynesian Reminiscences* (1866); Dora Hort, *Tahiti: the Garden of the Pacific* (1891); and books by Calderon (1921), and Keable (1925).

Taichu, an inland town on the western side of Formosa, about midway by rail between Taipeh and Tainan. Pop. 32,000.

Taihoku, or **TAIPEH**, since 1887 the capital of Formosa (q.v.), 13 miles by rail from Tamsui on the north coast. The Japanese have spent large sums of money on Taihoku, and it is now an extremely prosperous and well laid out town with a busy commerce, especially in tea, camphor, sugar, and coal, and with numerous important government buildings, hospitals, schools, banks, &c. Pop. 187,000.

Tail, and **Tailzie**. See ENTAIL.

Taillandier, SAINT-RENÉ (properly René Gaspard Ernest), a French writer (1817-79), born at Paris, studied at Paris and Heidelberg, and had already filled chairs at Strasburg and Montpellier, when he was called in 1863 to succeed Saint-Marc Girardin at the Sorbonne. He was admitted to the Academy in 1873. His chief work was to open up the art and literature of Germany to his countrymen in such books as *Histoire de la jeune Allemagne* (1849), *Études sur la Révolution en Allemagne* (1853), *Allemagne et Russie* (1856), and a translation of the Goethe-Schiller letters (1863), besides writing many volumes of essays, philosophical, literary, and historical.

Tailor-bird (*Orthotomus sutorius* or *Sutoria sutoria*), a bird belonging to the family Sylviidae. The male is about 6½ inches long; the general colour is olive-greenish; wings brown, edged with green; the two central tail feathers are long. It



Tailor-bird (*Orthotomus sutorius*).

is common in gardens, hedgerows, orchards, and low jungle in India, Burma, and China, being found usually in pairs, but sometimes in small flocks. The name tailor-bird is derived from the way in which the nest is formed. Two or three leaves are stitched together by means of silk from cocoons, thread, wool, or vegetable fibres, the necessary holes being made by the bill. In the cup thus formed the nest is made, and consists of cotton-wool with a few horse hairs and some fine grass. The eggs are three or four in number, and are of two distinct types, the ground of the one being reddish white and of the other pale bluish green. The latter type is the rarer, and the two kinds of eggs are never found in the same nest.

Tain (Scand. *Thing*, 'a place of assembly'), an ancient royal burgh of Ross-shire, near the south shore of the Dornoch Firth, 44 miles NNE. of Inverness by the Highland Railway (1864). A ruined chapel marks the birthplace of St Duthac (c. 1000-65), whose body was brought back from Armagh in 1253; within it Bruce's queen was taken captive for Edward I., and James IV. did yearly penance here. There are also a collegiate church (1471; restored 1849-82), a court-house (1849), a public hall (1876), and an academy (1812). Pop. (1861) 2319; (1921) 2394. As a parliamentary burgh (till 1918), Tain united with Wick, Dornoch, Dingwall, Cromarty, and Kirkwall to return one member. See Taylor's *History of Tain* (1882).

Tainan (until 1889 TAIWAN) is the oldest city in Formosa (q.v.) and was the capital for two centuries under Chinese rule. It contains law courts, a hospital, several schools, and has been much improved as a town since the Japanese

occupation. With its port Anping, 3 miles W., it was one of the last places to fall to the Japanese in 1895. Pop. 83,500.

Taine, HENRI, French critic, so styled first through a whim of the editor of the *Revue des Deux Mondes*, his real name being Hippolyte Adolphe Taine, was born at Vouziers in Ardennes, 21st April 1828. He studied at Paris at the Collège de Bourbon and the École Normale, but his religious opinions barred the way to a scholastic career commensurate with his abilities. He filled minor parts at Toulon, Nevers, Poitiers, but soon threw up the state educational service to return to Paris, where after a short time of struggle he conquered fortune by the sheer strength and originality of his literary work. He took his *Docteur es Lettres* in 1853, writing for the occasion, besides the regular thesis, a treatise on Lafontaine's *Fables*—a masterpiece of critical analysis which established his reputation. Here at twenty-five he had reached the critical method which was to dominate him throughout life. His method is to make a searching investigation into the race, social conditions, and antecedents of the individual, his environment, the special tendencies of the age and their bearing upon him. These supply the key to the fundamental quality—the *faculté maîtresse*—of the author, which, once grasped, the critical judgment is complete and unassailable. But unfortunately *race*, *period of time*, and *environment* give completely different combinations to the reading of different observers, and with the help of all these it is only possible to see what one wishes or expects to see. The individuality is a subtle essence which eludes all this pretentious analysis, and these vast generalisations remain mere preconceived theories and foregone conclusions, the process the very opposite of the objective, the scientific, the certain. In 1854 Taine won the Academy's prize for an essay on Livy—an audacious application of the same critical method to a period of which he did not possess adequate knowledge. His *Voyage aux Eaux des Pyrénées* (1855) and *Voyage en Italie* (1866) are books that stand almost first of their class. In 1863 Taine was appointed to an examinership at St Cyr; in October 1864 he became professor of Aesthetics and the History of Art at the École des Beaux-Arts in Paris, thus finding a motive for his well-known subtle and paradoxical books on the Philosophy of Art, the Ideal in Art, and the Philosophy of Art in Italy, in Greece, and in the Netherlands. Already an Oxford D.C.L. (1871), was elected to Loménie's chair in the French Academy in 1878; he died 5th March 1893. Some of his maturest critical work is to be found in the *Essais de Critique et d'Histoire* (1857) and the *Nouveaux Essais* (1865); his most vigorous polemic in *Les Philosophes Français du XIX. Siècle* (1856), an attack on Cousin, Jouffroy, &c. The *Notes sur l'Angleterre* (1861) is perhaps his best book of its class, spite of its cleverness a warning example of the folly of splendid inductive theories without adequate knowledge. His famous *Histoire de la Littérature Anglaise* (5 vols. 1863-64; Eng. trans. by H. Van Laun, 4 vols. 1872-74) excited a clerical storm in France which cost him the Academy's prize of 4000 francs. The work is marred by sins of omission and commission alike, and by no means justifies its title—Sainte-Beuve suggested as an alternative, 'Histoire de la race et de la civilisation anglaises par la littérature.' But it was long the best work of the kind done by a foreigner, full of sympathetic insight and subtlety, and admirably written. Taine's greatest work, however, is his study of the Revolution, its causes and its issues, *Les Origines de la France Contemporaine* (*L'Ancien Régime*,

1875; the Revolution itself, in three sections, 1878-81-85; *Le Régime Moderne*, vol. i. 1890). As a psychological history of the greatest event in modern history this work stands absolutely alone. The first part is a patient and accurate study of the social state of France for a hundred years, proving the inevitableness of revolution and of its violence alike. The treatment of the Revolution itself is original, and constitutes the strongest attack yet made upon it, the conclusion being much the same as that reached by Burke in his *Reflections*. He cherished as whole-hearted a contempt for the democracy as Carlyle, and, as Lord Acton said, fancied that to show the horrors of the Revolution was a good argument against democracy. His ultimate doctrine was that the wealthy and enlightened should lead the ignorant and those who live from hand to mouth. M. Aulard insisted that though honest, Taine was strongly prejudiced; that his documentary basis was incomplete and inadequate, in spite of his wealth of references; that he was guilty of grave inaccuracies in dealing both with facts and with documents; and that his omissions are as grave as his errors. He failed to realise that there may be two sides to a question, and when inconvenient facts presented themselves, he ignored them or belittled their importance.

See his *Derniers Essais de Critique et d'Histoire* (1895) and his *Carnets de Voyage* (1897); Bourget, *Psychologie Contemporaine* (1887); G. Monod, *Les Maîtres d'Histoire* (1895); studies by Margerie (1894), Giraud (1901), Aulard (1907), and Picard (1909); and his Life and Letters by his widow (Eng. trans. 1902-8).

T'ai-P'ings was the name given by foreigners to the followers of Hung Hsiü-ch'üan (S'eiw-tseuen), who raised the standard of rebellion in China in 1851, the enterprise not being finally suppressed till 1865. Hung was born in 1813 in a poor agricultural village of the district of Hwä, in Canton province. His only chance of rising in the world being by literary distinction, he became a diligent student, but he never succeeded in taking the first degree at the provincial capital. Through his visits to Canton, however, he had obtained a bundle of Christian tracts, and gained, we must believe, some knowledge of foreign missions. Returning home from another disappointing competition in 1837, he fell into a long illness, in which he saw visions, and conceived the idea of changing the religion of the empire, and subverting the ruling Manchü dynasty. When he got better he began to disseminate his new views, and could soon boast of two converts. These were like himself teachers of village schools, who by-and-by lost their pupils and came into angry collision with their neighbours. In 1844, in company with the elder of the two converts, Hung went into the adjacent province of Kwang-hsi, where they made many converts, and gathered them into communities which they called 'Churches of God.' Hung began also to give forth arrangements and decrees as revelations communicated to him by 'the Heavenly Father,' and the 'Heavenly Elder Brother.' The Heavenly Father was 'the Great God,' and the Elder Brother was 'our Lord Jesus Christ.' Meanwhile progress of organisation proceeded. A strictly moral conduct and the keeping of the Sabbath were enjoined on the congregations; all idolatrous practices and the use of opium were forbidden; professors of union from leaders of the Great Triad Society, pledged to the restoration of a native Chinese dynasty, were rejected.

After some years of uncertain struggle with the official authorities, the insurgents (for such they were now) took possession of the district city of Yung-an. There they hailed their leader as emperor of the dynasty of T'ai-P'ing (Grand Peace),

and adopted T'ien Kwo (Kingdom of Heaven) as the name of his reign. He was himself also styled T'ien Wang (Heavenly King), and some half a dozen of his oldest and most trusted followers were appointed by him his lieutenants, with the title of Wang (Kings). After being kept for some time in a state of siege in the city by their opponents, on the night of 7th April 1852 they burst forth, scattered their besiegers, and commenced their march to the north. Their number was only a few thousands, and they had no artillery, but full of enthusiasm they pressed on. We can only account for their success by recognising the unpreparedness and supine cowardice of the imperial officers and their troops. They passed from Kwang-hsi into Hsü-nan, got command of the river Hsiang, and before the end of the year had reached the great Yang-tze River. Launching forth on it, and taking on the way the capitals of Hsü-pei and An-hüi, they encamped before Nanking on the 8th March 1853. Within ten days it had fallen into their power, and every man of the Manchü garrison been put to the sword. Their host, grown in the twelve months from under 10,000 probably to more than 100,000, proclaimed the T'ai-P'ing dynasty anew, and swore fealty to the Heavenly King. In a few months a large force was despatched northwards to terminate the contest by the capture of Peking. This expedition did wonders, traversed the two provinces of An-hüi and Ho-nan, then marched west to Shan-shi, from which, turning east again, it penetrated into Chih-li, and finally occupied an entrenched position only about 20 miles from T'ien-tsin. But the rebellion had there reached the limit of its advance. Though the expedition met with no great defeat, sufficient reinforcements did not reach them, and the leaders were obliged to retreat towards Nanking in 1855.

From this time the rebel cause began to decay. The moral enthusiasm which had distinguished it in Kwang-hsi disappeared. Dissensions arose between the kings, who strove and fought among themselves, and passed from the stage one after another. Hung created new kings to supply their places, but his name had ceased to be a word to conjure with. He secluded himself from public view, and was unable to institute any system of good order or administration in the extensive provinces subject to his control. The promise of Christian institutions died away. The imperial government, moreover, rallied its forces, and a desperate struggle ensued between them and the rebels. Some of the new kings proved to be men of great ability. Sü-chau and Nang-chau, the capitals of Chiang-sü and Chih-chiang, were both reduced and held by them for a time. How the struggle would have ended was still uncertain, when the imperialists began to call in the assistance of foreigners. A body of men of different nationalities entered their service under an American adventurer known to us from his taking this command as General Ward. He was a very capable man, and did the imperialists good service till he was killed in 1862. Then the British authorities at Shanghai were prevailed on to organise a more effective force, and to put the whole auxiliary movement under the direction of Colonel Charles ('Chinese') Gordon (q.v.). The T'ai-P'ings fought with the courage of despair, but they could not long protract the final issue. Nanking was invested by the imperialists, and taken at last on the 19th July 1864. Hung himself, it is supposed, had taken poison a few weeks before, and so escaped capture. His son, a lad of sixteen years, fled under the protection of two of the kings, but they were all three soon taken and executed. What remnants there were of the fighting men made for the south in different bodies, but they gradually melted away,

and were finally extinguished in Canton province in the following year.

See CHINA, and books there cited; Callery and Yvan, *L'Insurrection en Chine* (1853); Meadows, *The Chinese and their Rebellions* (1856); *Pamphlets issued by the Chinese Insurgents*, compiled by Medhurst (Shanghai, 1853); A. Wilson, *Gordon's Chinese Campaign and the Tai-Ping Rebellion* (1868); Wells Williams, *The Middle Kingdom* (1883); A. Egmont Hake, *Events of the Taiping Rebellion* (1892).

Tairen. See DAIREN.

Tait, ARCHIBALD CAMPBELL, Archbishop of Canterbury, was born at Edinburgh, 22d December 1811, and was educated at the Edinburgh Academy and Glasgow University, whence he passed as a Snell exhibitioner to Balliol College, Oxford. In due time he became fellow and tutor, and was one of the four tutors who in 1841 protested against Newman's Tract 90. In 1842 he was appointed successor to Dr Arnold as head-master of Rugby, in 1849 became Dean of Carlisle (where he lost five little girls at once by scarlet fever), and in 1856 Bishop of London, as successor to Blomfield. Here he did much to bring the teaching of the church home to the people, instituting evening sermons in St Paul's, and encouraging open-air preaching; whilst the 'Bishop of London's Fund' for building schools, churches, and parsonages attained by his efforts to the amount of £350,000. A friend of compromise, though a foe to needless innovations, he showed much tact and personal kindness in dealing with various controversies as to vestments and confession; condemned the *Essays and Reviews*, but promoted moderate measures; and though strongly hostile to Colenso's views, intervened to secure him fair-play. The same love of the *via media*, which caused him now to be accused of bigotry and now of indifference, he manifested when (having declined the Archbishopric of York in 1862) he was in 1868 made Primate of all England by Disraeli. He assisted in composing the strifes raised by the question of Irish disestablishment, but was less successful with the Public Worship Regulation Act and the Burials Bill. He took a keen interest in missions, and greatly helped to extend and improve the organisation of the church in the colonies. The Lambeth Conference of 1878 took place under his auspices. He lost in 1878 both his only son, the Rev. Craufurd Tait, and his wife, a daughter of Archdeacon Spooner, whom he had married in 1843; and he himself died 3d December 1882.

See the Life by his son-in-law (Archbishop Davidson) and Canon Benham (2 vols. 1891), and the Memoir of Catharine and Craufurd Tait by Benham (1879).

Tait, PETER GUTHRIE, natural philosopher and mathematician, was born at Dalkeith, 28th April 1831. He was educated at the Edinburgh Academy, at Edinburgh University under Professors Kelland and Forbes, and at St Peter's College, Cambridge. He was senior wrangler and first Smith's prizeman of 1852. In 1854 he was elected professor of Mathematics in Queen's College, Belfast, and in 1860 professor of Natural Philosophy in Edinburgh University. While in Belfast he assisted Dr Andrews in experimental researches into the nature of ozone. Subsequently he was associated with Balfour Stewart in experiments on the heating of a disk rotating in vacuo. His most important experimental work was on thermo-electricity, on the pressure errors of the *Challenger* thermometers, on the effect of pressure on the maximum density point of water, on thermal conductivity, and on impact. To mathematical physics he contributed valuable memoirs on *Mirage*, on the *Kinetic Theory of Gases*, as well as many involving quaternionic treatment—all published in the *Transactions* of the Royal Society of Edinburgh, of which Tait was

general secretary from 1879. In pure mathematics his papers on *Knots* and on *Quaternions* are best known; his *Elementary Treatise on Quaternions* (q.v.) proclaimed him the successor of Hamilton. The *Dynamics of a Particle*, by Tait and Steele (1856), became a standard text-book. With Sir W. Thomson (Lord Kelvin) Tait wrote the famous *Treatise on Natural Philosophy* (vol. i. 1867; new ed. in two parts, 1879). *The Unseen Universe*, by Stewart and Tait, and its sequel, *Paradoxical Philosophy*, interested other than scientific minds. Tait also took part in preparing the biographies of Forbes, Rankine, and Andrews. Other writings were *Lectures on some Recent Advances in Physical Science* (3d ed. 1885) and his text-books on *Light* (2d ed. 1889), *Heat* (2d ed. 1892), and *Properties of Matter* (new ed. 1907); and two volumes of his *Scientific Papers* were published in 1898 and 1900. A tractate upon *Newton and the Laws of Motion* appeared in 1899. Having resigned his professorship in the spring of 1901, he died 4th July. See Professor Carrigill G. Knott's *Life and Scientific Work of Peter Guthrie Tait* (1911).—His son, Lieutenant FRED G. TAIT (1870-1900), the famous golfer, was shot in a reconnaissance near Koodoosberg in South Africa. A Life of him was published in 1910.

Tai-wan, an alternative name for the island of Formosa (q.v.). See TAINAN.

Tajiks, a brachycephalic ('Alpine') Iranian people of Persia and Turkestan. See PERSIA (*Inhabitants*), TURKESTAN.

Taj Mahal. See AGRA.

Tajurra Bay, an inlet of the Gulf of Aden into the African coast, on which is the small town of Tajurra. Around it lies the French Somali Coast Protectorate.

Takin (*Budorcas taxicolor*), a hollow-horned ruminant, seen but very rarely on the borders of Tibet and Assam, resembling a gnu, but smaller.

Takla Makan, the central Asian desert between the Kuenlun and the Tarim. See ASIA.

Takow, a port in SW. Formosa. Its harbour facilities are rapidly being extended, and there is considerable traffic in sugar; pop. 40,000.

Taku, a fortress defending the mouth of the Pei-ho.

Talavera de la Reina, a picturesque town of Spain, on the Tagus, 75 miles SE. of Madrid. Here, on July 27-28, 1809, Sir Arthur Wellesley, with 19,000 men and 34,000 useless Spaniards, defeated 50,000 veteran French troops under Joseph Bonaparte and Marshals Jourdan and Victor. Pop. 13,500.

Talayots, the name given to the numerous prehistoric stone mounds, 26 to 30 feet in height, found on the island of Minorca. They differ from the Nuraghi (q.v.) of Sardinia and the Brochs (q.v.) of Scotland in having—with very few exceptions—no internal chamber. In origin talayots are perhaps connected with the burial of the dead.

Talbot, a kind of dog deriving its name from the family of Talbot, who had a dog in their coat of arms. The talbot seems to have been the same as that called the St Hubert's breed, the oldest of the slow-hounds and perhaps the original stock of the Bloodhound (q.v.).

Talbot, a historic English family, traces its descent from Richard de Talbot, named in *Domesday*, whose descendant, Richard, was made a baron (died 1306). The sixth baron, Sir John Talbot, Lord-lieutenant of Ireland, was the famous champion of English arms in France during Henry VI.'s reign, and is familiar to readers of Shakespeare. The hero of some forty victories, he was checked at Orleans by Joan of Arc, and routed and taken prisoner at Patay (1429). Created Earl of

Shrewsbury (1442), he fell fighting against France in the eightieth year of his age (1453). Some of his successors are dealt with at SHEFFIELD. The twelfth earl held prominent office under William III., Anne, and George I., as Lord-lieutenant of Ireland, and Lord High Treasurer and Lord Chamberlain of Great Britain. He was made Duke of Shrewsbury in 1694; but the dukedom died with him (1718). The senior male line of earls died out in 1856, and, after a disputed succession, the title passed to Henry John Chetwynd, third Earl Talbot, who became eighteenth Earl of Shrewsbury. The Lords Talbot de Malahide are a distinct house, and represent a family settled in Ireland in the days of Henry II.

Talbot, WILLIAM HENRY FOX, celebrated in connection with photography, was born at Lacock Abbey, near Chippenham, on 11th February 1800. He passed from Harrow to Trinity College, Cambridge, where he graduated as twelfth wrangler and obtained the junior Chancellor's Medal in 1821. In the first reformed parliament Talbot sat for Chippenham; but scientific investigation being more to his taste, he gave up politics and devoted himself to the problem of fixing shadows. His principal services to photographic art, which in 1842 secured him a Royal Society medal, are described at PHOTOGRAPHY. Others lay in photographic and 'photoglyphic' engraving. Latterly he devoted himself to the study of general physics and to philological and miscellaneous researches, and was one of the first decipherers of the cuneiform inscriptions from Nineveh. He died at Lacock Abbey, 17th September 1877. His *Pencil of Nature* (1846), one of the first works illustrated by photographs, describes his great invention. Amongst his works are *Hermes, or Classical and Antiquarian Researches* (1838-39); *Legendary Tales* (1830); *Antiquity of the Book of Genesis* (1839); and a work on *English Etymologies* (1846).

Talc, a mineral composed almost entirely of silicate of magnesium, in the proportions of 63·5 silica and 31·7 magnesia, with 4·8 water. Its colours are silvery-white, greenish-white, and green. It has a pearly or semi-metallic lustre, and is unctuous to the touch, in which it differs from mica. It cleaves easily into thin flakes which are transparent and flexible, but not elastic. Its hardness = 1, hence it is readily scratched with the finger-nail. It usually occurs compact and not in good crystalline forms, but belongs either to the rhombic or the monoclinic system. It is also found massive, in beds associated with mica-schists, gneiss, and serpentine. Talc frequently occurs in rocks as an alteration-product, especially of magnesia minerals that contain little or no alumina. Hence it frequently replaces enstatite, augite, hornblende, &c. It is found in Scotland, Tyrol, the Pyrenees, and various parts of the United States, and is or has been used like Mica (q.v.) for stoves and ovens, for slate-pencils, for surfaces exposed to acids, for stoppers of chemical bottles, &c.—A kind called *Indurated Talc*, or *Talc Slate*, has a curved slaty structure, and is not separable into laminae like common talc. It approaches in character to Steatite (q.v.), and is used for similar purposes.

Talca, a town of Chile, on the Claro River, capital of the province of the same name (pop. 134,000), manufactures woollens, and trades in wines, wheat, &c.; pop. 36,000.

Talcahuano, the port of Concepción (q.v.) and principal naval base of Chile; pop. 22,000.

Talchir Beds, a group of strata occurring at the base of the Gondwana series of India. They probably occupy the same geological horizon as the Upper Carboniferous of Europe, but owing to

the rarity or absence of marine fossils their exact correlation with their European equivalents is somewhat uncertain. The beds are remarkable for the occurrence in them of numerous small and large erratics, some of the latter measuring 15 feet in diameter. In the neighbourhood of the Godavari the included blocks of foreign and transported rocks are smoothed, polished, and striated in the same manner as glacial stones. Moreover, the hard Vindhyan limestone which underlies this Talchir boulder-bed is similarly smoothed and scored in long parallel lines.

Talegalla, or BRUSH TURKEY, a name given to several Australasian gallinaceous birds in the same family (Megapodiidae) as the Mound-builders. One of the best known is the Brush Turkey (*Catheturus lathamii*) of eastern Australia, a blackish-brown bird, with pink head and neck, and a bright yellow neck-wattle. It is nearly the size of a female turkey. It frequents thickly-wooded parts, and escapes from dingoes and other enemies by taking refuge in the brush or by ascending trees. It is easily shot. These 'Talegallas' are often seen in small flocks, and they make their mounds together. A mound may be 6 feet high and 14 feet in diameter at the base, and is formed by kicking earth and decayed vegetation backwards. Several females may use the same mound, and the cocks probably assist in the construction. The same mound may be used for several years. In a cup-shaped hollow in the centre the eggs (20 to nearly 40) are placed, small end downwards, in circles and in layers. The heat of the fermenting vegetation favours development; the young bird may leave



Brush Turkey (*Catheturus lathamii*).

the mound twenty-four hours after hatching. The bird has bred in the Zoological Gardens in London, and might perhaps be domesticated for the sake of its palatable flesh and eggs. Nearly related are various species of Talegalla, whose mounds may be 11 feet high and show an internal temperature of 93° Fahr. See MOUND-BIRDS.

Talent (Gr. *talanton*, from a root 'to balance or weigh') was the heaviest unit of weight among the Greeks. The word is used by Homer to signify indifferently a balance and a definite weight of some monetary currency. Silver coin was first struck in Hellas proper in the island of Ægina, and the Æginetan standard was apparently adapted to the Babylonian gold standard. The Babylonian commercial talent seems to have been either 65 lb. 5 oz. or 66 lb. 5½ oz. Derivatives of this (containing 3000 shekels) were in use in Phœnicia and Palestine; but there was another silver talent, and a gold talent worth ⅔ths of the commercial talent. The Euboic talent was of smaller monetary measure and weight than the Æginetan. Its use was mostly confined to Athens, Chalcis, and

the Chalcidian colonies; while the Æginetan prevailed over the rest of the Greek world. About the middle of the 6th century B.C. the Attic standard arose, and it is impossible henceforth to distinguish the history of the Euboic from that of the Attic talent. These several talents were similarly subdivided into 60 minæ, the mina (Gr. *mina*) into 100 drachmæ, and the drachma into 6 oboli; and their relative proportions are Æginetan talent : Euboic talent : Attic talent :: 39 : 26 : 27, the weight of the first being 83½ lb. avoird., of the second 55½ lb., and of the third 57½ lb. Besides the Attic talent there were other talents in use at Athens for weighing various articles. One of these was the Commercial or Emporic, which was identical with the Æginetan standard for coins and corresponded in use to our weight avoirdupois, being the ordinary weight in use in the market.

Talfourd, SIR THOMAS NOON, was born at Reading, 26th May 1795. The son of a Reading brewer, he was educated at the grammar-school there under Dr Valpy, and in 1821 was called to the bar at the Middle Temple. He became a serjeant-at-law (1833), Whig member for Reading (1835-41 and 1847-49), and a justice of Common Pleas (1849), at the same time being knighted. He died of apoplexy during Stafford assizes, 13th March 1854. Talfourd is remembered by his four nearly forgotten tragedies, of which *Ion* (1835) was brought out by Macready at Covent Garden; by his Copyright Act (see COPYRIGHT) of 1842; and by his writings on Charles Lamb.

Taliacotius. See RHINOPLASTIC OPERATIONS.

Tal-lien-wan. See DAIREN.

Taliesin, or TALIessin, a 6th-century Welsh bard, perhaps wholly mythical, to whom much poetry of later periods, preserved in the 14th-century *Book of Taliessin*, has been attributed.

Talio. See CRIMINAL LAW.

Talipat, Talipot. See PALM.

Talisman (through Spanish from Arabic, from the Gr. *telesma*, 'mystery,' 'initiation'), a species of charm, consisting of a figure engraved on metal or stone when two planets are in conjunction, or when a star is at its culminating point, and supposed to exert some protective influence over the wearer of it. The terms Talisman and Amulet (q.v.) are often considered nearly synonymous, but the proper distinctive peculiarity of the former is its astrological character. Talismanic virtues have often been attributed to a peculiarly marked or formed egg, and instances are recorded, by various authors, of eggs hatched with figures of comets or eclipses on them. Talismans which acquired considerable celebrity were the Abraxas Stones (q.v.). Another historic talisman is the Lee-penny, a heart-shaped, dark red jewel, now set in a shilling of Edward I., with a silver chain and ring attached, supposed to have been obtained in Spain by Sir Simon Lockhart, who set out with Sir James Douglas to bear Bruce's heart to the Holy Land. So late as 1824 water in which it had been dipped was used to cure cattle bitten by a mad dog. A species of talisman at present in use in Asia is a piece of paper on which the names of the Seven Sleepers and their dog Kitmer are inscribed. Pasted on the walls of houses, it is believed to be a protection against ghosts and demons. The Phylactery (q.v.) was a common talisman; and in Christian Byzantium phylacteries were made bearing the figure of Solomon, the compeller of demons. See ABRACADABRA, ASTROLOGY, DIVINATION, EDENHALL, EVIL EYE, INCANTATION.

Tallage, a tax to which, under the Anglo-Norman kings, the demesne lands of the crown and all royal towns were subject.

Tallahassee, the capital of Florida, 166 miles by rail W. of Jacksonville, has a capitol and several colleges; it has wagon and canning industries, and is the centre of an agricultural district, in which the vine is largely cultivated; pop. 6400.

Tallart, or TALLARD, CAMILLE, COMTE DE (1652-1728), served with distinction in the wars from 1670 on, under Condé and Turenne, commanded a corps d'armée in the War of the Spanish Succession, and, a marshal of France, was defeated by Marlborough at Blenheim (q.v.).

Tallemant des Réaux, GÉDÉON (1619-92), the Brantôme of his century, was born at La Rochelle, studied law, and married his cousin Elisabeth Rambouillet, daughter of a wealthy farmer of revenues; and having bought the seignorial estate of Plessis-Rideau in Touraine, changed its name to Des Réaux. His famous work, the *Historiettes*, written in 1657-59, is invaluable as a complete picture of the society of his time; the most finished group of these portraits in miniature, that of the famous circle of the Hôtel de Rambouillet, without doubt coloured the style and tone of Tallemant. He takes a malignant pleasure in setting forth the vices of the great, and shows a relish for a scandalous story. His short characters, as printed by Monmerqué, are 376 in number, in no case finished biographies, rather collections of illustrative anecdotes, throwing strong light from behind the scenes on the leading figures of three-quarters of a century. And still more, those portraits may generally be accepted as sound and truthful, if some allowance is made for the natural maliciousness and personal prejudices of the writer.—His brother, the Abbé Tallemant (1620-93), was a man of wit and an academician, but his *Vies de Plutarque* (1663) brought him little credit.—His cousin, Paul Tallemant (1642-1712), early began to scribble verses, at eighteen wrote his *Voyage de l'Île d'Amour*, an ingenious commentary on Mlle. de Scudéry's famous 'Carte de Tendre,' and entered the Academy in 1666.

The *Historiettes* of Tallemant des Réaux were first published, from the MSS. of the author, by Monmerqué, de Châteaugiron, and Taschereau (1834); a second edition was by Monmerqué (1840); and a third by Paulin Paris (1872). See Life by Magne (1921-22).

Talleyrand de Périgord, CHARLES MAURICE, Prince de Bénévent, the most inscrutable and resolutely self-regarding of modern politicians, was born at Paris on 2d February 1754. His father, Charles Daniel, Comte Talleyrand de Périgord (1734-88), was an officer in the army of Louis XV. during the Seven Years' War. An accident early in life, followed by an act of legal injustice, seems to have had a determining influence—for evil and not for good—on Talleyrand's character and career. By this accident he was lamed for life, and, in consequence, his rights of primogeniture were transferred to a younger brother, while he himself was, to his regret, educated not for the army but for the church. He threw himself, however, at the Collège d'Harcourt, at the Séminaire de St Sulpice, and at the Sorbonne, which he subsequently attended in succession, into the work of gratifying his ambition. He made himself a fair scholar, and cultivated the character of a rake and a cynical wit. His promotion, considering his well-known immorality, was rapid. He obtained the abbacy of St Denis in 1775, and five years later he was appointed *agent-général* to the French clergy; finally, Louis XVI. appointed him Bishop of Autun in 1789. Meanwhile he had been watching the signs of the times in France, and carefully studying politics. In 1789 the clergy of his diocese elected him to represent them in the States-general; and on this occasion he delivered a

speech which at once stamped him as a political leader. He now became an authority on constitutional, financial, and educational questions, and the friend of men of such widely different gifts as Mirabeau, Sieyès, and Lally-Tollendal. He was one of the members of Assembly who were selected to draw up the Declaration of Right. He took a cynical delight in attacking the profession to which he still nominally belonged. It was he who in 1789 proposed the measure for the confiscation of the landed property of the church. He had rightly calculated that nothing could make him more popular with the rank and file of the revolutionaries in the Assembly; and on the 13th February was elected its president for the usual period. In November he took the oath to the new constitution, and in the beginning of 1791 he consecrated two new bishops—those of Aisne and Finistère—declaring at the same time his sincere attachment to the holy see. It was now, however, open war between it and Talleyrand. In April he was excommunicated by the pope; he retaliated by giving up the clerical career altogether. About this time he was appointed director of the department of Paris in succession to Mirabeau. His most remarkable achievement, however, as a member of the National Assembly was his preparation of a report upon public instruction. This document was greatly in advance of the times, and was undoubtedly the model followed in all the great changes that subsequently took place, when France reorganised her educational system.

Talleyrand, although a favourite in Paris, had never been in sympathy with the fiercer spirits of the Revolution, and indeed was at heart a believer not in the Republic but in a constitutional monarchy. He was heartily glad, therefore, to leave France for London on an unofficial diplomatic mission early in 1792, and did his best to reconcile Pitt to his country, but failed. In December of the same year his connection with the Revolution was brought to a close by his being placed on the list of *émigrés*. He remained in exile in London till the end of January 1794, when he was compelled to leave under the provisions of the Alien Act. He had made many friends in London, and Lord Lansdowne having given him an introduction to Washington, he sailed for the United States. After the fall of Robespierre the sentence of proscription on him was recalled, and he returned to Paris in 1795. He attached himself to the party of Barras, and in 1797 he was called by the public opinion of the country to the post of foreign minister under the Directory.

Talleyrand was for a time the first man in France, Barras being simply his tool. But he had already recognised the genius of Bonaparte, and established intimate relations with him. For a short period, however, he was in disgrace, the fact having been revealed that he had indicated his willingness to sell his services in connection with the conclusion of a treaty between Great Britain and the United States for money. But on the establishment of the Consulate he was restored to his former position as foreign minister, and for many years was closely associated with the fortunes of Napoleon. He had no genuine love for his master, but simply made him a means towards his own aggrandisement and enrichment. Gambling was his chief pleasure, and laid the foundation for an enormous fortune. Among the more odious of the acts of Napoleon with which Talleyrand will always be associated are the kidnapping and murder (March 1804) of the Duc d'Enghien. It is virtually beyond doubt that it was by his instructions that the crime was consummated in spite of the vehement opposition of Josephine, whose opposition led her to denounce him as a *maudit boiteux*.

He was greatly instrumental in consolidating the power of Napoleon first (1802) as consul for life and then (1804) as emperor. When in the following year Great Britain, dreading a French invasion, formed a powerful European coalition against France, it was by the ingenuity of Talleyrand that it was partially broken up. To him as much as to Napoleon was owing the organisation in 1806 of the Confederation of the Rhine. Napoleon and he were thoroughly at one as regards the foreign policy of France till the conclusion of the peace of Tilsit in July 1807. After his creation as a prince of the empire under the title of Prince de Bénévent, he withdrew from the Ministry. The failure of Napoleon's designs in Spain was, however, the occasion of the first real rupture between him and Talleyrand.

Although Talleyrand was an advocate of the Austrian marriage, his voice was on the whole for a policy of wisdom during the later years of the first empire. In particular he was opposed to the invasion of Russia; and this gives some justification for his desertion of Napoleon in 1814. That desertion was complete and, from his own point of view, successful. He became the leader of the anti-Napoleonic faction; and through him communications were opened both with the allies and with the Bourbons. He dictated to the Senate the terms of Napoleon's deposition; and he became minister of foreign affairs under Louis XVIII., whom, indeed, he had placed on the throne. In his country's distress Talleyrand was now as much its good genius as was Thiers at a later and even darker period of its history. He negotiated the treaties by which the allies left France in possession of the boundaries which had been established in 1792, and in the congress which met in Vienna in September he successfully vindicated her rights to be heard in the readjustment of European arrangements. He had not calculated on the Hundred Days, however, and offered no help to Louis, who, on Napoleon's escape from Elba, had retired to Ghent. Yet the allied powers insisted on his being taken back into royal favour, and after the second restoration he became prime-minister. He remained in office, though, only for a short time, as he found himself the reverse of a *persona grata* to the king, and disliked by all existing parties in France.

During the reigns of Louis XVIII. and Charles X. Talleyrand was little better than a discontented senator who never lost an opportunity of injuring the court and the government, although it is possible that his protest in 1823 against the Spanish war was animated by genuine regard for his country's interests. During the July revolution he was Louis-Philippe's chief adviser. The citizen king offered him the post of foreign minister, but he declined it. He went to London as ambassador, and was well received there. He reconciled the British ministry and court to France, and returned in triumph to Paris, and finally retired into private life in 1834, and died at Paris on 17th May 1838, at the age of eighty-four.

'A man living in falsehood and on falsehood; yet not what you can call a false man' is Carlyle's view of Talleyrand. 'That rather middling bishop but very eminent knave' is De Quincey's. Both views have been widely entertained; but Talleyrand is a puzzle—more of a puzzle since the publication of his *Memoirs* than he was even before. That he was shamelessly corrupt, immoral, selfish, and mendacious is beyond doubt. Nor was he a wise statesman in the modern sense; the amelioration of human society never entered into his calculations as an object to be aimed at. But he was amazingly clever, infinitely dexterous, and an admirable judge of men, and in his tortuous

diplomacy he generally considered and sought his country's advantage as well as his own.

The Talleyrand *Memoirs*, published in 1891 by the Duc de Broglie, and translated by Mrs A. Hall, are disappointing and unreliable, even if they were not tinkered by Bacourt, Talleyrand's literary executor, or, as Augustin Thierry maintains (*Les Grandes Mystifications*, 1911), written by the Baron de Lamoignon-Langon. For his public career see the works of Mignet, Bastide, and Louis Blanc, the Lamartine, Guizot, and Rovigo *Memoirs*, Sir Henry Lytton Bulwer's *Historical Characters*, Sainte-Beuve's lectures, Pullain's *Correspondence between Talleyrand and Louis XVIII.*, and the Lives by Lacombe (trans. 1910) and Loliée (trans. 1912). Michaud's *Histoire politique et privée* (1853) and Pichot's *Souvenirs Intimes sur M. de Talleyrand* (1870) are partisan pamphlets; McCabe's *Talleyrand* (1906) is also eminently apologetic.

Tallien, JEAN LAMBERT, was born the son of a butler at Paris, 23d January 1767, and was first a lawyer's clerk, next employed in a printing-office, and made himself famous in the first months of 1791 by his Jacobin broad-sheet, *L'Ami des Citoyens*. He was conspicuous in the attack on the Tuileries (10th August), and became secretary to the Commune Insurrectionelle. He had his share in the infamous September massacres, and was elected by Seine-et-Oise to the Convention, where he was one of the most intemperate among the Jacobins, voted for the death of the king, was elected to the Committee of General Security, and played a part in the downfall of the Girondists (June 2). In September he went on his memorable mission to Bordeaux, where he extinguished all opposition under the guillotine, and disgraced himself by shameful profligacy. But a passion for one of his victims, the lovely Comtesse Thérèse de Fontenay (1775-1835), the daughter of the Spanish banker Cabarrus, was said to have changed his nature, and earned for her the title of 'our Lady of Pity.' He was recalled, but in 1794 was chosen president of the Convention. Robespierre hated his insincerity and immorality, and Tallien, recognising his danger, took an active part in the successful attack (really engineered by Fouché) upon the Dictator on the 9th Thermidor. Tallien, now for a moment one of the most influential men in France, lent his aid to suppress the Revolutionary Tribunal and the Jacobin Club, and drew up the accusations against Carrier, Le Bon, and others of the Terrorists; but his importance ended with the Convention, and soon after the frail Thérèse, who had married him in December 1794 and reigned awhile the social queen of Paris, deserted him for a wealthy banker. Bonaparte carried him to Egypt, and for some time he edited the official *Décade égyptienne* at Cairo. On the voyage homeward he was captured by an English cruiser, and brought to England, where the Whig Opposition were stupid enough to make a hero of him (1801). Later he was through Fouché and by Talleyrand sent as consul to Alicante. He died in poverty at Paris, 16th November 1820.

In his *Life of Madame Tallien* (trans. 1913), Gastine has stripped the romance from the story of the 'lion amoureux' and the 'lady of pity,' and proved him a contemptible adventurer and robber, and her a grasping courtesan.

Tallis, THOMAS, 'the father of English cathedral music,' was born about 1510, held the post of organist of Waltham Abbey till the Abbey was dissolved, and after 1540 was attached to the Chapel Royal. In Day's Psalter (1560) there appear eight tunes composed by Tallis, one of these being still used to Ken's evening hymn. In 1575-76 letters-patent were granted to Tallis and William Byrd (q.v.) according to them 'the exclusive privilege of printing music and ruled music paper for twenty-one years.' The first work printed under this patent was issued in 1575,

entitled, '*Cantiones quæ ab argumento Sacre vocantur, quinque et sex partium*,' containing sixteen motets by Tallis and eighteen by Byrd. Tallis died on 23d November 1585, and was buried in the chancel of Greenwich parish church, with an epitaph in verse, which was afterwards set to music by Dr Cooke as a glee. Tallis, besides writing a large number of anthems, pieces, responses, and Te Deums (a complete list of which appears in Grove's *Dictionary of Music*), was the author of a celebrated work—'Song of the Forty Parts,' composed for eight choirs of five voices each. Tallis, it has been well said, was 'one of the greatest contrapuntists of the English school. His works are invested with great learning and much dignity, and are highly calculated to impress by their solemnity and power.'

Tallow. See FATS, OILS, LUBRICANTS, MINERAL TALLOW.

Tallow-tree, the name given to trees of different kinds which produce a thick oil or vegetable tallow, or a somewhat resinous substance, which, like tallow, is capable of being used for making candles. The tallow-tree of Malabar (*Vateria indica*) is a very large tree of the family Dipterocarpaceæ (see COPAL). The tallow-tree of China (*Sapium sebiferum* or *Stillingia sebifera*) belongs to the family Euphorbiaceæ. It has been naturalised in India, the West Indies, and in some parts of the southern United States. The capsules are internally divided into three cells, each containing a nearly hemispherical seed, which is covered with a beautifully white vegetable tallow. For the manufacture of candles the capsules and seeds are crushed and boiled, and the fat skimmed off in a melted state. To improve the consistency, wax or linseed-oil is added. The leaves are used in dyeing. The tallow-tree or butter-tree of West Africa (*Pentadesma butyracea*) is of the Guttiferæ. The name tallow-tree is sometimes given in North America to a species of Candleberry (q.v.).

Tally (Fr. *tailler*, 'to cut'), the name given to the notched sticks which, till the beginning of the 19th century, were used in England for keeping accounts in Exchequer, answering the double purpose of receipts and public records. They were well-seasoned rods of hazel or willow, inscribed on one side with notches indicating the sum for which the tally was an acknowledgment, and on two opposite sides with the same sum in Roman characters, along with the name of the payer and the date of the transaction. Different kinds of notches, differing in breadth, stood for a penny, a shilling, a pound, £20, £100, £1000. The tally was cleft through the middle by the deputy-chamberlain with knife and mallet, so that each piece contained one of the written sides, and a half of every notch; and one half was retained by the payer as his receipt, while the other was preserved in Exchequer. At the union of England and Scotland a store of hazel rods for tallies was sent to Edinburgh, but never made use of. An act of George III. (1783) decreed the discontinuance of tallies in Exchequer, but some use was made of them till 1812; the old tallies were ordered to be destroyed in 1834; and the overheating of the stove within the precincts of the House of Lords in which the tallies were burned caused the conflagration in which the old Houses of Parliament were destroyed.

Tally System is the name given to a mode of dealing by which dealers furnish certain articles on credit to their customers upon an agreement for the payment of the stipulated price by certain weekly or monthly instalments. This petty credit system of dealing is carried on chiefly in London and other large towns, in stores or shops known as tally-shops. Both seller and purchaser keep

books in which the circumstances of the transaction and the payment of the several instalments are entered, and which serve as a tally and counter-tally. The prices charged under this system are usually exorbitant, and the goods sold, which principally consist of wearing apparel and cheap finery, furniture, hardware, and other household goods, are generally very inferior in quality.

Talma, FRANÇOIS JOSEPH, an eminent French tragedian, was the son of a dentist, and was born at Paris, 15th January 1763. He made a creditable début in 1787 at the Comédie Française as Séide in *Mahomet*, but the occasion of his first great success was his innovation in costume when playing Proculus in the tragedy of *Brutus*. Previously actors had worn the garb of their own country and even their own time. Talma appeared in a Roman toga. 'Look at Talma,' said a member of the company; 'how ridiculous he is! He has quite the air of an ancient statue!' a compliment as exquisite as it was unintentional. Henceforth Talma, aided by the counsels of the painter David, made a point of rigorous accuracy in costume; and his own remarkably handsome figure, fine voice, and perfect elocution, together with that matchless ease of movement which came after much labour, combined to fit him for the highest tragic rôles. But it was not till 4th November 1789, when he played Charles IX. in Chénier's play, that he rose to his full height in popular estimation. In 1791 he quarrelled with his associates, and with some other dissentients founded the Théâtre Français de la rue de Richelieu—the name changed next year to Théâtre de la République. Here he reigned throughout the Revolution in such characters as Othello; Nero in *Epicharis et Néron*; and Ægistheus in *Agamemnon*. Some of his later characters were among his best; Leicester in *Marie Stuart*; Sylla; Orestes; Leonidas; and Charles VI. Talma died 19th October 1826. See *Mémoires sur Talma*, by Moreau (1826), and his Autobiography, edited by A. Dumas (4 vols. 1849-50).

Talmage, THOMAS DE WITT, pulpit orator, was born at Bound Brook, New Jersey, 7th January 1832, and after holding several charges, from 1869 to 1894 he was pastor of an important Presbyterian church in Brooklyn. He died 13th April 1902. His sermons were translated into many tongues; and a long series of them were issued under fantastic titles.

Talmud (from Heb. *lamad*, 'to learn'; i.e. 'The Study') is the name of the fundamental code of the Jewish civil and canonical law, comprising the Mishna and the Gemara, the former as the text, the latter as the commentary and complement. This 'Oral' or Post-mosaic Code was of gradual development; it is generally recognised that there were older collections upon which the Mishna was framed before being finally redacted in the form in which we now possess it. The oldest codification of *Halachoth*, or single ordinances, is due to the school of Hillel (q.v.). Simon, son of Gamaliel II. and great-grandson of Gamaliel I., mentioned in the New Testament, and his school carefully sifted the material thus brought together. He died 166 A.D. His son Jehudah Hannasi, commonly called Rabbi, who died 219, and his disciples brought the work to its close in six portions (*Sedarim*), 63 treatises (*Masichtoth*), and 524 chapters (*Perakim*), which contain the single Mishnas. But besides this authoritatively compiled code there were a number of other law collections, partly anterior to it, and not fully embodied in it, partly arising out of it—as supplements, complements, bylaws, and the like—partly portions of the ancient Midrash, partly either private text-books composed by the masters of the academies

for their lectures or enlargements of the existing Mishna. All this additional legal material was collected, not rarely together with the dissensions which begot it, under the name of *Baraitoth*, 'foreign,' 'external,' by Chaiya and his school, in the succeeding generation. Not to be confounded with them, however, are the collections of *Toseftas* 'supplements,' or *Great Mishnas*, which, commenced at the time of Jehudah Hannasi himself, and continued after his death by his scholar Chaiya and Hoshaiya, embody much of what has been purposely left out in the concise Mishna, which only embraced the final dicta and decisions. Such 'additions' we possess now to 52 treatises, forming together 383 *Perakim* or chapters. All these different sources of the 'Oral Law'—finally redacted before the end of the 3d century, though probably not committed to writing until 550 A.D.—belong to the period of from about 30 B.C. to about 250 A.D. This great mass of legal matter, although apparently calculated to provide for every case, if not for all times, was yet found insufficient. The dicta of later masters, the decisions of the courts, the discussions on the meaning and purport of special traditions, the attempts at reconciling apparent contradictions in the received material, the amplifications or modifications of certain injunctions rendered necessary by the shifting wants and conditions of the commonwealth—all these and a number of other circumstances made a further codification peremptory.

We must not omit to state here that this Mishna (*Mathnithin*), although it contained nothing but what were indigenous laws and institutions, was yet not a little influenced—if the very fact of its redaction was not indeed caused—by the spirit of the times. At Berytus, at Alexandria, at Rome the legal schools were then in their most vigorous stage of development, and everywhere system and method were being introduced into what till then had been a vast complex of traditional and popular institutions, decrees, and decisions. The Mishna in all respects fulfilled the conditions reasonably to be demanded from such a text-book as it was intended to form; it was clear, concise, complete, and systematic, and moreover composed in as classical a Hebrew as still could be written in those days of decadence of the 'sacred language.'

The further development of this supplementary, oral, or second law—in fact rather an exegesis thereof—together with the discussions raised by apparent contradictions found in the individual enactments of the Mishnic doctors, is called Gemara—i.e. Discussion, Complement, or, according to another explanation, Doctrine. This Gemara contains, apart from the *Halacha*, which is generally written in Aramaic, also a vast number of non-legal, chiefly Hebrew, fragments—homiletic matter, tales, legends, and the like—called *Haggada*.

There are two Talmuds, the one called the Talmud of the Occidentals, or the 'Jerusalem' (Palestine) Talmud, which was closed at Tiberias, and the other the 'Babylonian' Talmud. The first of these now extends over thirty-nine treatises of the Mishna only, although it once existed to the whole of the first five *Sedarim* or portions. It originated in Tiberias in the school of Johanan, who died 279 A.D. Its final redaction probably belongs to the end of the 4th century; but the individual academies and masters through whom it received its completion cannot now be fixed with any degree of certainty. There is less discussion and more precision of expression in this than in the second or Babylonian Talmud, emphatically styled 'our Talmud,' which was not completed until the end of the 5th century, and which makes use of the former. As the real editor of the Baby-

Ionian Talmud is to be considered Rabbi Ashe, president of the academy of Sora in Babylonia (352-427 A.D.). Both the Mishna and the Palestine Gemara had, notwithstanding the brief period that had elapsed since their redaction, suffered greatly, partly by corruptions that had crept into their (unwritten) text through faulty traditions, partly through the new decisions arrived at independently in the different younger schools—of which there flourished many in different parts of the Dispersion—and which were at times contradictory to those arrived at under different circumstances in former academies. To put an end to these disputes and the general confusion arising out of them, which threatened to end in sheer chaos, Rabbi Ashe, aided by his disciple and friend Abina or Rabina I. (abbr. from Rab Abina), commenced the cyclopean task of collecting anew the enormous mass of Halachistic material which by that time had grown up. The method he pursued was simple enough. His disciples met twice a year at Sora, in spring and in autumn. At the spring gathering he gave out all the paragraphs of one treatise; and the disciples had the task to find out until the autumn meeting what opinions the different schools had pronounced on the special points thereof. He then investigated the whole critically, and put it into shape according to a certain order. This process took him, with the assistance of ten secretaries, no less than thirty years; and many years were spent by him in the revision of the work, with which he proceeded in the same manner as he had done with the compilation itself. The final close of the work, however, is greatly due to Rab Abina II., head of the Sora academy (473-499). He was the last of the Amoraim expounders, who used merely oral tradition. After them came the *Saboraim*, the reflecting, examining, critical, the real completers of the Babylonian Talmud, and by many in ancient and modern times declared to have first reduced Mishna and Talmud to writing.

The Babylonian Talmud, as now extant, comprises the Gemara to almost all tractates of *Sederim* ii.-v. There is also Gemara to the first treatise of the first, and to the first of the last order. The rest, if it ever existed, which is very doubtful, is now lost. The whole work is about four times as large as the Jerusalem one, and its thirty-six treatises, with the commentaries generally added to them in our editions (Rashi and *Tosafoth*), fill 2947 folio leaves. The language of the Talmud is, as we said, Aramaic (Western and Eastern), closely approaching to Syriac. The minor idiomatic differences between the two are easily accounted for by differences of time and place; but the additional matter—quotations and fragments from older Midrash and Gemara collections, *Haggada*, &c.—is, as before stated, principally written in Hebrew.

The masters of the Mishna (*Tannaim*) and of the Gemara (*Amoraim*) were followed by the *Saboraim* (see above). The code of the oral law had come to a close with the second named; and not its development, but rather its proper study, elucidation, and carrying into practice was the task of the generations of the learned that followed. Apart from this, the Aramaic language itself began to die out as the popular language, and required a further study. The *Saboraim* no longer dared to contradict, but only opined on the meaning and practicability of certain enactments, and undertook the task of inculcating and popularising the teachings laid down by their sires; apart from bestowing proper care upon the purity of the text itself, and adding some indispensable glosses. Their activity was at its height in the 8th century, when Karaism (see *JEWS: Religion*), which utterly denied the authority of the Talmud, sprang

into existence. Respecting, however, this authority of the Talmud itself, there has never been anything approaching to a canonicity of the code, or to a reception of it as a binding law-book by the whole nation. The great consideration in which it was always held is owing partly to its intrinsic value, and to the fact of its becoming the basis of all further development of Jewish literature (it being undeniably the most trustworthy receptacle of the traditional Jewish law), and partly to the persecution of the Jews in the Persian empire at the time of Yezdigerd II., Firuz, and Kobad I. (438-531), who closed the schools and academies for a space of nearly eighty years, during which this book was the sole authoritative guide of public conscience, and remained endowed with its importance even when the schools were restored. The best commentaries of the Mishna are by Maimonides and Bartenora; of the Babylonian Talmud by Rashi (q.v.) and the Tosafists of France and Germany. An abstract of the Talmud for practical legal purposes by Maimonides (q.v.) is called *Mishneh Torah*. The Mishna was first printed at Naples, 1492; the Talmud of Jerusalem at Venice, by D. Bomberg, 1523. The entire Babylonian Talmud was first published at Venice by him in 1520. Previously Gershom Soncino had printed twenty-three separate treatises (1488-1519) at Pesaro and Soncino. It is generally printed in twelve folios, the text on the single pages being kept uniform with the previous editions, to facilitate the references. For translations of the Gemara see the bibliography below. The complete Mishna has been translated repeatedly into Latin, German, Spanish, &c., by Surenhusius, Rabe, Jost, and others. We must refrain in this place from attempting a general characterisation of the Talmud, a work completely *sui generis*, which is assuredly one of the most important records of humanity. Nothing can give even an approximate idea of the immensity of material, historical, geographical, philological, poetical, that lies hidden in its mounds. A contribution to the records of fanaticism may also be found in the 'exoteric' history of the Talmud, which was, albeit utterly unknown save by a few garbled extracts, prohibited, confiscated, burned, and generally prosecuted and inveighed against by emperors, popes, theologians, and fanatics generally, from Justinian down almost to our own day, as perhaps no other book has ever been. In our own times, however, its value begins to be recognised by great scholars, not merely as the only source of the knowledge of Judaism, but as the chief source—next to the gospels—even for the history of the origin and early days of Christianity; a notion long ago hinted at by eminent divines like Lightfoot and others.

See also *JEWS, MISHNA, EXEGESIS*, and an essay in the *Literary Remains* of Em. Deutsch, original author of the above article. Moïse Schwab has translated the Jerusalem Talmud into French (Paris, 1871; retranslated into English). The Babylonian Talmud has been translated or adapted by J. M. Rabinowicz in his *Législation Criminelle du Talmud* (Paris, 1871), and *Législation Civile du Talmud* (5 vols. Paris, 1877); Aug. Wünsche, *Der Jer. Talmud in seinen haggadischen Bestandtheilen ins Deutsch übers.* (Zurich, 1880), and *Der Bab. Talmud in seinen haggadischen Bestandtheilen* (Leip. 1886); N. Brüll, *Die Entstehungsgeschichte d. Bab. Talmud*, in *Jahrbücher f. Jüd. Gesch. u. Lit.* ii. (1876); Z. Frankel, *Introductio in Talmud Hierosol.* (Breslau, 1870); W. Bacher, *Die Agada d. Palästinensischen Amoräer* (Strasb. 1892); Jastrow, *Dictionary of the Targumim and the Talmud* (Lond. 1887-92); J. Levy, *Neuhebr. . . Wörterb. . . u. d. Talm. . .* (Leipzig, 1876). A supplement was issued by L. Goldschmidt (Berlin, 1924). The recent anastatic reprints of Levy and Jastrow are, in many cases, hard to read. The student is advised to obtain the old editions. M. L. Rodkinson's abridged English trans. (New York, 1896-) is not so useful as

the German version (with critical text and notes) of L. Goldschmidt (Berlin, 1897-). A number of separate tractates have been translated (see p. 301 of S. Levy's *Jewish Year Book* Lond. 1927). J. H. Lowe's *Tutorial Preparation* (Lond. 1926) is for self-instruction.

The following articles and bibliographies are of great importance: W. Bacher (*Jew. Ency.*, xi. 1); M. Richtman (*ib.* 27); J. Z. Lauterbach (*ib.* 30); L. Blau (*ib.* 33); S. A. Cook (*Ency. Brit.*, xxvi. 380); I. Abrahams (Hastings's *E.R.E.*, xii. 185: this article is of great value for its appraisal of the Talmud as a factor in life); 'Permanent value of the Talm.' in his *Permanent Values* (Oxf. 1924, p. 67); ch. iii. in his *Short Hist. of Jew. Lit.* (Lond. 1906; see also select bibliography on p. 27); S. Schechter (Hastings's *Dict. Bible*, 1904, v. 57); 'Hist. of Jew. Trad.' in his *Studies in Jud.* (Lond. 1896, I. ser. i. 222); 'On the Study of the Talm.' (Philad. 1908, *ib.* ser. ii. 102); P. Fiebig (*Relig. in Gesch. u. Gegenwart* Tüb. 1913, iv. 388); H. L. Strack (*New Schaff-Herzog* New York, 1903, xi. 255); F. Schühlein (*Cath. Ency.*, xiv. 435; various printer's errors).

The following introductions may be noted: H. L. Strack, *Einleitung in d. Talm.* (Leipzig, 1894, and later editions); M. Mielziner, *Introd. to the Talm.* (New York, 1925); S. Funk, *D. Entstehung d. Talm.* (Leipzig, 1910); M. Braunschweiger, *D. Lehrer d. Mischnah* (Frankfort on the M. 1903).

Talpidæ. See MOLE.

Talus, a term employed in Geology to designate the sloping heap which accumulates at the base of a rock or precipice, from fragments broken off by the weather, or materials in any way carried over it. The term is also applied to the slope of a wall which diminishes in thickness as it rises.

Tamaqua, a borough of Pennsylvania, on the Tamaqua or Little Schuylkill River, 134 miles by rail W. of New York. It has an extensive coal-mining industry, foundries, flour and powder mills. Pop. 14,000.

Tamar, a river which for 45 miles is the boundary between Devon and Cornwall; its estuary in Plymouth Sound is called the Hamoaze.

Tamarack. See LARCH.

Tamarind, a beautiful tree of the family Leguminosæ, sub-family Cæsalpinioidæ, a native of the East Indies, but now very generally cultivated in warm climates. Only one species is known (*Tamarindus indica*), a spreading tree 30 or 40 feet high,

with alternate pinnate leaves, which have from twelve to fifteen pair of small leaflets, and fragrant flowers, with three petals, the pods brown and many-seeded, as thick as a man's finger, and about 6 inches long. There are two varieties, the East Indian and the West Indian, the former having long pods containing from six to twelve seeds, the latter short pods with from one to four seeds. The pods are filled with a pleasant, acidulous, sweet, reddish-black pulp, in which the seeds are imbedded. West Indian tamarinds are usually imported preserved in syrup, the outer shell having been removed. The wood of the tamarind-tree, and especially of its roots, is a cabinet wood of much beauty, but of extreme



Tamarind (*Tamarindus indica*),
branch in flower:
a, seed-pod section.

hardness, so that it is wrought with difficulty. The pods of some other trees of genera allied to *Tamarindus* are filled with a similar pulp, which is used in the same way, as the Tamarind Plum of India (*Dialium indicum*), and the Brown and Velvet Tamarinds of Sierra Leone.

Tamarind pulp contains citric, tartaric, and malic acids, potash, sugar, vegetable jelly, &c. It is refrigerant and gently laxative, and, in combination with more active remedies, is often employed in the diseases of children. A kind of sherbet is also formed from it; and it is an excellent addition to curries. Cold tamarind tea, made by infusing tamarinds in boiling water, forms an agreeable and cooling drink.

Tamarisk (*Tamarix*), a genus of Tamaricaceæ. The plants of this family inhabit the warmer parts of Europe and Asia, and of Africa, generally growing in arid situations. Some of them are herbaceous, others are shrubs or small trees, with rod-like branches, scale-like leaves, and small flowers in close spikes or racemes. The Common Tamarisk (*T. gallica*) grows in sandy places in the countries near the Mediterranean, and has been naturalised in some places on the southern coasts of England. It sometimes attains a height of 30 feet. The ashes of this and some other species of the genus contain much sulphate of soda. The Oriental Tamarisk (*T. articulata*) is one of the few trees to be seen in the Arabian and African deserts, where its leafless appearance accords with the surrounding desolation. Galls are found on some species in India, and are valued both for medicinal use and for dyeing. *T. mannifera* yields a kind of Manna (q.v.). The German Tamarisk (*Myricaria germanica*), belonging to another genus of this family, is a smaller shrub than the common tamarisk, and abounds in many parts of Europe and Asia.



Common Tamarisk (*Tamarix gallica*):
a, a flower.

Tamatave, a fortified port and important trading town of Madagascar, on the east coast, on a bay surrounded with reefs, with a good anchorage. Pop. 13,000.

Tamaulipas, the northernmost of the Gulf states of Mexico (q.v.), with part of its low coast bordered by the southern Laguna del Madre. Pop. 288,000. Capital, Victoria (pop. 18,000).

Tamayo y Baus, MANUEL (1829-98), Spanish dramatist, born at Madrid, produced *Genoveva de Brabante*, an adaptation from the French, in his twelfth year. His best plays are *Virginia* (1853), *Lances de Honor* (1863), and *Un Drama nuevo* (1867), his numerous adaptations of French plays being of uneven quality. He became a member of the Spanish Academy in 1858, and director of the National Library in 1884.

Tambour (Fr. *tambour*, 'drum'), a frame upon which muslin or other material is stretched for embroidering. Tambour-work was extensively employed for the decoration of large surfaces of muslin, &c., for curtains and similar purposes; but pattern-weaving has been brought to resemble it so closely that it has been largely superseded. See EMBROIDERY.

Tambourine, a very ancient instrument of the drum species, much used by the Biscayan and South Italian peasants at their festivities, and sometimes introduced into orchestral music where the subject of the piece is connected with a people who use it. It is composed of a piece of parchment stretched on the top of a hoop furnished with little bells, and is sounded by the hand, fingers, or elbow. When sharply struck by the hand the tambourine has not much effect, unless used in numbers. When sounded by gliding the fingers along the parchment a roll results, in which the bells are chiefly heard; and by rubbing the parchment without quitting it with the whole weight of the thumb the instrument gives out a wild, grotesque sound which is sometimes of service in masquerade scenes. The tambourine is nowadays much used by negro minstrels and Salvationists, and as a surface for young ladies' paintings.

Tambov, a Russian town, 300 miles SE. of Moscow by rail. A university was established in 1919. Pop. 70,000.

Tamerlane, whose proper name was TIMUR or TIMUR-I-LENK (i.e. Lame Timur), one of the great conquerors who came forth from the heart of Asia during the middle ages, was born at Kesh (or Sebzi), some 50 miles S. of Samarkand, in 1336, his father being the chief of a Mongol clan. Tamerlane's youth and early manhood had been full of adventure, when in 1369, having overcome all his rivals and enemies, he seated himself on the throne of Samarkand. The rest of his life, after he had organised the internal affairs of his kingdom, was spent in military campaigns inspired by his lust of conquest. He subdued nearly all Persia, Georgia, and the other Caucasian states, and the empire of the Eastern Kipchaks or the Tatars (in 1390). But the military genius of Toktamish, chief of the Eastern Kipchaks and also of the Western Kipchaks or the Golden Horde, imposed upon Tamerlane a second long and determined campaign; however, in the end (1395) he effectually humbled his former protégé and broke up his empire (see UZBEKS). India was the next object of his ambition. He conquered (1398) all the states between the Indus and the lower Ganges, and returned to Samarkand with a fabulous wealth of booty. He next set out to measure himself against the Turks in Asia Minor; but first turned aside to win Damascus and other strong places in Syria from the Mameluke sovereigns of Egypt. At length on the plains of Angora the Mongol and Turkish hosts came together; and, as the result of a gigantic battle, Sultan Bajazet was taken prisoner and his troops utterly routed. The victorious Tamerlane, after resting awhile at Samarkand, turned his eyes towards China. During the reign of the first Ming dynasty emperor, presents and friendly letters were exchanged; but when that emperor's fourth son in 1402 usurped the throne, 'son-in-law Timur' was reported by the returning Chinese envoy to have been marching against China by way of Bishbalik (Urumtsi), when he died at Otrar on 17th February 1405, his grandson Ha-li (Khalil Shah) succeeding. Otrar (Wo-t'o-ho-rh), on the eastern side of the Syr-Daria, was the first place captured by Genghis in 1219-20. Tamerlane seems to have been in many respects a typical oriental ruler of the abler class: in times

of peace he mingled clemency with justice, and fostered learning and the arts, but in war he was cruel, implacable, and reckless of human life. He is the hero of Marlowe's *Tamburlaine*.

The recognised Life is Petis de la Croix's translation (1722) of one by the Persian writer Sherif ed-Din. See also Sir Henry Howarth, *History of the Mongols* (1876-88), and Sir J. Malcolm, *History of Persia* (1828).

Tamil. See INDIA, Vol. VI. p. 102; also CEYLON.

Tammany Society, a Democratic political organisation of New York City, derives its name from an Indian chief who is said to have signed the treaty with Penn. and round whom many fanciful legends afterwards gathered. Washington's Pennsylvania troops chose him as their patron saint in place of St George; and on his 'day,' 12th May 1789, the society—although at first as the Columbian Order, to rival the Cincinnati (q.v.)—was founded under a grand sachem and twelve subordinate chiefs of tribes. The organisation soon became a party 'machine,' and by its aid Aaron Burr was raised to the vice-presidency. In 1805 the Tammany Society was formally chartered, its professed objects charity and the extension of the franchise. Its first hall was built in 1811, and a second one in 1867-68; indeed as early as 1822 the society had grown too large, and the management and practically all the power were transferred to a general committee of three delegates from each ward. The political society known as Tammany Hall is nominally distinct from the Tammany Society, but they are virtually identical. Tammany took a leading part in city politics from the first, and flourished steadily. The number of the general committee rose to over 1400, delegates ultimately being sent from each district and precinct; and finally a central 'committee on organisation' was chosen from this unwieldy body, whose chairman was 'boss' of the hall. The most notorious of these 'bosses' was William M. Tweed, whose gigantic frauds, and those of the 'ring' of which he was the chief, were finally exposed in 1871; Tweed was convicted, and died in gaol while suits were pending against him for the recovery by the city of \$6,000,000. This catastrophe crippled the power of Tammany, but its influence was by no means killed, though it was unquestionably used entirely for the pecuniary benefit of its leaders. Investigations in 1895 and 1899 showed extraordinary corruption in the police and municipal government, due to Tammany. Yet, in spite of periodical reverses, Tammany retains a firm hold on New York politics, as is seen in its overwhelming victory in 1918. Its power is partly to be ascribed to the efficiency of its machinery, partly to its consistent bid, often through very tangible means, for the sympathies of the lower classes.

Tammerfors, or TAMPERE, an important manufacturing city of Finland, 50 miles NW. of Tavastehus by rail. It is situated on a rapid which connects two lakes, and affords motive-power to cotton, linen, paper, and woollen mills. The first textile factory was established in 1820 by James Finlayson (1771-1852), a Glasgow engineer. Shoes are also made. Pop. (1922) 49,398.

Tammuz. See ASTARTE.

Tampa, Florida, at the head of Tampa Bay (40 miles long), 240 miles SSW. of Jacksonville, ships phosphates, fruits, timber, and cattle, imports tobacco from Cuba, and manufactures vast quantities of 'Havana' cigars. Tampa, a favourite health resort, is connected by a concrete bridge two miles in length with St Petersburg, on the other side of the bay. Pop. 94,700. Larger ships enter at Port Tampa, 9 miles SW., a great starting-point of

steamers for the West Indies and Central America. Government works in 1905-12 greatly improved the channel.

Tampere, Finnish name of Tammerfors (q.v.).

Tampico, a seaport of Mexico in the state of Tamaulipas, on the Panuco, 9 miles from its mouth in the Gulf of Mexico, and 200 miles NNE. of Mexico. Harbour-works (1890-1900), with the help of two jetties thrown out some 5000 feet, over the bar at the river-mouth, permit ships drawing 24 feet to enter. Tampico, which is situated on a small hill and is much healthier than Vera Cruz, has extensive dock and quay accommodation, and shares with Vera Cruz the greater portion of the foreign trade of Mexico. Pop. 20,000.

Tamsui, or HOBE, a port on the NW. coast of Formosa (q.v.); the harbour is impeded by a bar at its entrance. Pop. 21,000. See FORMOSA.

Tamus. See BRYONY.

Tamworth, a town on the border of Stafford and Warwick shires, at the confluence of the Tame and Anker, 110 miles by rail NW. of London, 17½ NNE. of Birmingham, and 7 SE. of Lichfield. It is near the Roman Watling Street, and was the residence of the kings of Mercia. Burned by the Danes in 874, it was rebuilt by Ethelfleda, Alfred's daughter, who founded a castle, which was afterwards held by the Marmion, Ferrers, Townshend, and other families, and now belongs to the corporation. The castle stands on an artificial mound 130 feet high. The church of St Editha was founded in the 8th century; the present edifice, which was built in 1345, has some interesting monuments and a curious double tower-staircase. There are also a bronze statue of Peel (q.v.), the municipal buildings and assembly rooms, a town-hall erected (1701) by Thomas Guy (q.v.), a grammar-school (1588; rebuilt 1868), almshouses founded by Guy, a cottage hospital, recreation grounds, &c. The manufactures include elastic, tape, clothing, smallwares, paper, &c.; and in the vicinity are market-gardens and coal and clay pits. A municipal borough, chartered by Elizabeth, Tamworth returned two members until 1885, when it was merged in the county. The county border ran through the middle of the town till 1889; the borough was transferred to Staffordshire for civil purposes in 1889, and for parliamentary purposes in 1918. Pop. (1851) 4059; (1921) 8032.

Tan, FLOWERS OF. See MYXOMYCETES.

Tana, TZANA, or DEMBEA, a great fresh-water lake on the high plateau of Abyssinia, south of Gondar, situated some 6000 feet above sea-level. The greatest length is 60 miles; the breadth varies from 30 to 40; the area is 1181 sq. miles. It is fed by numerous streams and is the main reservoir of the Blue Nile (q.v.), which flows into and out of it under the name of Abai. The lake was probably formed by the damming up this river by a lava stream. The water is clear and full of fish, with hippopotami; there are many small basaltic islands, some of them inhabited. For the regulation of the Nile, it has been proposed to supplement the great reservoir at Assuan (q.v.) by a dam here.

Tanacetum. See TANSY.

Tanagers (*Tanagridæ*), a family of the Passeriformes, or perching birds, containing nearly 400 species; the bill is usually conical (sometimes depressed or attenuated), more or less triangular at the base, with the cutting edges not much inflected, and frequently notched near the tip of the upper mandible. This last character will generally serve to distinguish the tanagers from the finches, to which they are very closely allied; while on the other hand they have strong affinities

to the American Warblers (*Mniotiltidæ*). They are mostly birds of small size, the largest barely exceeding a song-thrush, and the smallest, some of the genus *Euphonia*, being hardly 4 inches in length. This genus, with its ally *Chlorophonia*, is remarkable in having no gizzard; the birds belonging thereto feed chiefly on ripe fruits, which, with insects, form the principal food of the typical tanagers; some, however, feed on seeds and grain, like the finches. With the exception of a few species which visit North America in summer, the tanagers are confined to Central and South America and the West Indies. Some genera of tanagers are remarkable for their beauty of plumage, which is sometimes confined to the male sex, and sometimes possessed by the female also. Many are also pleasant songsters, such as the Organist Tanager (*Euphonia musica*) of San Domingo; the male of this species has the upper parts purplish-black, the cap blue, and the forehead, rump, and under parts yellow; the female being olive-green, with a blue cap, and lighter and yellowish below. The Scarlet Tanager (*Pyrranga rubra*), visiting the eastern parts of North America in summer, and ranging south in winter to Ecuador, Peru, and Bolivia, is also a songster; it is larger than the preceding species, and the male is scarlet, with black wings and tail, while the female is olive, with the wings and tail brown. Tanagers do well in captivity, and several species may usually be seen in the Zoological Gardens.

Tanagra, an ancient city in the extreme east of Bœotia, on the Asopos, which suffered constantly in the wars between Athens and Thebes. Great finds of terra-cotta statues and statuettes were made in its necropolis towards the end of the 19th century. See POTTERY.

Tanais. See DON.

Tananarive. See ANTANANARIVO.

Tancred (b. 1078), one of the chiefs of the first crusade, was the grandson of Robert Guiscard, and son of a certain Marchisus, who was perhaps a Lombard prince. Joining his uncle, Bohemund of Tarentum, Guiscard's son, in the first crusade, Tancred specially distinguished himself in the sieges of Nicæa, Antioch, and Jerusalem. His reward was the principality of Tiberias. For some time he ruled his uncle's state of Antioch, and shortly before his death, on 21st April 1112, he was invested with the principality of Edessa. Tancred figures in the contemporary chroniclers as the model of crusading chivalry: before Tarsus he quarrelled with Baldwin, brother of Godfrey of Bouillon, but generously made up the quarrel when they came to the Holy City; after the storm of Jerusalem he endeavoured to save some hundreds of the captives from massacre; these and many other noble traits are recorded of him. He is the hero of Tasso's great epic.

Tandy, JAMES NAPPER, Irish patriot, was born in Dublin in 1740, and became a prosperous and popular merchant there. One of the chief Protestant leaders of the popular interest, he took an active part in corporation politics, the free-trade agitation, and especially in volunteering affairs, and became the first secretary to the United Irishmen of Dublin. Early in 1792 he challenged the solicitor-general, Toler, for his abusive language, and was ordered to prison till the close of the session by the House of Commons for breach of privilege. As the viceroy had proclaimed him, with a reward for his apprehension, he had the temerity to raise a formal action for illegality against him and his privy-councillors, which was dismissed at the final hearing on November 26. For distributing in County Louth a 'seditious' pamphlet against the corruption of the powerful Beresford family he

was about to be tried at the Dundalk assizes in the spring of 1793, when the government discovered the graver matter that he had met the Defenders at Castle Bellingham in County Louth, and taken their oath, with the view of effecting a coalition between them and the United Irishmen. Tandy fled to America, lived awhile at Wilmington in Delaware, and crossed to France in the spring of 1798, where Madden assures us he was raised to the rank of a general of division in the French army. He followed the ill-fated invasion of Ireland, and made a futile landing at Rutland Island, 16th September 1798, but returned on board that same night. He made his way to Norway, thence to Hamburg, the senate of which handed him over to the English government. On 12th February 1800 he was put on his trial at Dublin, but acquitted. But he was detained in custody, and again put on trial (7th April 1801) at Lifford, in County Donegal, for the treasonable landing on Rutland Island. This time he was convicted and sentenced to death, but, from the same motives of policy that engendered the peace of Amiens (27th March 1801), was permitted to make his way to France. He spent the rest of his days at Bordeaux, dying there in 1803. See Dr R. R. Madden's *United Irishmen* (3d series, vol. i. 1846).

Taney, ROGER BROOKE, American jurist, was born the son of a Maryland planter in 1777, admitted to the bar in 1799, and elected to the state senate in 1816. He was a courageous opponent of slavery as early as 1819. In 1824 he passed from the Federal into the Democratic party, and supported Andrew Jackson, who in 1831 appointed him attorney-general of the United States, and in 1833 secretary of the treasury. He encouraged and carried out the removal of the government deposits from the United States Bank (see JACKSON), and in June 1834 the senate for the first time refused to confirm a president's nomination of one of his cabinet officers. But the balance of parties changed, and in 1836 the senate confirmed his appointment as chief-justice of the United States. His early decisions were strongly in favour of the doctrine of state sovereignty (see STATES' RIGHTS), but his most famous decision was that in the Dred Scott Case (q.v.). He died 12th October 1864. There is a Memoir (autobiographical to 1801) by S. Tyler (1872).

Tanganyika, a lake of Eastern Central Africa, lying between 3° and 9° S. lat., long. of centre being 30° E.; length, 420 miles (nearly a fifth longer than Lake Michigan); breadth, from 15 to 56 miles; maximum depth, 4758 feet. It was discovered by Speke and Burton in 1858. Livingstone and Stanley disproved in 1871 the theory till then accepted that the lake belonged to the Nile basin. Cameron surveyed the south and west coasts in 1874, and discovered an outlet, the Lukuga, on the west side. In 1876 Stanley satisfied himself that this channel, which he proved to communicate with the Lualaba or Upper Congo, is generally dried up in certain parts of its course, and only carries the overflow of Tanganyika westward at intervals of years. Thomson reaffirmed the connection between Tanganyika and the Congo by the Lukuga. Hore found the height of the surface in March 1879 to be 2700 feet above sea-level; in August 1880 the water had fallen 10 feet 4 inches. He believed that the lake had gradually for several years been rising to the former, apparently its highest level, that the obstructions in the Lukuga had then been carried away. The Lukuga has since been alternately blocked and open. Except when several rainy seasons follow one another, the evaporation keeps the water about the same level; the evaporation is so great that the opposite shores, even if only 15

miles distant, are visible only in the rainy season. The water is slightly brackish, the climate not unhealthy. The lake is surrounded by high mountains, some of them attaining a height of 10,000 feet. The scenery is beautiful, and the shores abound in animals of all kinds. It is 600 miles from the coast; separates Belgian Congo from Tanganyika Territory; has its south end in Northern Rhodesia; and as a link of connection between the Zambezi basin and the Nile is in a very true sense the heart of Africa. There are a number of good harbours and anchorages on the shores of the lake, and a considerable trade is carried on. See Moore's *Tanganyika Problem* (1902).

Tanganyika Territory consists mostly of the region on the east coast of Africa formerly known as German East Africa. It is bounded by Kenya, Uganda, Belgian Congo, Northern Rhodesia, Nyasaland, and Portuguese East Africa, and has a coast-line of rather less than 500 miles on the Indian Ocean. Area, 370,000 sq. m., with a population of 4,107,000, excluding the Ruanda and Urundi districts (under Belgian administration), with an area of 20,000 sq. m. and a population of 3,500,000. The people are largely of Bantu race, much subjected to external influences, Hamitic (Wahimas, Masais) in the NW. and N., Wangoni in the S., and Arab-Swahili on the coast. Traces are still found of the aboriginal Bushman race in the western interior. Bantu dialects make up the speech of most of the inhabitants, though Kiswahili (a mixture of Arab and Bantu) is the *lingua franca* throughout. Mohammedanism is the chief religion on the coast; paganism prevails inland, though missionary enterprise is enthusiastically prosecuted by numerous sects.

Except for the coastal plain, from 10 to 40 miles in width, most of the country forms an elevated plateau, rising to higher ground in the west, north (Mount Kilimanjaro, 19,680 feet, and Mount Mern, 14,960 feet), and south (Livingstone Mountains, over 9000 feet). The Rufiji and Pangani rivers are navigable to some extent, but the Rovuma, on the southern border, is difficult. The boundary takes in Lakes Victoria, Kivu, Tanganyika, and Nyasa; others of note are Lake Rukwa in the south-west, and the three salt lakes, Natron, Eyasi, and Manyara in the north. Most of the country is in the path of the south-east trade-winds, and has a dry season from June to August and heavy rains from December to February. On the coast the climate is damp though equable, but in the interior there are great extremes, and in some districts scanty rainfall. The high ground is generally healthy for Europeans, though malaria is everywhere prevalent. Blackwater fever, dysentery, tick-fever, and typhoid are other maladies which science is attempting to subdue.

Agriculture is by far the most important occupation. The regions of greatest fertility are the Usambara district in the NE., the Ruandi, Urundi, and Bukoba districts in the NW., and the Mahenge area in the south. The principal exports are sisal, cotton, coffee, ground-nuts, grains (sorghum, maize, millet), copra, hides and skins, sim-sim, wax, gli, rubber, sugar, some spices, copal. Stock-raising is important, especially in the NW., where the ravages of rinderpest and of the tsetse-fly are less marked. Horses are little used. Extensive forests in the north and south, nearly all in government reserves, produce cedar, yellow-wood (East African pine), and ebony; there are also teak, mahogany, bamboo, and baobab. The ancient system of land-tenure on a tribal and communal basis, still largely obtains; native rights, however, have been frequently violated by foreigners, and much discontent has sometimes arisen. There is little industry beyond basket and mat weaving, metal-

working, and pottery. The chief minerals are coal, iron, gold, lead, copper, mica, salt, and some pitchblende. Garnets, agates, tourmaline, topaz, moonstones, and some diamonds are found. Trade, carried on largely by Arabs and Indians, flourishes mostly in the coast towns, though regular markets are held in most districts of the interior. Communications were considerably developed by the Germans, who built the Usambara railway (219 miles) and Central line (from Dar-es-Salaam to Kigoma on Lake Tanganyika, 772 miles). Caravans and pack-animals are giving way to motor traffic. There are many good natural harbours along the coast in spite of coral reefs and bars; the largest are Dar-es-Salaam, Tanga, Bagamoyo, Lindi, and Kilwa-Kisiwani. Mwanza on Lake Victoria is the most considerable of the numerous lake-ports, but is very unhealthy. Tanganyika has a uniform customs tariff with Kenya and Uganda.

History.—The Portuguese first set foot on the East African coast in 1505. At the end of the 17th century power passed to the Imams of Muscat, and in the 19th century the Sultan Seyyid Said, who made Zanzibar his headquarters in 1832, came to rule over the littoral of what is now Kenya and Tanganyika. In the eighties of last century the Germans, pursuing ideas of colonial expansion, began to annex large tracts of territory in East Africa, and finished by proclaiming an Imperial German Protectorate, arranging the boundaries by a treaty with Great Britain in 1890. The Germans did much for the economic and intellectual betterment of the country, but were much afflicted with native insurrections, especially in 1905. After a lengthy campaign during the Great War, Germany lost the colony, and the Treaty of Peace (1919) gave Great Britain a mandatory power over most of it, the districts of Ruanda and Urundi being assigned to Belgian administration. The mandate, approved by the League of Nations, lays down conditions as to slavery, forced labour, usury, traffic in arms and spirits, and security of land-tenure. The policy of the government is educational, and aims at establishing native administration. The governor has his seat at Dar-es-Salaam, and is aided by an executive council and the district commissioners of the twenty-two administrative areas into which the country is divided. See F. S. Joelson, *The Tanganyika Territory* (1920).

Tangent. See TRIGONOMETRY; and for Tangent-sailing, see GREAT CIRCLE SAILING.

Tanghinin is a crystalline body extracted from the kernel of *Cerbera Tanghin* (family Apocynaceae), which grows in Madagascar. It is a deadly poison, acting upon the heart like digitalis, strophanthus, and their allies, but possessing a convulsant action which these lack. Like digitalis it excites vomiting. Tanghin, an extract made by the Malagasy from the kernel, was used by them for the judicial Ordeal (q.v.).

Tangier, or TANGIERS (Arab. *Tanja*), a seaport of Morocco, on a small bay or inlet of the Straits of Gibraltar, 38 miles SW. of the town of that name. The town is surrounded by old walls, and is situated on two hills, the houses being, as a rule, miserable edifices, and the streets narrow and dirty. It has an extensive shipping trade, and is patronised as a holiday-resort by Europeans. Tangier was taken by the Portuguese in 1471, and given to Charles II. of England as dowry with Catharine of Braganza. It was held by England till 1683, when, on account of the expense and the badness of the climate, it was evacuated and the fortifications dismantled. The notorious Colonel Kirke (q.v.) commanded the garrison, and Bishop Ken was for a short time chaplain. It was subsequently long a nest of pirates. Its harbour was for long a mere roadstead.

An international company was formed in 1910 to undertake the construction of a harbour, but no progress was made for fourteen years. The scheme was revived in 1924. The town has been the subject of much political controversy in recent years. The Franco-Spanish treaty of Madrid (1912) constituted Tangier and the adjoining region an international zone. This agreement was strengthened by a convention between Britain, France, and Spain in 1923, which came into force in 1925. It declares Tangier a neutral and unfortified zone, and provides for general administration by a chief administrator and assistants, for native administration by a *mendub* (the representative of the Sultan of Morocco), for a Committee of Control (composed of the consuls of various powers), and an International Legislative Assembly (26 members). The administration of justice is also on an international basis. The convention, however, has not been accepted by all the powers, and Tangier remains in a position of uncertainty which is preventing its economic development. Pop. 50,000 (26,000 Moors, 12,000 Jews, and 12,000 Europeans).

Tangle, a name given to various kinds of Sea-weeds (q.v.), especially to Laminaria.

Tango, a dance associated with Mexico and with the Argentine but probably of African origin, is rather faster than the Habanera, but is of the same nature—languorous and graceful. It has been considerably modified in Paris. The rhythm is duple (in *Andante* time), one of the beats often consisting in a triplet. Milhaud and other French composers have written tangos for concert performance.

Tanis (Greek form of Egyptian *Tân*; Heb. *Zaan*), an ancient Egyptian city in the north-east of the Delta, once the chief commercial city of Egypt, capital of the Hyksos kings about 2100 B.C., and of Rameses II. and other great monarchs of the 19th dynasty. Its prosperity was destroyed by the silting up of the Tanitic mouth of the Nile, which was named from it, and it was destroyed for rebellion in 174 A.D. The ruins near the fishing-village of Sân el Hager near the south shore of Lake Menzaleh were examined first by Mariette, and in 1883-84 explored by Flinders Petrie. See the explorer's monograph (1885).

Tanistry, an ancient Celtic mode of tenure, according to which the right of succession lay not with the individual, but with the family, in which it was hereditary; and by the family the holder of office or lands was elected, the design doubtless being that power should in this way be reserved for the strongest or worthiest of the stock—other things being equal, the nearest male relative of the actual tanist in possession. In the case of a monarchy it was the custom to appoint the heir-apparent during the lifetime of the sovereign; and there is no doubt that the nearest to the original stock was held to have a preferable claim, as contended by Bruce in his claim to the Scottish throne.

Tanjore (*Tanjûr* or *Tanjâvûr*), a town of India, capital of a district in the Madras province, 218 miles SSW. of Madras city, in the midst of an extensive plain, on one of the branches of the lower Kaveri. The principal edifices of Tanjore are the great temple, described with an illustration at PAGODA, the palace of the old rajahs, and a dismantled fort. Once a famous Hindu capital, it was a great centre of learning and religion. Silks, jewellery, carpets, copper vessels, and artistic models in clay, &c., are manufactured. Pop. (1921) 59,913.

Tanks, the name applied by the British army to the armed and armoured automobiles used by it

on the battlefields of northern France during the Great War. Their construction was suggested in 1914 and experiments were conducted—at first largely on naval initiative—but tanks did not appear in action till 1916, and were not definitely successful till 1917. They were also used by the French, and, to some extent, by the Americans and Germans. Numerous modifications in design were effected in later models, but in the main the first British tank, the *Mark I*, supplied the essential features. Gaunt and grim in appearance and rhomboidal in shape, it moved on the Caterpillar Tractor (q.v.) system, propelled by a high-powered petrol motor. Although tanks had been experimented with in order to provide a means of transport for infantry over bullet-swept ground, it was recognised that their chief utility lay in their ability to crush barbed-wire entanglements and attack machine-gun lairs with impunity. They were impeded, however, by their slowness of speed, by their cumbrousness, and by their inability to operate in mud. These difficulties were partly met by the construction of smaller and speedier tanks (*Whippets*), about half the weight of the full-sized type. The normal armament consists of some half-dozen machine-guns, though frequently two six-pounder guns are carried. The crew usually numbers eight, but the smaller tanks carry only three or four, while experiments have been conducted with a 'one-man tank.'

See A. G. Stern, *Tanks, 1914-18*; D. G. Browne, *The Tank in Action* (1920); J. F. C. Fuller, *Tanks in the Great War* (1920).

Tannahill, ROBERT, poet, was born at Paisley, the son of a hand-loom weaver, on 3d June 1774. He eagerly read Burns, Fergusson, and Ramsay; and having been put to the loom after leaving school, he composed many of his best songs to the music of the shuttle. In 1800 he went with a brother to Lancashire, and remained there till 1802, when he returned to Paisley on hearing of his father's failing health. By the year 1805 his poems had become well known in the town, and a number of friends advised him to have them published. In 1807 he issued a volume of 175 pages entitled *Poems and Songs*, of which an edition of 900 copies was sold in a few weeks, to the profit of the author, who was able to deposit twenty pounds in the Union Bank. The poet was now famous, and heard his songs sung everywhere, special favourites being *Gloomy Winter's noo awa*, *Jessie the Flower o' Dunblane*, *The Braes o' Gleniffer*, *Loudon's Bonnie Woods and Braes*, and *The Wood o' Craigielea*. In 1810 the Ettrick Shepherd came to Paisley, and spent a night with Tannahill, who the following day convoyed Hogg half-way to Glasgow. It was a melancholy adieu Tannahill gave him. He grasped his hand, tears gathering in his eyes the while, and said: 'Farewell, we shall never meet again; farewell, I shall never see you more'—prophetic words soon to be verified. He had arranged a corrected edition of his works for the press, and offered them to Mr Constable, who returned the manuscript, as he had more new works on hand than he could undertake. This rebuff the poet was unable to bear, and he sank into despondency; two days before his death he threw into the fire all his new songs, nearly a hundred in number. On 17th May 1810 his body was found in a canal near Paisley; and there seems no reason to doubt that his death was that of the suicide. A granite obelisk marks his grave in the burying-ground of the West Relief (Canal Street) Church; and in 1883 a statue was erected in Paisley as a memorial of the poet. As a songwriter Tannahill continues to be remembered; and several of his pieces have established themselves as part of the musical repertory of the

Scottish people. He has a genuine lyrical gift, much tenderness of sentiment, and a true eye and feeling for the simple effects of nature with which he was familiar. Of Burns's force and passion he has little; but in grace and sweetness Burns himself has scarcely surpassed his happier passages. See *Life in Semple's* edition of his poems (1876), and Brown's *Paisley Poets* (vol. i. 1889).

Tannenberg, a village of Masuria in East Prussia, 10 miles SW. of Hohenstein. It has been the scene of two historic battles. Here on July 15, 1410, the Poles and Lithuanians defeated the Teutonic knights (the battle is sometimes given the name of Grinwald; see POLAND, TEUTONIC KNIGHTS). Here also on August 26-31, 1914, a German army under Von Hindenburg (q.v.) shattered an invading Russian army under General Samsonov, who shot himself after the battle.

Tanner, THOMAS, was born at the vicarage of Market Lavington, Wiltshire, January 25, 1674, and after graduating from Queen's College, Oxford, was in 1696 elected a Fellow of All Souls. He had already a high reputation as an antiquary, and Wood at his death in 1695 left him the care of his papers. He took orders, and became in succession chaplain to his father-in-law, Bishop Moore of Norwich, chancellor of Norwich, prebendary of Ely, rector of Thorpe near Norwich, archdeacon of Norwich (1710), canon of Christ Church, Oxford (1723), and Bishop of St Asaph (1732). He was thrice married, and died at Oxford, 14th December 1735. An improved and enlarged edition of his *Notitia Monastica* (1695) appeared in folio under the care of his brother in 1744. But Bishop Tanner's fame rests hardly less securely on his great posthumous biographical and bibliographical work—the labour of forty years, the *Bibliotheca Britannico-Hibernica* (ed. by Dr D. Wilkins, 1748). His edition of Wood's *Athenae Oxonienses* he had published in 2 vols. folio in 1721.

Tannhäuser, the hero of one of the most beautiful of mediæval German legends, is a knight who, in the course of his travels, comes to the Venusberg, and enters the cave-palace to behold the wonders of the Lady Venus and her court. After having lived there some time in every kind of sensual delight, his conscience smites him, he invokes the Virgin Mary, and makes a pilgrimage to Rome, to Pope Urban, to seek, through confession and penance, remission of his sins, and escape from damnation. But the pope, when he hears his story, tells him that he can as little obtain God's mercy as the rod in his hand can become green again. Thereupon Tannhäuser departs in despair, and returns to the Lady Venus in the mountain. Three days after he had gone the dry rod begins to sprout and bear green leaves; and the pope immediately sends out messengers to every country, but in vain, for the knight can nowhere be found. Such is the story as told in the popular ballad once common all over Germany, and even beyond it. Elsewhere it is added that 'the faithful Eckhart,' of many German heroic legends, sits before the mountain, and warns the people of its dangers. In this shape the story may be traced as far back as the 14th century, but the substance of the legend is much older, and goes back to the days of German paganism. Some traditions connect it with the Heselberg or Hörselberg, near Eisenach, in which the Lady Hulda (see BERCHTA) held her court, who again suggests Freyja the Scandinavian Venus. Grimm sees in the legend a touching portrayal of the regret that lingered in the popular heart for the dying paganism, and of the sternness of the Christian priesthood in regard to it. This idea of subterranean palaces in which the kings or queens of

dwarfs, pygmies, and fairies held their courts seems to be universal. Everywhere stories are told of men, like Thomas of Ereildoune, being enticed to enter, and finding it difficult or altogether impossible ever again to obtain their liberty. The visits of Ulysses to the isle of Calypso and to that of Circe are amplifications of the same idea. In later times the story has been treated by Tieck, and gave the subject for an opera to Wagner.

About the middle of the 13th century, and contemporary with Pope Urban IV. (1261-65), there lived in reality in Germany a Bavarian knight named Tannhäuser, who, as Neidhart relates, after returning from the wars, lived as a minnesinger at the court of the Austrian Duke Frederick II. the Quarrelsome, and after his death either with Duke Otto II. of Bavaria, or wandering from place to place. Tannhäuser composed fine spirited ballads.

For the legend, see Zander, *Die Tannhäusersage und der Minnesänger Tannhäuser* (1858); Grässe, *Der Tannhäuser und ewige Jude* (2d ed. 1861); P. S. Barto, *Tannhäuser and the Mountain of Venus* (1917).

Tannin, Tannic Acid, or DIGALLIC ACID, is an astringent substance found in gall-nuts, and hence called gallotannic acid. The name tannin has, however, been applied to a number of different astringent compounds existing in the bark or leaves of most trees. These compounds, though not intimately related to each other, yet agree in giving blue or green-black compounds with salts of iron, and in producing leather by their action on animal skins. The true tannic acid is a colourless amorphous body, obtainable in fine scales or vitreous masses by the evaporation of its solution. A yellowish colour soon develops in the acid even when excluded from light. It is readily soluble in water and alcohol, but insoluble in chloroform. It reddens litmus, and has a powerful astringent taste and local action. On this account it is employed for relaxed throats as a gargle, or in the form of lozenge. As a styptic it is of much value. In the arts it is employed in the manufacture of ink, although most makers employ the crude gall-nuts in preference to the purified acid. The various tanning substances containing the other varieties of tannin are more employed in leather-making and Dyeing (q.v.).

Tanning. See LEATHER, BARK.



Tansy (*Tanacetum vulgare*).

allied to *Artemisia* (see WORMWOOD), and having hemispherical heads of flowers, with the florets all tubular, the receptacle naked, the pappus a

Tansa, a small river whose valley has been, at a point 53 miles N. of Bombay, impounded for the water-supply of Bombay. The embankment, rivaling the great Asuan Nile dam in size, is a little short of 2 miles long, 118 feet high, and 100 feet thick at the bottom, and contains over 11,000,000 cubic feet of masonry—all solid stone. The area of the dam is about 8 square miles.

Tansy (*Tanacetum*), a genus of Compositæ (Tubulifloræ)

slight membranous border. The species are pretty numerous, and are natives of the temperate parts of the Old World. Common Tansy (*T. vulgare*) is a native of Britain and of continental Europe, growing in fields and by roadsides, river-banks, &c. It has long been generally cultivated in gardens. It is now naturalised in many parts of North America. It is a perennial, from 2 to 4 feet high, with great abundance of deep-green, bipinnatifid, inciso-serrate leaves; the flowers in terminal corymbs, yellow, and rather small. The leaves and flowers have a strong aromatic smell and a bitter taste. The young leaves are used for flavouring puddings, cakes, omelets, &c. The plant is also tonic and anthelmintic, and *Tansy tea* is an old popular medicine. Some curious old customs still linger in many parts of England connected with the use of *Tansy cakes* and *Tansy puddings* at Easter, which was originally intended to represent the use of bitter herbs at the Paschal feast.

Tanta, an important town and railway junction of Lower Egypt, between the Rosetta and Damietta branches of the Nile, with a famous mosque, and a great fair; pop. 74,000.

Tantallon Castle. See NORTH BERWICK.

Tantalum (sym. Ta; atom. wt. 181; atom. number 73) is a rare metal, discovered by Hatchett and by Ekeberg in 1801-2, and found associated with columbates in columbite, tantalite, and ytrotantalite. In 1904-5 it was first isolated in purity (Moissan's preparation in 1902 being brittle and impure) by Werner von Bolton, both by an electrical and by a chemical method. It has a high melting-point, 2300° C., and is extremely hard. Tantalum wire is used as the filament in incandescent electric lamps.

Tantalus, said to have been the son of Zeus and father of Niobe, for having divulged the divine counsels was afflicted in the lower world with an insatiable thirst, and had to stand up to the chin in a lake, the waters of which receded whenever he tried to drink of them; and clusters of fruit hung over his head, which eluded his grasp whenever he endeavoured to reach them.

Tantalus, or WOOD-IBIS, a genus of birds of the stork family (Ciconiidae), quite distinct from the true ibises. The American Wood-ibis (*T. loculator*) is as large as a stork, but more slender, white, with black quill and tail feathers, the naked skin of the head and neck black. It is especially at home in South America, but also occurs in the southern states in swampy districts, and breeds abundantly in Florida. An allied African form, *Pseudotantalus rhodopterus*, was for long regarded as the sacred ibis of the Egyptians, but this was a true ibis (*Ibis aethiopica*).

Tantia Topee, the most notable leader under Nana Sahib (q.v.) of the Indian Mutiny, who, in alliance with the Rani of Jhansi, held the field for a time after his chief had fled. He hid in the jungles of Central India till 7th April 1859, when he was captured and executed.

Tantra. See SANSKRIT, Vol. IX. p. 90.

Tantum Ergo. See PANGE LINGUA.

Tantura. See DORA.

Taoism, the religious system founded by Lao-tse (q.v.). See also CHINA; F. H. Balfour, *Taoist Texts* (1884); J. Legge's *Texts of Taoism* (1891); De Rosny, *Le Taoisme* (1892); R. K. Douglas, *Confucianism and Taoism* (1906); E. H. Parker, *Studies in Chinese Religion* (1910); H. A. Giles, *Confucianism and its Rivals* (1914). There are translations of the Tao-Teh King by E. H. Parker and I. Mears.

Taormina, a town on the east coast of Sicily, on a lofty rock 650 feet above the sea, 30 miles

SW. of Messina by rail. The ancient Tauro-menium was founded in 397 B.C.; it has numerous relics of antiquity of the Roman period, such as some large cisterns, a small theatre (called the Odeon) traces of houses, tombs, &c., and the remains of a Roman theatre, reckoned one of the most splendid ruins in Sicily, and commanding a view of almost unparalleled magnificence over Etna and the Straits of Messina. There are some fine specimens of both Romanesque and Gothic architecture in the modern town; and the place is in great favour as a winter resort. Pop. (1921) 4980.

Tapajos, a navigable river of Brazil, and an affluent of the Amazon, is formed by the confluence of the Arinos and the Juruena, both of which rise in the south of Matto Grosso state. After a northward course of 900 miles, the Tapajos falls into the Amazon, above the town of Santarem. Steamers run 150 miles to the lowest of several waterfalls. A short portage separates the upper waters of the Tapajos from those of the Paraguay.

Tapestry is an ornamental textile used for the covering of walls and furniture, and for curtains and hangings. In its method of manufacture it is intimately related to oriental carpets, which are made in precisely the same way as certain kinds of tapestry, the only distinction being that carpets are meant for floor-coverings alone. Fine storied tapestries are, however, much more elaborate and costly than any carpets, and they have altogether different artistic pretensions. Tapestries are divided into two classes, according as they are made in high-warp (*haute lisse*) or low-warp (*basse lisse*) looms. The former in manufacture have their warp-threads stretched in a vertical manner with a roller at the top around which the warps are wound, and another at the bottom for receiving the finished tapestry. On the low-warp looms the warp is extended horizontally, there being an arrangement in both for shedding or separating the warp into two leaves, front and back, as in ordinary weaving. It is in high-warp looms that the most elaborate storied or pictorial tapestries are made, low-warp looms being more largely devoted to the production of still-life and non-pictorial decorative compositions. Notwithstanding these differences, it is difficult to distinguish between tapestries which have been made on high and low warp looms respectively, although the latter are more rapidly and consequently less expensively woven. In reproducing a design on the high-warp loom the workman has the portion of the cartoon he is copying behind him. He works from the back or wrong side of the tapestry, and to guide him the outline of the subject is slightly indicated on the warp threads. He has an endless number of shades and tones of wool and silk (formerly gold and silver threads were also used) which, with little shuttles, he shoots through the number of warp threads required for each particular shade, and with such wefts he covers and entirely encloses the warp-threads. In the reproduction of a design the utmost skill and experience are essential, not only to outline the figures and composition generally with accuracy, but also for the proper grading and hatching in of tones to secure the rich and mellow harmonies which constitute the principal charms of a picture. In low-warp tapestry-weaving the design to be copied is placed under the warp, and, as the workman here also weaves from the back, the design is reversed in the finished production. Of late years only it has become the habit to trace a reverse drawing on the warp-threads, whereby the tapestry is made to show the design as originally composed. The difficulty of examining low-warp work as it

proceeds prevents the elaborate and delicate work being produced by this method which it is possible to secure on high-warp looms. The best work of Arras, Brussels, and of the Gobelins, for example, is almost entirely high-warp.

The art of tapestry working is of great antiquity. It was practised by the ancient Egyptians and Greeks, and had reached a high degree of importance even by the time of Penelope and her loom. It may be that the curtains of the tabernacle 'of blue and purple and scarlet, with cherubim of cunning work' (Exod. xxvi. 1), were a kind of tapestry, though more probably they were of needle-work. The art was continued by the Romans, and later by the Copts, and during the Dark Ages was kept alive in the monasteries. The fourteenth century marks a turning-point in the history of tapestry—for the Bayeux Tapestry (q.v.) is really just embroidered work. The decay of feudalism transformed the baronial castle into a home of culture, while the Crusades gave to Europe a more comfortable and luxurious standard of living. Indeed, the debt to the East was realised so much that frequently the tapestries were known as *Sarrazinois*. The first important 'period' or 'school' was that of Paris, centering round Nicolas Bataille at the end of the fourteenth century, and terminating with the disturbances of the Hundred Years' War. Paris was succeeded by Arras, which, under the munificent patronage of the Dukes of Burgundy, became supreme in the first half of the fifteenth century to such an extent that the word 'arras' passed into common parlance. Flemish weavers (*tapisseries*) from Tournai, Bruges, &c., were in great demand all over Europe, especially in England and in Italy, but Flanders temporarily declined before the victories of Louis XI. The next century witnessed the triumph of Brussels under the influence of the Italian Renaissance. This collaboration of Italian artists and Flemish craftsmen, which lasted half a century, began with Raphael, who in 1515 sent to Brussels the famous cartoons illustrating the Acts of the Apostles, to be worked into tapestries for the Sistine Chapel. The Renaissance work perhaps lacks some of the naïveté and spontaneity of the earlier Gothic periods, but is more dramatic, relying on broad effects of line and space, and the weaver was, of course, always allowed a considerable amount of discretion in choice of colours. The supply could not meet the demand, and gradually the workmanship became hasty, careless, and slipshod, faults not entirely remedied by the signing of tapestries and introduction of guild restrictions. Oudenarde was the other principal centre of weaving, but the Spanish wars drove many weavers to seek refuge in Italy, where the Barberini, the d'Este, and other noble families set up workshops, and in England, where Henry VIII. had a huge collection of tapestries. It must be remembered that tapestries were extensively used for both inside and outside decorations even as early as Chaucer's day, and consequently formed a common and acceptable gift on occasions of embassies, marriages, and state celebrations generally. The subjects were taken from biblical, mythological, and even sometimes contemporary sources.

There were three outstanding events in the seventeenth century. First, the institution of royal workshops in Paris under two Flemings, Comans, and de la Planche, in the reign of Henry IV., who granted them special privileges and facilities. Second, the supremacy of Mortlake in England, under Sir Francis Crane, who received the patronage of Charles I. (It is worthy of remark that English wool had always formed the staple for the finer qualities of the fabric.) Third, the foundation at Paris in 1664, under Charles

Lebrun, of the famous Gobelins factory, which Louis XIV. intended to be the nucleus of gold and silversmiths' work, and other applied arts. Aubresson and Beauvais were also centres of industry. The Gobelins were at their most brilliant up to about 1690, when they suffered eclipse owing to the disastrous wars in the Netherlands, but they reappeared next century. The actual dimensions had now become smaller to suit the style of Les Trianons, but contemporary artists, such as Boucher, were again employed to design the cartoons. Of all the modern attempts to continue the art of tapestry-weaving by far the most interesting has been that of William Morris (q.v.) at Merton Abbey in 1881. Many modern artists, in supplying cartoons for copying, do not rely sufficiently on bold, decorative treatment, but make the mistake, if not of rivalling, at least of copying oil-paintings with all their subtle harmonies and minuteness of detail. Fine examples of European tapestries are to be found in various museums, churches, palaces, &c., but the following are especially noted for their collections—South Kensington Museum, Hampton Court, Royal Palace at Madrid, Gobelins factory in Paris, Museum of Bern, the Vatican, and Metropolitan Museum of New York.

See monographs and catalogues of the various collections; the huge *Histoire Générale* (1874–84) of Guiffrey, Pinchart, and Müntz; the standard general histories in French by Müntz (1881, tr. 1885) and Guiffrey (1886), and in English by Thomson (1906); the smaller books by Hunter (1912) and Candee (1913); Migeon, *Les Arts du Tissue* (1909); the work on the technical side of weaving by Christie (new ed. 1920); and the Bibliography of Tapestry by Guiffrey (1904). Most of these books are profusely illustrated.



Fig. 1.—Head of *Tænia solium* (Leuckart).

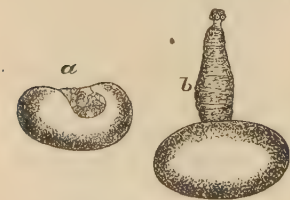


Fig. 2.—Bladder-worm of the Fig (*T. solium*):

a, with invaginated head, about natural size; b, with evaginated head, a little bigger than natural size (Leuckart).

The adult sexual *Tæniadæ* live for the most part in the intestine of mammals, birds, and fishes; the larval Bladder-worms (q.v.) or *Cysticerci* occur in

both vertebrates and invertebrates; and the general rule is that the host of the bladder-worm forms part of the ordinary food of the host of the tapeworm.

In the *Bothriocephalidæ* the head is oval and flattened; the two suckers are elongated muscular pits, lying opposite one another longitudinally; the hooks, if present at all (*Trienophorus*), are not borne on a rostellum; the 'joints' are broader than long; there are three genital apertures on the middle of the ventral surface, through one of which (uterine) some of the developing eggs may escape before the joint breaks off; the embryos are ciliated and able to swim about in water; the cysticercoid stage occurs in fishes, and is elongated and solid, not like a bladder. The most important genus is *Bothriocephalus*.

Several tape-worms are in their adult sexual state

parasitic in man: *Tænia solium*, with the bladder-worm stage in the pig; *T. saginata* or *mediocanellata*, with bladder-worm in the ox; and some others, *T. cucumerina*, *T. nana*, *T. flavomaculata*, and *T. madagascariensis*, occasionally occur. They infest the small intestine, and there also *Bothriocephalus latus* (larval in pike and burbot) may be found. Moreover *Tænioid* bladder-worms also occur in man, the most important being that of *Tænia echinococcus*, which lives as an adult tapeworm in the dog.

In the majority of cases man becomes infected with tapeworms through eating the raw or imperfectly cooked flesh of the animal—be it ox or pig or fish—which is the host of the immature stage of the parasite. In other cases filthy habits of living and eating render it readily possible for the bladder-worms—or, in the case of *T. echinococcus*, the ova—to get mixed up with the food. The presence of tapeworm in the small intestine need not be dangerous—indeed, the Abyssinians regard freedom from the parasite as a disaster; but it is usually troublesome, giving rise to disturbances of digestion, colic-like pains, diarrhoea, or, on the contrary, constipation, besides less local effects, such as anæmic and neurotic states. No certain diagnosis is possible, 'unless the eggs or proglottides of the *corpus delicti* be observed, and these must always be identified before so radical a cure as treatment with anthelmintics is begun.' Of these anthelmintics—which are intended to expel the parasite from the intestine—there is no lack in the pharmacopœia. Thymol is one of the most effective, but prevention is always better than cure.

See Leuckart, *The Parasites of Man* (trans. by Hoyle, 1886); Braun, *The Animal Parasites of Man* (1903); and, for tapeworm in dogs, *WORMS*.

Tapioca, a farinaceous substance obtained from cassava or manioc (when prepared as explained at MANIOC) by drying it whilst moist on hot plates, so that the starch grains swell or burst, and the whole agglomerates in small lumps. The name is sometimes given to a kind of Sago (q.v.) and to a preparation of potato starch.

Tapir (*Tapirus*), a genus of Ungulata, of the section Perissodactyla, having a bulky form, with

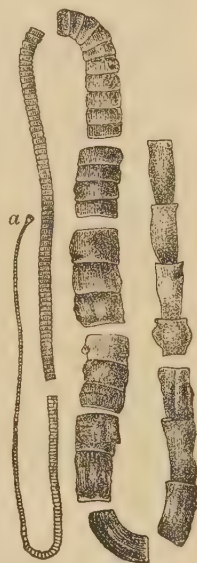
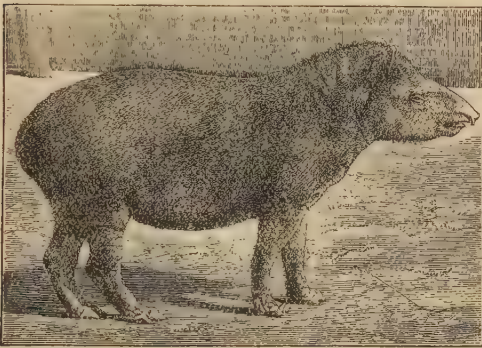


Fig. 3.—Portions of *Tænia mediocanellata*, about half natural size (Leuckart).

moderately long legs; the fore-feet four-toed, the hind-feet three-toed; the skin thick, the hair short; the tail very small; the neck thick; the ears short; the eyes small; the muzzle elongated; the nose prolonged into a short, flexible proboscis, which, however, is not prehensile, like that of the elephant; six incisors, two canine teeth in each jaw, and fourteen molars in the upper and twelve in the lower jaw, the molars separated from the canine by an interval. There are certainly four species, of which three are American and one Oriental. The best known is the American Tapir (*T. terrestris*), which is about the size of a small ass, and is common in almost all parts of South America, its range extending as far south as the Strait of Magellan, although it suddenly ceases to be found at the Isthmus of Panamá. Its colour is a uniform deep brown, but the young are—as in many other animals (e.g. the Puma) which when adult are of all one colour—marked with yellowish fawn-coloured stripes and spots. The skin of the neck forms a thick rounded crest on the nape, with a short mane of stiff hair. The tapir inhabits deep recesses of the forest, and delights in plunging and swimming in water. It feeds chiefly on young shoots of trees, fruits, and other vegetable substances,



American Tapir (*Tapirus terrestris*).

but is ready to swallow almost anything that comes in its way. Pieces of wood, clay, and pebbles are often found in its stomach. It sometimes commits great ravages in cultivated grounds; a large herd of tapirs sallying forth from the forest by night, trampling and devouring all that they find in the fields. The tapir is a very powerful animal, and, protected by its thick hide, forces its way through the forest where almost no other quadruped can. When assailed by the jaguar it seeks to get rid of him by rushing through thick underwood, and if it can reach water is often successful by plunging in and diving. It is inoffensive, never attacking man, but when hard pressed by dogs makes a violent resistance, and inflicts severe bites. It is very easily tamed, and becomes extremely familiar; but its large size makes it a troublesome pet. Its hide is useful, and its flesh is eaten, although rather dry. The other two American species—viz. *T. bairdi* and *T. dowi*—are generally regarded as generically distinct from the rest, and have been termed *Elaomognathus*. The Malayan Tapir (*T. indicus*) is found in Malacca, Sumatra, &c. It is larger than the American tapir, and its proboscis is rather longer in proportion. The neck has no mane. The colour is glossy black, except the back, rump, and sides of the belly, which are white. The colours do not pass gradually one into another, but the line of separation is marked, giving the animal a very peculiar appearance. The habits of this species

are very similar to those of the American tapir, and it is equally capable of domestication. The young are striped and spotted as in that species.

The remains of tapirs have been found in Miocene and subsequent strata. In all about twelve species have been determined. Tapir-like animals are common in Eocene beds. *Lophiodon* appears to have been the precursor of the tapirs during the Eocene period. True tapirs are found in beds of an earlier age in Europe (Miocene) than in America (Post-Pliocene). Hence it has been argued that the tapir is an Old-World form which migrated to the New World, and ultimately established itself there upon a firmer footing.

Tapping is an operation frequently resorted to for the removal of fluid accumulations, particularly in the pleural and peritoneal cavities. It consists in introducing one end of a small tube into the cavity, with the least possible injury to the skin, and withdrawing by means of a vacuum as much of the fluid as is desired. Various contrivances (aspirators) have been used to effect this without allowing air to enter—the commonest form being that devised by Dr Potain. The fluid beneath the skin in general dropsy is removed by fine silver tubes (Southey's tubes) left in position for some hours or days; and the fluid in the spinal canal can be withdrawn by a sharp needle inserted between the vertebrae in the lumbar region. These instruments have done much for the certain diagnosis and safe treatment of fluid collections in various situations. Besides dropsical or inflammatory exudations in the pleura or peritoneum, similar collections in the joints can be thus dealt with; and cysts and abscesses, when deep-seated and obscure, can be recognised with certainty and sometimes cured. See DROPSY, PLEURISY, &c.

Taprobane. See CEYLON.

Tapti, a river of Bombay, rises in the Betúl district of the Central Provinces, and flows 450 miles west through the Sátúra uplands and the districts of Khandesh and Surat to the Gulf of Cambay, 17 miles below the town of Surat. Even small vessels of 40 to 50 tons burden cannot ascend higher than Surat. The port of Suwali, at the mouth, is now deserted, and the lower channels of the river are being silted up.

Tar. The nature of tar differs according to the raw material from which it is derived. In nearly all cases it is a thick, black, or dark-brown liquid of complex composition. The tars of commerce have a strong characteristic odour varying with their origin. When wood, coal, or shale is subjected to destructive distillation in close vessels there are produced (1) incondensable gases, (2) a liquid portion consisting of various substances soluble in water, and (3) another portion composed of bodies insoluble in water. This third or last portion is generally called tar. In former days wood-tar was used for much the same purposes as that for which the residual pitch derived from it is employed now. The time has come when any kind of tar is looked upon rather as a mother-liquor from which valuable chemical substances are obtained than as a material to be used by itself in the arts.

Wood-tar.—Different woods yield tars of a so far unlike nature. The tar from pine-wood is not the same as that from oak or beech. Most of the wood-tar produced in Europe is obtained from the Scots pine (*Pinus sylvestris*), but it is also got from other pines and from larch. Coniferous wood yields from 14 to 18 per cent. of tar, while from the wood of dicotyledonous trees of temperate regions only from 9 to 10 per cent. is obtained. Wood-tar is still made by the very old process of

burning wood in cone-shaped piles covered over with sufficient earth and turf to exclude air, of which just enough is admitted to promote combustion by means of apertures at the bottom where the pile is ignited. The pile stands on a clay floor, and it is fully a week before any tar is collected. By this rude process much charcoal, crude acetic acid, and other products are wasted; but these are now very often saved by distilling the wood in close vessels. Several forms of retorts or kilns are employed to make charcoal and at the same time to yield tar. One kind of kiln is in the shape of an oblong brick chamber, arched over, and with a floor formed into a sort of channel sloping from the middle of the chamber, where it is highest, to each of the end walls. Its internal size is 25 feet long, 12 feet wide, and 15 feet to top of arch. The chamber is closely filled with wood, the only place where a small space is left being where the flame or heat from the fire enters at one side. Air must be as far as possible excluded during the charring of the wood, which in a kiln of this kind may consist of stumps, branches, and any sort of odd pieces. The fire hearth, placed just outside the side wall of the chamber, has no grate, so as to prevent too much draught. As the tar is formed it runs down the right and left inclines of the channel, and at each end, by one branch of a two-way pipe, is led into a tar vessel, while the more volatile acetic acid and wood-spirit pass by the upper branch of the pipe into a condenser. Wood-tar contains (besides the tar proper) a large admixture of watery distillate, and gives on redistillation acetic (pyroigneous) acid, wood-spirit or methyl-alcohol, methyl-acetate, acetone, wood-creasote, and wood-naphtha, consisting of hydrocarbons very often containing methyl groups replacing hydrogen; also heavy oils and crystalline bodies not yet much investigated and that disappear in the pitch. Tar from some resinous woods contains oils resembling turpentine in composition. Before American petroleum became so cheap an oil of this kind was made in Norway and burned in paraffin-lamps.

In medicine tar and tar-ointment are used for cutaneous diseases (such as psoriasis), and much controversy arose as to the virtues of tar-water, regarded by Bishop Berkeley as almost a panacea. Tar-water was the watery liquor obtained when a quart of wood-tar and a quart of water had been well shaken together and allowed to settle. This Berkeley found was used, taken internally, as a preventive and palliative of smallpox in the American colonies. He tried it and found it exceedingly useful, he says, for consumption, fevers, ulcers, pleurisy, gravel, stomachic disorders, &c.; and on it bases his *Siris* or *Treatise concerning the Virtues of Tar-water*, a chain of philosophical reflections, which, as Professor Fraser says, connects tar-water with the throne of the Divine Ruler of the universe.

The use of tar or pitch for 'tarring and feathering' obnoxious persons, still understood to be practised in some parts of the United States in execution of mob-law, is of very ancient origin, dating apparently at least from the times of the Crusades. According to Rymer's *Foedera* and Hakluyt's *Voyages*, King Richard I. enacted for the royal navy that a thief or felon 'lawfully convicted, shal haue his head shorne and boyling pitch powred vpon his head, and feathers or downe strawed vpon the same, wherby he may be knowne.' Scarron (q.v.) was reported to have tarred and feathered his own person as a carnival disguise.

Coal-tar or Gas-tar.—In the making of gas for illumination the coal is distilled at a higher temperature than that used for the production of ordinary coke, the result being that the constituents of the tar from the two processes differ.

Gas-tar contains more benzole and other colour-making materials than coke-tar. See COAL-TAR.

Coke-oven Tar.—For long the recovery of the volatile products, such as tar and ammonia, given off during the conversion of coal into coke was neglected. Coke-ovens are, however, now constructed which, among other improvements, include the collection of the tar, the nature of which depends upon the temperature at which the coal is distilled. In the Jameson coke-oven the temperature is low at the point of destructive distillation, and consequently the tar produced contains paraffin and the higher phenols. On the other hand, the Simon-Carvès coke-oven, in which a high temperature is reached, produces a tar more resembling that obtained in coal-gas making. It is characterised by the presence of naphthaline and Anthracene (q.v.), and small quantities of benzole and carbolic acid.

Blast-furnace Tar.—In some cases the tar from iron blast-furnaces in which coal is used as fuel is now recovered. It is of an intermediate quality between the two kinds of coke-tar just noticed, but rather more resembling that produced at a high temperature.

Lignite or Brown Coal and Peat were distilled some years ago to yield tars. The former gave a considerable yield of buttery tar containing about 15 per cent. of paraffin. From the latter a tar was obtained, also yielding some paraffin.

Tara. See TARO.

Tara, HILL OF, an eminence (507 feet) in County Meath, 7 miles SSE. of Navan. Here prior to 560 is said to have stood the hall of the kings of Ireland; and here O'Connell (q.v.) held a monster meeting on 15th August 1843.

Tara Fern (*Pteridium esculentum*), a large bracken-like fern whose rhizome was one of the principal articles of food of the Maoris before the settlement of New Zealand by British colonists. The rhizome, about an inch in circumference, was cut in pieces, dried, and stacked. For use it was steeped in water, dried in the sun, and then roasted. Good flour was obtained from it by beating on a stone.

Taranaki (formerly New Plymouth), a provincial district of New Zealand, occupying the south-west corner of the North Island; area, 5732 sq. m., of which a great part is dense forest. The coast is lined with iron-sand and smelting has been tried though not very successfully. The soil and climate are good for rearing stock, and being well watered grass and root-crops are abundant. Pop. 62,000. Capital, New Plymouth; pop. (with suburbs) 14,000.

Tarantella, a rapid dance in triplet time, accelerating as it continues, and sometimes accompanied either with song or with tambourine and castanets. It is probably named after Taranto in Apulia, but has been curiously associated with 'tarantism,' a disease specially rampant in the 16th century, and falsely attributed to a bite of the Tarantula (q.v.) spider. The dance was popularly supposed to be a remedy.

Taranto (anc. *Tarentum*), a seaport of Southern Italy, in the province of Lecce, situated on a rocky islet between the Mare Grande or Gulf of Taranto and the Mare Piccolo, an extensive natural harbour on the east side of the town, 72 miles SSE. of Bari by rail. The harbour is sheltered by two small islands, San Paolo and San Pietro, the *Cherades* of antiquity, and is closed by Cape San Vito on the south-east. The town is joined to the mainland by a six-arched bridge on the east side, and on the west by another, carrying a Byzantine aqueduct.

The principal buildings are a modernised cathedral dedicated to St Cataldo, a dubious 6th-century Irishman said to have been the first bishop of Tarentum, and a castle erected by Charles V. There is a very fine archaeological museum containing antiquities (principally vases and terracottas from tombs at Tarentum and elsewhere in Apulia, notably Canosa). The Mare Piccolo is still famous for its shell-fish, and a considerable portion of the population (1921, 103,807) finds employment in oyster and mussel fisheries. The honey and fruit are still famous also, but the chief importance of the town is as an arsenal and naval base, there being practically no commercial shipping.

The earliest habitation on the site was a terramara on the Scoglio del Tonno to the NW. of the town, exactly like those of the Po valley—apparently an isolated colony. The ancient Tarentum, founded by a body of Spartan emigrants about 708 B.C., grew to be the sovereign city of Magna Græcia, famous for its purple fisheries, potteries, wool manufactures, &c. Its 4th century coins are perhaps the finest the Greeks ever struck. A small part of an early Doric temple still exists (early 6th century B.C.), and other remains, including those of the city wall, and many tombs have been excavated. Here flourished about 400 B.C. the philosopher and geometer Archytas, under whom it became the centre of the Pythagorean sect. At the height of its greatness it insolently provoked a quarrel with Rome (281), was saved for a little by Pyrrhus, king of Epirus, but taken in 272, and retaken and punished severely in 209 for revolting to the side of Hannibal five years before. Under Augustus it was still essentially Greek, and was a favourite resort. Later it belonged to Byzantine, Saracen, and Norman masters, sharing the fortunes of the kingdom of Naples.

Tarantula, a name applied to various spiders, e.g. *Lycosa narbonensis*, a common South-European 'wolf-spider,' and *Eurypelma hentzi*, an American Avicularid. They give, like all spiders, a venomous bite, the seriousness of which is exaggerated. The name refers to the town Taranto where



Tarantula Spider, $\frac{3}{4}$ natural size.

Lycosid spiders are common. Unfortunately the generic name Tarantula belongs to an American genus of Pedipalpi, not spiders at all, but related to 'whip-scorpions.'

TARANTISM was a leaping or dancing mania, accompanied with gesticulations, contortions, and cries somewhat resembling those of St Vitus's Dance and other epidemic nervous diseases of the middle ages; but the affection differed from these in several respects, and was doubtless some not then recognised nervous malady, the symptoms of which are plainly those of hypochondriacal and

hysterical affections. The sufferers were subjected to extraordinary treatment, such as being buried up to the neck in earth. For the use of music and dancing, see TARANTELLA. Cases of tarantism relieved by dancing to music were reported from Asia Minor in 1911. Homœopathy uses a preparation of the spider's venom as a remedy for St Vitus's dance. See Hecker's *Epidemics of Middle Ages*.

Tarapacá, till 1883 the southernmost department of Peru, but annexed by Chile after the war. Area, 16,700 sq. m.; pop. 100,500. The country contains vast fields of nitrate of soda, as well as silver-mines and deposits of guano. Capital, Iquique (q.v.).

Tarare, a manufacturing town of France, in the dept. of Rhône, stands at the foot of Mont Tarare, 21 miles NW. of Lyons by rail. It manufactures muslins, tarlatans, silks, satins, plush, &c. Pop. 12,500.

Tarascon, a town and railway junction of France, in the Provencal department of Bouches-du-Rhône, 14 miles SW. of Avignon and connected with Beaucaire by a suspension bridge across the Rhone. King René's castle, now used as a prison, dates from 1400; and an old Gothic church is dedicated to St Martha, who here is said to have subdued a dragon called Tarasque. But Tarascon is chiefly famous through associations with the immortal Tartarin of Taudet's creation. It has manufactures of woollens and silks, 'saucissons d'Arles,' &c. Pop. 8300.

Tarawera. See NEW ZEALAND, Vol. VII. p. 487.

Taraxacum, a genus of Compositæ ranging from Novaya Zemlya to the Falkland Islands, including the Dandelion (q.v.).—TARAXACUM, or DANDELION-ROOT, is a tonic laxative in disorders of the liver.

Tarazona, an episcopal city of Spain, in the province of Saragossa, 20 miles S. of Tudela, on an affluent of the Ebro. Pop. 8300.

Tarbagatai, mountains, 10,000 feet high, in Russian Central Asia, on the frontier between Semipalatinsk (Cossack Republic) and Mongolian Zungaria.

Tarbes, a town in the south of France, capital of the department of Hantes Pyrénées, stands on the left bank of the Adour, 24½ miles by road ESE. of Pau and 12½ miles NW. of Lourdes (q.v.). There is a somewhat uninspiring cathedral, and a government arsenal, and the place is famed for its breed of light horses. Pop. (1921) 26,585. *Turba*, under the Romans, stood about 11 miles SE. of the present town. The bishopric is thought to date from the end of the 5th century. The town was in the hands of the English from 1360 to 1406. It is the birthplace of Barère, Gautier, and Foch.

Tardigrada (Lat. 'slow-paced'), a name given to the group or sub-order of mammals containing the two genera of Sloth (q.v.), remarkable for their sluggish movement and extraordinary tenacity of life under injury, starvation, or poison.

Tardigrada, or BEAR-ANIMALCULES, a group of animals of uncertain affinities. They appear to be degenerate Arthropoda, and show some resemblances to the mites and to the pycnogonids. They are of small size, a millimetre or less in length. They live in water, or on Sphagnum and other bog-mosses, but some have great power of resisting drought, and revive on being placed in water. In others the eggs have the same power. The body has a distinct head, but no abdomen, and is unsegmented. The animal moves about slowly by means of four pairs of very short, unjointed legs. Circulatory and respiratory organs seem to be absent, but the nervous system is well

developed. Eyes may be present. The tardigrades are hermaphrodite.

Tare, a number of species placed by some, along with the Lentil, in a genus *Ervum*, distinguished from *Vicia* (see *VERCH*), to which it is oftener assigned, by a cipitate stigma, downy all over. It is not supposed that the *Tare* of the New Testament has any affinity to these plants; it is doubtful what it is, but it seems not improbable that it is the Darnel (q.v.).

Tare and Tret, certain deductions usually made from the gross weight of goods. *Tare* is the weight of the box, cask, bag, or wrapping containing the goods; and the amount is obtained either by weighing the empty package itself, by taking an average of a few similar packages of equal size, or by mutually agreeing upon a certain proportion of the gross weight. The remainder is the *net weight*. Another deduction, at the rate of 4 lb. for every 104 lb., or $\frac{1}{26}$ th of the net weight, is then made, as an allowance for waste through dust, &c., and is called *tret*.

Tarentum. See *TARANTO*.

Target, in its modern sense, is the mark for aiming at in practising with cannon, rifle, bow, or the like. In its more ancient meaning a target or targe was a shield, circular in form, cut out of ox-hide, mounted on light but strong wood, and strengthened by bosses, spikes, &c. Of modern targets the simplest is that used for Archery (q.v.). Targets, as commonly thought of, are usually painted white and have a black 'bull's-eye' in the centre (varying in diameter according to the length of range), and three further rings called respectively 'inner,' 'magpie,' and 'outer.' Frequently only the upper half of the 'bull's-eye' is visible, i.e. black. The accessories are a butt, artificially constructed or cut in the face of a hill, to catch stray shots; a marker's shot-proof cell, near the targets; and a range of such length as can be procured. Previous to the inaugurating of the Wimbledon meeting in 1860 all targets were circular, and made of iron. From that year till 1873 they were square iron plates; but in 1874 targets of canvas and paper stretched on an iron frame were introduced, together with practice at objects moving at various rates of speed and at a greater or less distance, for which purpose a 'running-man target' was devised, consisting of a millboard figure running on wires, worked by the marker in the butt. There are also self-marking or automatic targets, constructed of several pieces, each of which when struck signals the fact; and disappearing targets, only visible to the firer for very short periods of time. For these and for field firing, targets take the form of flat wooden dummies shaped like men standing or kneeling. Black and brown head-and-shoulder silhouettes are the regular service targets, the bull's-eye variety having been largely discarded except for 'grouping' exercises. Dummies are also used as targets for field artillery practice. Heavy guns firing on a sea-range generally use a floating target, often a large timber framework lying at anchor or attached to buoys.

Targovica, or *TARGOWICZ*, a small town in Ukraine, was the scene (May 1792) of a plot by five Polish nobles to overthrow the constitution of 1791. See *POLAND*.

Targum (Assyr. *ragāmu*,* 'to speak,' whence *targumānu*, 'speaker'), the general term for the Aramaic versions—often paraphrases—of the Old Testament, which became necessary when, after and perhaps during the Babylonian Exile, Hebrew began to die out as the popular language, and was supplanted by Aramaic (see *ARAMEA*).

* But see p. 1076, *Hebr. & Engl. Lex.*, Oxf., 1906.

The origin of the Targum itself is shrouded in mystery. The first signs of it—as an already fixed institution—have been found by some in Nehemiah, viii. 8, and according to tradition Ezra and his coadjutors were its original founders. However this be, there can be no doubt that its beginnings belong to a comparatively early period. The Mishna (q.v.) contains a number of strict injunctions respecting it, and also respecting a certain guild of Meturgemans (whence 'dragoman') or interpreters, who had sprung up as professional followers of those learned men who, at a previous period, had volunteered their services in the translation and paraphrastic interpretation, both activities being implied by the term. At first, and indeed for many centuries, the Targum was not committed to writing, for the same reason that the 'Oral Law' or Halakhah itself was not at first intended ever to become fixed as a code for all times. In the course of time, however, both had to yield to circumstances, and their being written down was considered preferable to their being utterly forgotten, of which there was no small danger. Yet a small portion only of the immense mass of oral Targums that must have been produced has survived. All that is now extant are three distinct Targums on the Pentateuch, a Targum on the Prophets, Targums on the Hagiographa—viz. on Psalms, Job, Proverbs, the five 'Megilloth' (Song of Songs, Ruth, Lamentations, Esther, Ecclesiastes), another Targum on Esther, one on Chronicles, one on Daniel, and one on the apocryphal pieces of Esther. The most important of the three Pentateuch Targums is the one named after Onkelos, probably a corruption of Akylas (Aquila, a proselyte, one of Gamaliel's pupils), whose Greek version had become so popular that this Aramaic version was honoured with being called after it. This Targum seems to have been originally produced among the scholars of R. Akiba between 150 and 200 A.D. in Palestine, and sent to Babylonia, where it was more needed; wherefore it is called *Babli*. Here it was probably edited about 300, and afterwards vowelled in the Babylonian method. Subsequently vowelled in the Palestinian method, it spread from Palestine over the world. It is an excellent translation for the people, and adheres more closely to the Masoretic text than any other ancient translation. It is useful for the exegete, the linguist, and the antiquary.

Two other Targums on the Pentateuch have hitherto been known as Targum Jonathan ben Uzziel and Targum Jerushalmi. They are of Palestinian or Syrian growth. Jerushalmi is fragmentary, and appears to be a Haggadic supplement to Onkelos. The Pseudo-Jonathan, by its maturer angelology, its abbreviations, and other signs, appears to be a later recension of the Jerushalmi. It cannot well have been composed before 750. As a version this Targum is of small importance; but it is valuable as a storehouse of allegories, parables, sagas, and the like popular poetry of its time. Its language and grammar are exceedingly corrupt; it abounds, moreover, with foreign—Greek, Latin, Persian, and Arabic—terms. It mentions Constantinople (Numbers, xxiv. 19, 24); and names Khadija (or Ayesha) and Fatima (Genesis, xxi. 21). Its general use lies more in the direction of Jewish literature itself, as well as of archæology and antiquities of the early Christian centuries, than in that of a mere direct interpretation of the Bible text. The Targum on the Prophets is generally and erroneously ascribed to Jonathan ben Uzziel, an eminent scholar of Hillel the Elder; the fact being that, except for one spurious Talmudical passage, in which mention is made of his having translated the Prophets, this

Targum is everywhere else, from the Talmud down to the authorities of the 10th century, ascribed to one R. Joseph, president of the Babylonian school of Pumbeditha about 322. This Targum, while tolerably literal in the first—the historical—books, gradually becomes a frame for Haggada, which it introduces at every turn and at great lengths. It is considerably interpolated, containing historical bits disguised, or rather typified, lyrical pieces of some poetic value, and much Messianic lore. In language and general manner it resembles Onkelos, which evidently lay before the author.

Joseph the Blind, to whom the foregoing Targum is ascribed, is the reputed author of Targums on the Hagiographa. Several centuries lie between him and them, their date being approximately between 800 and 1000. Certain distinctions between the different books must further be made. The Targums on Psalms, Job, and Proverbs were probably contemporaneous compositions due to private enterprise in Syria. The two former are made more paraphrastic than the last, which resembles closely the Syriac version. The paraphrase on the five 'Megilloth' mentions the Mohammedans, and is of later date; probably one man's work. It is principally a collection of more or less poetical fancies, traditions, and legends, to which the single verse in hand merely seems to furnish the keynote. Its dialect lies somewhat between the East and West Aramaic. The Targum on the Book of Chronicles—almost unknown until it was printed in the 17th century—also belongs to a late period, and was probably composed in Palestine. There are some useful philological, historical, and chiefly geographical hints to be gleaned from it, but nothing more; least of all can it be used exegetically. A Persian version of a Targum on Daniel (unedited) is all that has been discovered on that book as yet. It was probably composed in the 12th century, the influence of the early Crusades being plainly visible in it. On the paraphrase of the apocryphal pieces of Esther we shall not dwell here, any more than on the scanty fragments of a 'Palestinian Targum' that are found either interspersed in the general (Babylonian) Targum, or as independent pieces. It seems probable that more of this Palestinian version will come to light some day, as authorities of a few centuries back still quote from it rather largely. At present, however, their quotations are nearly all that is known. By 900 in Africa and Spain the Targum had begun to be disused in public, Arabic or the national language being substituted. In Yemen the Aramaic Targum is still used in the ancient manner, the meturgeman standing beside the reader and rendering verse by verse. In London the prophetic lesson (Jer. viii. 13—ix. 23) is still read with a Spanish Targum in the Sefardic synagogues on the Fast of Ab.

The Targum of Onkelos was first printed unvowelled in Bologna, 1482; vowelled, Lisbon, 1491; more or less incorrectly in the Bomberg Rabbinical Bible of Venice (1518) and in subsequent editions; the Complutensian Polyglot (1517); the Biblia Regia of Antwerp (1569); and Walton's Polyglot (Lond. 1657). Buxtorf's edition (1618-19) is vitiated by attempts to conform it to biblical Aramaic. The Sabionetta edition (1557) is the best till Abr. Berliner's reproduction of this (Berlin, 1884), with an exhaustive essay. The Targum on the Prophets appears in the Bomberg, Complutensian, Antwerp, Buxtorf, and Walton Bibles. It is edited by Paul de Lagarde (Leip. 1872). He edited the Targum on the Hagiographa (1873). See Frankel, *Zu d. Targum der Propheten* (Breslau, 1872); Pauli, *Chaldee Paraphrase on Isaiah* (Lond. 1872); the *Targum of Onkelos and Jonathan on the Pentateuch* (1862 and 1865), by Etheridge.

The late Chief Rabbi, Dr N. M. Adler, composed a valuable commentary on the Targum on the Pentateuch, called *Nethinah lag-Ger*. This is printed in certain Rabbinic Bibles, e.g. Wilna, 1886.

See the articles (with bibliographies) by I. Abrahams (Hastings, *E.R.E.*, xii. 202); F. C. Burkitt (in article 'Texts and Versions,' *Ency. Bibl.*, iv. 5028); J. F. Stenning (*Ency. Br.*, xxvi. 419); W. Bacher (*Jew. Ency.*, xii. 57); T. Walker (Hastings, *Dict. Bible*, 1902, iv. 678); W. Oosterley (Hastings, *Dict. Bible*, 1909, p. 893), also in Oosterley and Box, *Religion and Worship of the Syn.*, ed. 1911, p. 46.

Tarifa, the southernmost town on the continent of Europe, is a seaport of Spain, in the province of Cádiz in Andalusia, and is situated 21 miles SW. of Gibraltar. The town is still quite Moorish in aspect, and retains its alcázar and battlemented Arab walls. A causeway connects it with a small island, on which are some powerful fortifications and a lighthouse, 135 feet above sea-level. Tunny and anchovy fishing is and has been since Roman times the principal occupation of the inhabitants, but the preparation of leather is also carried on, and there is a trade in sweet oranges. Tarifa, called Julia Joza by Strabo, was occupied in 710 A.D. by the pioneers of the Moorish invasion, under Tarif Abū-Zor'a, whence it obtained its Arabic name of Jeziret-Tarif (Tarif's island). It was taken from the Moslems, after an obstinate siege, in 1292, by Sancho IV. of Castile, and its first Spanish governor was Alonzo Perez du Guzman, celebrated in the *Romancero* for his valiant defence of the town against the besieging Moors in 1294. During the Peninsular war Tarifa was successfully defended by Gough with 1800 British troops and 700 Spaniards against a besieging army of 10,000 French (December 1811 to January 1812). Pop. 12,000.

Tariff (from an Arabic word for notification), a table or catalogue, generally drawn up in alphabetical order, of the duties, drawbacks, bounties, &c., charged or allowed on different kinds of merchandise, as settled by authority, or agreed to between different states. The principles of the tariffs of different countries depend on their respective commercial policy, and on the fluctuating interests and wants of the community. The duties may be prohibitory, retaliatory, countervailing, or differential, and may be designed to bring in revenue or to afford protection without definite thought of revenue. A *single-line* tariff, usually a revenue tariff, consists of one schedule of duties to be applied irrespective of country or conditions. A *double-line* (or *multiple*) tariff consists of a schedule of two (or more) rates for each article. Double-line tariffs are: (a) *general conventional* (as in Germany), in which a general rate of duty is fixed by the legislature, while a second or conventional rate results from the operation of commercial conventions and 'most-favoured-nation' clauses; (b) *maximum and minimum* (as in the United States), in which two rates, a higher and a lower, are fixed by the legislature, the lower being applied to favoured countries. These broad distinctions are apt to be blurred in particular cases. Duties may be: (a) *ad valorem*, i.e. assessed as a percentage of the value of the article; (b) *specific*, i.e. based on some physical feature of the object, weight, length, specific gravity, &c.; (c) a combination of these two. A feature of modern tariff schedules is the tendency to specialisation of grades and qualities, and the preference for specific duties as being more satisfactory in practice. See T. E. G. Gregory, *Tariffs: a Study in Method* (1921). See CUSTOMS DUTIES, FREE TRADE, PROTECTION.

Tariff Reform, the name applied to the movement for imperial preference inaugurated in 1903 by Mr Joseph Chamberlain (q.v.). See CORN LAWS, FREE TRADE, PROTECTION.

Tarik. See GIBRALTAR.

Tarim River. See TURKESTAN (EASTERN); and ASIA.

Tarlatan, a thin, gauze-like fabric of cotton, used for ladies' ball-dresses, &c. It is either finished white or dyed or printed in colours. Tarare is the chief centre of this manufacture; the Swiss tarlatans are inferior.

Tarilton, RICHARD (d. 1588), a famous clown of Queen Elizabeth's day, on whom was fathered one of the best-known Jest-books (q.v.).

Tarn, a dept. in the south of France, bounded on the N. by the depts. of Aveyron and Tarn-et-Garonne, receives its name from the river Tarn, an affluent of the Garonne. Area, 2231 sq. m.; pop. (1881) 359,223; (1921) 295,588. The surface is in general elevated, and in the south and south-east are the Montagne Noire and the Lacauze branches of the Cévennes. Wooded mountains, vine-clad hills, beautiful valleys, and fertile or grass-producing tracts are the principal features of the landscape. A considerable part of the surface is covered with forests, chiefly of oak and beech. The dept. is for the most part agricultural, grain, wine, fruit, potatoes, chestnuts, and cattle being amongst the chief produce. Coal is mined; and wool-spinning, silk-spinning, dyeing, the making of steel goods, glass, and pottery are local industries. Tarn is divided into four arrondissements—Albi, Castres, Gaillac, and Lavaur; Albi is the capital.

Tarn-et-Garonne, a small dept. in the south of France, bounded on the SE. by the dept. of Tarn. Area, 1440 sq. m.; pop. (1881) 217,056; (1921) 159,559. The principal river is the Garonne, with its affluents the Tarn and Aveyron. The surface is largely occupied by plateaus, about 1000 feet in average altitude; the highest hills do not rise above 1600 feet. The climate is temperate. Cereals are raised, also wine, fruit, hemp, &c. Hydraulic lime, calcium phosphate, and barytes are worked, there is some copper-smelting and some manufactures of straw hats, silk, and paper. The dept. is divided into the three arrondissements of Montauban, Castelsarrasin, and Moissac; Montauban is the capital.

Tarnopol, a town of Eastern Galicia, on the Sereth, 80 miles ESE. of Lemberg by rail. Pop. 30,900.

Tarnow, a trading town of Polish Galicia, 50 miles E. of Cracow by rail. It has a theological college and a fine cathedral. Pop. 36,000.

Taro (*Colocasia antiquorum*), a plant of the Araceæ, of a genus akin to the Cocco (q.v.) or Eddoes, cultivated for its roots, which are a principal article of food in the South Sea Islands. They are washed to take away their acidity, and cooked in the same way as bread-fruit; they may also be boiled or made into a pudding. A pleasant flour is made of taro. The plant has no stalk; broad, heart-shaped leaves spring from the root; and the flower is produced in a spathe. The leaves are used as spinach.

Tarots. See CARDS.

Tarpan. See HORSE.

Tarpaulin, strong linen, hempen, jute, or cotton cloth, coated with tar or pitch or other material to render it waterproof.

Tarpeian Rock. See CAPITOL.

Tarpon (*Megalops atlanticus*), an American food-fish belonging to the Clupeidæ, much sought after by sportsmen, is common in the warmer Atlantic waters and off the shores of the Gulf states, and attains a length of 6 feet. It is sometimes called Jew-fish.

Tarquinii. See CORNETO.

Tarquinius, the family name of two kings of Rome, derived from the Etruscan city of Tarquinii—and doubtless implying the domination of

that city over a district south of the Tiber. The first, Lucius Tarquinius Priscus, is said to have reigned at Rome 616–578 B.C., and to have considerably modified the constitution, and to have begun the Servian agger and the Circus Maximus.—Lucius Tarquinius Superbus (534–510), the seventh and last king of Rome, was a capable but intolerable despot, the chief events of whose reign are given at ROME. See LUCRETIA.

Tarragon, an aromatic plant (*Artemisia Dracunculus*; see WORMWOOD) used for flavouring vinegar, sauces, &c.

Tarragona, a seaport of Spain, chief city of the modern province of Tarragona, situated on the Mediterranean shore, at the mouth of the Francoli, 60 miles W. of Barcelona by rail. The upper and older town is irregular and dirty, and is girdled with ramparts; the lower is regular and open, and defended by two forts. Tarragona is the seat of a bishop. The Gothic cathedral, one of the finest of its kind in Spain, dates from about 1120. There are some anchovy, tunny, and sardine fisheries, and a few unimportant manufactures. Liqueur is made by the exiled monks of the Grande Chartreuse (q.v.). A considerable miscellaneous trade is done through the harbour at the SW. of the new town. Pop. (1920) 27,883. Tarragona, the Roman *Tarraco*, was the capital of the Roman province of Tarraconensis. Among the Roman antiquities are the remains of an amphitheatre, which has been used as a quarry; a magnificent aqueduct, 96 feet high and 700 feet long; and near the town the Tower of the Scipios, much decayed. Tarragona was taken by storm by the French under Suchet in 1811, but in August 1813 its fortifications were blown up by him when unable longer to hold out against the English.

Tarrytown, a village of New York, on the Hudson, 21 miles by rail N. of New York City. It has some manufactures. Close by Major André was captured in 1780; and two miles to the south Washington Irving spent his last years, and there lies buried. Pop. 6000.

Tarshish, probably the same as *Tartessus*, which is the Latin form for the Greek name of a city and emporium of the Phoenicians in Spain, near the mouth of the Guadalquivir, but used of the whole region—subsequently known as Andalusia (q.v.). Tarshish is frequently mentioned in the Bible. Speaking of Tyre, Ezekiel (xxvii. 12) says—'Tarshish was thy merchant by reason of the multitude of all kinds of riches'; notably there were here great fisheries of tunny and muræna, and rich mines of silver and other metals. Less likely are the views that Tarshish was simply Tarsus (q.v.), or else a part of Yemen, near Ophir (q.v.). The site of Tartessus was explored in 1911 and 1919–22 by Professor Adolf Schulten, who ascribes the origin (in the 3d millennium B.C.) and early importance of Tartessus to Cretan merchants, and its distinction (6th century B.C.) to the Carthaginians. See A. Schulten, *Tartessos* (Hamburg, 1922).

Tarsia-work. See INLAYING.

Tarsier (Tarsius). See LEMUR.

Tarsipes, a small Australian honey-sucking marsupial, of the family Phalangistidæ, about the size of a mouse. See MARSUPIALS, PHALANGER.

Tarsus, anciently chief city of Cilicia, and one of the most important in Asia Minor, on the river Cydnus, 12 miles from the sea, in the midst of a productive plain. It was a great emporium for the traffic carried on between Syria, Egypt, and the central region of Asia Minor. In the time of the Romans two great roads led from Tarsus, one north across the Taurus by the 'Cilician Gates,'

and the other east to Antioch by the 'Amanian' and 'Syrian Gates.' Tarsus, which was sacred to Baal Tars, may have originated in an Ionian colony. It fell to the Assyrian Shalmaneser about 830 B.C., and joined unsuccessfully in a revolt in 696. In the *Anabasis* of Xenophon it figures as a wealthy and populous city, ruled by a prince tributary to Persia. In the time of Alexander the Great it was governed by a Persian satrap; it next passed under the dominion of the Seleucidae, and finally became the capital of the Roman province of Cilicia (66 B.C.). At Tarsus Antony received Cleopatra, when, as Aphrodite, she sailed up the Cydnus, with magnificent luxury. Under the early Roman emperors Tarsus was as renowned for its culture as for its commerce, Strabo placing it, in respect to its zeal for learning, above even Athens and Alexandria. The natives were vain and luxurious; a Moslem general estimated their number at 100,000. Weaving goats' hair was the staple manufacture. It was the birthplace of the apostle Paul (q.v.), who received the greater part of his education here; the Stoic Antipater and the philosopher Athenodorus were also natives, and here the Emperor Julian was buried. Gradually, during the confusions that accompanied the decline of the Roman and Byzantine power, it came into the hands of the Turks, and fell into comparative decay; but even yet this modern, squalid, and ruinous city, under the name of *Tarso* or *Tersus*, has a permanent population of 7000, and a pop. of 30,000 in winter, and exports corn, cotton, wool, gall-nuts, wax, goats' hair, skins, hides, &c.

Tartan. See HIGHLANDS.

Tartar, a mixture of bitartrate of potash and tartrate of lime, is a deposit formed from wine, and known in its crude form as Argol (q.v.). The name, given by the alchemists, is usually referred to Gr. *tartaros*; but some derive it from Arab. *durd*, 'dregs.' See CREAM OF TARTAR, TARTARIC ACID. For tartar on the teeth, see DENTISTRY; for tartar emetic, ANTIMONY.

Tartarian Lamb. See BAROMETZ.

Tartaric Acid, $C_2H_2(OH)_2(COOH)_2$, exists free or in combination with bases in the fruits and juices of many plants. In the rowan, grape, and pine-apple it gives a subacid flavour. The commercial source is *tartar*, or argol, an impure cream of tartar deposited in wine vats. This is boiled with chalk, and the insoluble tartrate of lime is removed by straining. On treatment with sulphuric acid and purification, tartaric acid is obtained in the form of large transparent, prismatic crystals, which are readily soluble in water. They possess a pleasant acid taste, and the solution reddens litmus. When rubbed in the dark the crystals become luminous. When tartaric acid is heated it melts, forming the isomeric pyro-tartaric acid, and by further heating it is broken up into a number of bodies, formic acid, acetone, and carbonic acid being among the number.

Besides the tartaric acid of commerce there are others, isomeric with the above, known to chemists. These differ mainly in the power of rotating the plane of Polarisation (q.v.) of light to the right or the left. The ordinary acid rotates it to the right, and another rotates it to the left, so that when mixed in equal proportions and dissolved the solution has no action on polarised light at all. Such a compound exists in nature, and is known as *racemic acid*. It gave rise to many important researches and discoveries, owing to its similarity to tartaric acid, except in its being inactive to polarised light. To Pasteur is due the above explanation of its peculiar behaviour. Tartaric acid is largely used in dyeing

and calico-printing, and in the manufacture of aerated waters and confections. Being a dibasic acid (see ACIDS), it forms a large number of salts, many of which are important. *Bitartrate of potash*, or *cream of tartar*, $KHC_4H_4O_6$, is obtained by purifying the crude argol by crystallisation. It is used, along with baking soda, by housewives, as a baking powder. Medicinally it is a useful purgative, and is a favourite domestic remedy for clearing the blood in spring-time. *Tartarated iron* or *tartrate of iron and potash* is a mild tonic, which, when dissolved in sherry, constitutes iron wine. *Tartrate of potash and antimony*, or *tartar emetic*, $KSbOC_4H_4O_6$, has been long used in medicine, in doses of $\frac{1}{16}$ to $\frac{1}{4}$ of a grain; it is a powerful sudorific, but in larger doses, 1 to 3 grains, it acts as an emetic. It has gained considerable notoriety through being employed in several famous poisoning cases which have come before the public. It should never be in unskilful hands, as $\frac{3}{4}$ grain has proved fatal to a child, and 2 grains in one case at least were fatal to an adult.

Tartars. See TATARS.

Tartarus, according to Homer, is a deep and sunless abyss, as far below Hades as earth is below heaven, and closed in by iron gates. Into Tartarus Zeus hurled those who rebelled against his authority, as Kronos and the Titans. Afterwards the name was employed sometimes as synonymous with Hades or the under-world generally, but more frequently for the place of damnation where the wicked were punished after death. See HELL.

Tartary. See TATARS.

Tartessus. See TARSHISH.

Tartini, GIUSEPPE (1692-1770), a celebrated Italian musician and composer, born at Pirano in Istria. At Padua he studied law, but gave it up for music and fencing. Having secretly married the niece of the Archbishop of Padua, he had to take refuge in a monastery at Assisi, where he became a proficient on the violin. In 1721 he was allowed to rejoin his wife, and return to Padua, where he was appointed solo violinist in the chapel of San Antonio, while seven years later he opened his famous school of violin-playing at Padua. He has been described as 'the greatest scientific and practical violinist of his day,' while of his numerous compositions the best known is the sonata, *Il Trillo del Diavolo*. He was the author of *A Treatise on Music*, and was the discoverer of the so-called grave harmonics, or third or combination sounds in sounding double stops.

Tartu. See DORPAT.

Tartuffe, the name of the chief character in Molière's most celebrated comedy, which has become a synonym in all languages for a hypocritical pretender to religion. See MOLIÈRE.

Tarudant, capital of the Moorish province of Sus, on the Sus, 40 miles from the sea; pop. 8500.

Tashkand, or TASHKENT, once the capital of Russian Turkestan, now the largest town of Uzbekistan (41° 20' N., 69° 18' E.), is watered by the Chirchik, which joins the Sir Darya about 50 miles to the SW. It consists of an ancient walled city and a new Russian quarter with broad streets bordered by canals and avenues of trees. Notable features are the university (1919), a fort, Russian schools of all grades, an observatory, library, and museum, and several learned societies (geographical, Eastern studies, &c.). It is connected with the European system of telegraphs, and by rail with Orenburg (1210 miles; since 1904) and the Caspian (1175 miles; since 1897). Tashkand has orchards and vineyards, and is a centre for Kalmuk wool. The Russian town has numerous industries (cotton-mills, tobacco factories, flour-

mills, &c.); the natives make metal, leather, and other goods. Pop. 245,000—55,000 in the Russian town, the rest mostly Sarts, Uzbegs, and Kirghiz. Tashkand was in 1810 conquered by Khokand, and since 1868 has been Russian. See TURKESTAN.

Tasmania, the only State of the Australian Commonwealth which lies apart from the mainland, is an island in the Southern Ocean, situated approximately between lats. 41° and 44° S. and longs. 144° and 149° E. Its greatest length and greatest breadth are each about 200 miles, and its area is 24,330 square miles. It is divided from Australia proper by Bass Straits, a channel about 150 miles wide, and the State includes the islands in the straits as far north as Kent's Group, about 39½° S., making its area up to 26,215 square miles.

The main island was discovered in 1642 by Abel Tasman, a Dutch voyager whom the governor of Batavia had commissioned to explore the Southern Ocean in the hope of discovering a rumoured southern continent. Tasman seems to have struck the coast somewhere near Macquarie Harbour, rounded the southern end, vainly attempted to explore Blackman's Bay (near which a sailor, swimming ashore, hoisted the Dutch flag), and left the coast almost opposite the point at which he had reached it, going thence eastwards to New Zealand. He named his discovery Van Diemen's Land, after the governor who had sent him out. One hundred and thirty years later a Frenchman, Marion du Fresne, followed almost exactly in Tasman's tracks, and effected a landing (not without attack from the aborigines) on the shores of Marion Bay. Next year the first Englishman, Tobias Furneaux, Cook's second-in-command on his second voyage, explored the southern shores confusedly, and misplaced many of Tasman's names—Cook, who anchored there in 1777, acquiescing in Furneaux's mistakes. At this time and for some years afterwards the shores thus visited were believed to be a part of the mainland; but in 1798 Matthew Flinders (q.v.) and George Bass completely circumnavigated the island. French navigators, for some reason, were especially attracted by it; La Pérouse in 1785 was particularly ordered to explore it, and may have done so; D'Entrecasteaux in 1692-93 made careful and excellent surveys of the south-eastern corner, and Baudin's expedition in 1802 surveyed the whole coast-line except a strip on the west. This attention naturally excited the suspicions of the English authorities in New South Wales, and early in 1803 hasty settlements were made at the mouths of the two chief rivers—the Derwent on the south, and the Tamar on the north; within a year or two both these were abandoned, and the final town-centres were established at Hobart and Launceston. For a short time each settlement had its own government; but Macquarie in 1813 appointed Colonel Davey lieutenant-governor of the whole island, and in 1825 the British parliament reduced the control of New South Wales to a shadow.

Settlement in the island proceeded more slowly than on the mainland, and on different lines. The Tasmanian aborigines, a less advanced race than the Australian, remained savage and hostile to the last (probably because they were from the first less tactfully treated), and a remnant was deported during the thirties to Flinders Island in the straits. The convict element in the settlements was both more prominent and worse in character, because it consisted of 'colonially convicted' prisoners—i.e. those who had committed fresh crimes after their arrival in New South Wales; hence escaped convicts who took to bushranging were exceptionally inhuman. The worst characters were isolated in a special settlement, at first at Macquarie Harbour on the west coast, afterwards at Port Arthur in

Tasman's Peninsula, which could be reached overland only across an extremely narrow neck of land, and was therefore a very safe prison. Governor Arthur (1824-36) maintained that free settlement must be subordinated to the interest of the convict prisons; though his successor, Sir John Franklin, attempted to encourage the free element, the next two governors were elected for their knowledge of convictism, and the abolition of transportation to the Australian mainland in 1840 greatly increased the number sent to Tasmania. It was not till 1852 that the British government agreed to send no more convicts anywhere east of the Bight; and this promise opened the way for the constitution of Tasmania as a self-governing colony—a promotion marked by the adoption of the present name, since up to that date the island had been always called by the name Tasman gave it. Thenceforth the little colony pursued a career just like those of its larger neighbours, developing agricultural settlement and orchards in the river-valleys, breeding sheep of high quality on the uplands, and from 1871 onwards discovering great mineral wealth, especially in the previously neglected north-west. In 1901 the colony became a State of the Commonwealth, receiving exceptional treatment at first by the concession of more representation than its population justified, afterwards by a series of special money-grants.

Geography.—The island is both geographically and geologically an outlier of the mainland, the long ridges of the eastern Australian tableland being traceable southwards through the island-groups of Bass Strait into Tasmania itself. A 300-foot elevation of the sea-bed would re-establish land-connection with Victoria. The tableland has been much worn away by river action, its exposure to the heavy rainfall of the 'roaring forties' both denuding and incising it severely. The central plateau, which carries on its surface several large lakes, is a triangular area about 50 miles in the side, and falls steeply to the valleys of the Tamar and Derwent tributaries in terraces, called 'bluffs' in the north and 'tiers' elsewhere. The plateau itself is also dissected by rivers, which have cut themselves deep gorges almost from the point at which they leave their parent lakes. Outside it there is practically no level ground in the island, though a region of comparatively low foothills stretches along the north coast from the Tamar to the Forth. The rest is occupied by knots of rugged hills: the north-eastern, delimited by the Tamar and South Esk, culminates in Mount Barrow (4664 feet) and Ben Lomond (whose highest point is Legge's Peak, 5160 feet); the south-eastern, whose highest hill is St Paul's Dome (3368 feet), lies east of the Jordan and Macquarie rivers; while the whole western area—nearly one-third—of the island is a tangle of difficult and as yet scarcely known ranges intersected by the many tributaries of the Arthur, Pieman, Gordon, and Huon. Cradle Mountain (5069 feet), the second highest in Tasmania, is on the line between this tangle and the central plateau; several others, including Mount Wellington behind Hobart, pass 4000 feet; but the chief interest of the western ranges centres on the highly mineralised district between Macquarie Harbour and the north coast.

The chief rivers are the Derwent (107 miles) and Tamar (160 miles); the latter river for the greater part of its course is known as the South Esk, the name 'Tamar' properly applying only to the 40 miles of navigable estuary. The Huon is also over 100 miles long, but the greater part of its course lies in unused country. The mass of settlement lies either in the basins of the two principal rivers or among the foothills of the north coast. Hobart, with 58,740 inhabitants, and Launceston, with about

25,000, are the only towns of importance; but Devonport on the north coast and a couple of mining townships in the west approach the 5000 mark.

Other notable physical features are the lakes and the island groups of Bass Straits. With the exception of Lake St Clair (9500 acres, 550 feet deep), which lies among high hills, all the big lakes are shallow depressions in the central plateau, and most drain to the Derwent; the Great Lake, though 28,400 acres in area, is barely 20 feet deep. Several are now well stocked with English trout, which in the Great Lake are said to have been altered by gross feeding into the bull trout form. Of the islands, the Kent and Flinders groups represent a former connection with Victoria, from Wilson's Promontory to Cape Portland, by a ridge which continues through Ben Lomond to Tasman's Peninsula; King Island and the Hunter group are relics of a similar connection between the Otway ranges and Cape Grim, which continues through Cradle Mountain to Mount Wellington and the Huon ranges. In the early days these islands were the resort of whalers, nowadays they are merely detached settlements sharing the interests of their larger neighbour. Among the many small islands off the ocean-girt coasts, two—Bruni Island in Storm Bay, and Maria Island above Tasman Peninsula—deserve mention for their size; otherwise they have no separate interest, though Maria Island was the scene of a risky experiment in silkworm-culture.

Although geologically homogeneous, the mountainous area which constitutes most of Tasmania is divided into two well-marked and very distinct sections. Like the neighbouring mainland, the island gets its weather mainly from the west, where the 'roaring forties' provide a steady supply of moisture. Consequently the eastern hills, which receive the winds only after they have been drained of their load, are comparatively dry, and their vegetation and products approximate to those of southern Victoria. The moderate rainfall (averaging 22-30 inches) nourishes forests of eucalyptus, banksia, and similar trees. The western ranges are hid under a very different kind of forest—'pines' (*Athrotaxis* and *Dacrydium*), beeches (*Nothofagus*), and sassafras furnishing the taller timber, with an almost impenetrable undergrowth of tea-tree, tree-ferns, and *Bauera* scrub that has been a principal factor in defeating many attempts to explore the region. The excessive rainfall (80 to 117 inches—'over three yards of rain,' say the few settlers there) which nourishes this enormous plant-growth also swells the rivers, and makes of the central lakes a series of inexhaustible reservoirs whose value is at last being utilised.

Geology.—Owing to the ruggedness and remoteness from settlement of a great part of the island's area, its geology has been only approximately worked out. Traces of the Archæan (supposedly Algonkian) foundation of the tableland are found all along long. 146°—at Port Davey in the south, in the King William and Denison Ranges and the Collingwood valley in the centre, and in the Forth valley and near Rocky Cape in the north. Cambrian sandstones appear slightly to the east, near Latrobe in the north and near Mount Field West in the centre—both about long. 146° 30'. The north and north-eastern coastal district are largely Ordovician, and the west coast ranges Silurian (the massive conglomerates of the north-west, once considered Devonian, are now dated further back). Devonian granites are exposed along long. 148° as far south as Maria Island, and seem responsible for the great tin-fields of Zeehan, Mount Heemskirk, and Mount Bischoff in the west, and of Ben Lomond and the Blue Tier in the east. The Mount Lyell rocks may be Devonian or earlier. South-eastern

Tasmania is predominantly Permo-carboniferous, and coal-beds of that age are mined in the Mersey valley west of Launceston, and near Port Cygnet below Hobart. A much better quality of coal, mined along the upper valley of the South Esk, is variously attributed to upper Carboniferous and to Mesozoic series. The former seems more probable, the Mesozoic age being represented in Tasmania only by some variegated sandstones in the Hobart district, and by the great sheet of dolerites and diabases which almost covers the central plateau, preserving it from the extreme dissection which has been the fate of most of the great tableland. Mount Wellington is a fragment of this sheet. Tertiary rocks cannot be subdivided as in Europe; the lowest seem to be the marine fossiliferous beds at Table Cape on the north coast, in which occurs a very early marsupial; above them come the lake deposits of the Tamar valley and the alluvial tin-bearing sands and gravels of the north-east; then come sheets of basalt, usually olivine, well displayed in the promontory of Circular Head; above these sheets come more gravel drifts, and the close of the Tertiary period was marked by a glacial epoch, of which many traces are left, between Macquarie Harbour and the central plateau. The same district shows glacial deposits of late Palæozoic age.

Aborigines.—The aborigines of Tasmania, though believed by some writers to be Melanesians, or unaltered Australians, are now almost certainly classed as Negritos. It is still uncertain—and will probably always remain so—whether they were driven southwards through and out of Australia by the invading Dravidians who are represented by the present 'blackfellows,' or whether, as Huxley suggested, they reached Tasmania from New Caledonia by traversing lands now sunk below the Pacific along Australia's eastern shores. At any rate they seem to have left no trace of their passage through Australia itself, unless the peculiar shape of the cranial vault in certain South Australian tribes betokens intermarriage with women of the Tasmanian type. The race is quite extinct, and we depend for first-hand information about it on numerous casual accounts by unskilled observers, strengthened with a very few careful observations made by the one or two Europeans who took any trouble to know them. With these inadequate sources of information, however, H. Ling Roth has compiled an account of them which is not likely ever to be bettered.

Whereas the Australian aborigines are still in the Neolithic age, the Tasmanians never passed beyond a low Palæolithic stage, below even the drift and cave men of Europe. They knew nothing of ground stone implements; they could not draw; their canoes were mere bundles of bark lashed together with vegetable fibre; they went usually naked, and could not sew skins together for clothing, though they occasionally used single skins for covering; they obtained fire by rubbing a stick in the groove of another stick, not by the comparatively more civilised drill-method. Their hair was black and woolly, and their colour a dull black. Their numbers were very scanty; it is doubtful whether there were ever more than 200 in the island at any time during the British occupation. These were divided into, maybe, sixteen 'tribes,' which varied in number from 30 to 200, and spoke separate dialects of a single language; the tribes and dialects can be again grouped into four chief divisions—southern (below Hobart), western (along the coast from South-west Cape to Emu Bay), central (between Hobart and a line drawn from the Great Lake to St Patrick's Head), and north-eastern. Of these the central tribes were the biggest and most important, and came most into

contact (and conflict) with the European settlers. Of their social and religious systems very little is known, and what is known is of doubtful value, since the facts were observed for the most part after the introduction of a 'tame mob' of black-fellows from the mainland, and may have been the result of their teaching. But the religion was apparently a form of fetish-worship, and there are traces of a totem-system and of several tabus. Such government as there was seems to have been patriarchal.

It is usually stated that the last of the Tasmanian aborigines, a woman named Trucanini, died in 1873. She was certainly the last of the free aborigines who had inhabited the main island; but there is some probability that the last aboriginal of pure blood was Fanny Cochrane, born on Flinders Island of pure-blooded native parents after the deportations. Her native name, if she had one, is not known; her European name was given her by the catechist at the settlement where she lived as a girl.

Industries.—Up till a few years ago Tasmanian industries were practically all primary, and the prosperity of the island depended on its sheep, its mines, and its apple-orchards. The restricted area of its pasturages has always limited the expansion of its flocks, which for many years have numbered about 2 per cent. of the Commonwealth total. But the value of their wool amounts to nearly 4 per cent. of the Commonwealth total, since the island is Australia's chief nursery of stud merinos and of Shropshires. An important mineral district lies east of Launceston, tin and some gold being found in the north-east (Ringarooma district), and gold and coal in the upper valley of the South Esk. The chief mineral wealth lies, however, in the north-west, where the tin of Mount Bischoff, the silver-lead of Zeehan, and the gold and copper of Mount Lyell have yielded huge dividends to shareholders all over the world. No other district of Australia—except perhaps the tableland behind Cairns in northern Queensland—is so rich in a diversity of minerals; the value of the yield of gold, silver, lead, zinc, tin, copper, and osmiridium since 1875 is estimated at nearly 50 millions sterling. Iron, too, is found in the valley of the upper Blythe and at Mount Heemskirk, and magnetite in the basin of the Pieman River.

Roughly speaking, northern Tasmania is the home of sheep; eastern and western of the mining industry; the southern valleys, especially those of the Derwent and Huon, are packed with apple-orchards. The export of apples began in 1884, but was insignificant until the nineties; in 1914 over 2,000,000 cases were exported—half to the mainland states, half overseas. The progress since that year may be judged from the following table:

	To Mainland States.	Beyond Australia.
1914.....	1,096,397	951,722
1916.....	945,749	814,590
1918.....	825,058	None (no shipping was available).
1920.....	1,271,697	457,833
1922.....	1,399,530	1,354,553

These figures indicate that the Australian market is taking regularly all it needs, and expansion cannot be looked for there except in consequence of a great increase in population; the overseas market, which still affords opportunities for expansion, is unfortunately dependent on shipping facilities, which are conspicuously lacking.

Indeed, with a stationary wool-yield, a diminished mineral yield, and hampered apple-markets, Tasmania might have poor years in prospect but for the recent development of her secondary industries. This is due entirely to a hydro-electric

scheme, based on the great lake-reservoirs of the central plateau, which in 1926 provided 66,000 horse-power, has created within the last few years an important manufacturing district round Hobart, and is encouraging the creation of a second round Launceston. Among the new industries thus attracted to the island are electrolytic works for zinc-production, carbide manufactories, and the joint Australian establishment of three chocolate manufacturing firms, Cadbury's, Fry's, and Pascal's.

Government.—Tasmania sends six senators and five representatives to the federal parliament. The State government is of the usual Australian type (see AUSTRALIA). A council of 18 members (3 from Hobart, 2 from Launceston, 1 from each of 13 other constituencies) is chosen by electors with an educational or a small property qualification, which excludes about three-quarters of the adult population; a third of the council retires every two years. An assembly of 30 members, chosen by adult suffrage, includes 6 members elected in each of the 5 federal electorates, thus avoiding the multiplication of political divisions that confuses the organisation of the mainland states; a system of proportional representation which has been in use since 1909 seems to result regularly in an almost equal representation of parties, so that a by-election may easily create a deadlock. Members of both houses receive £150 a year; four ministers administer eight departments, and a few councillors are usually made honorary ministers. The council in Tasmania has for some reason been regarded as more of a stumbling-block to democracy than those in the mainland States, and not long ago it was altogether ignored by the lieutenant-governor (during an interregnum between two governors), Sir Herbert Nicholls deciding that council amendments to the appropriation bill were 'unconstitutional nullities,' and assenting to the bill as passed by the assembly alone. The Colonial Office, being consulted, merely said that if the lieutenant-governor was acting on the advice of his law-minister no question could arise as to the constitutionality of his action.

The State revenue averages about £13 per inhabitant, and the expenditure is slightly less; but this result is obtained only by the receipt from the Commonwealth of a special grant in addition to the 25s. per head capitation grant in which all the States share. Notable features of Tasmanian public finance are the heavy direct taxation (the highest in the Commonwealth) and the small return from public services, railways, &c.; on the other hand, the small size of the island and the compactness of its settlement make expenditure much lower in proportion to population than that of any other State.

Population, Education, &c.—At the census of 1921 the population was 213,780; on 31st March 1926 it was estimated at 212,139. As the birth-rate is well above the Commonwealth average, this decrease (which has been noticeable since 1900) must be attributed to the steady migration to the mainland of young Tasmanians looking for employment. Ninety-one per cent. of the inhabitants are Australian-born—the highest proportion in the Commonwealth—and 7 per cent. British-born. Barely 27 per cent. are collected in the capital, which is an exceptionally small proportion for Australia. Primary education is of the normal Australian type (see EDUCATION), but private elementary schools are allowed under control of a teachers' registration board. In State schools no fees have been charged since 1908. Of the secondary schools the Hutchins School at Hobart dates from Sir John Franklin's time; some of the State high schools include agricultural training in their curriculum. The University of Tasmania, established

in 1889, has 7 professors and 19 lecturers for 145 matriculated students.

See AUSTRALIA and works there cited. For the early history of the colony West's *History of Tasmania* and Backhouse's *Narrative of a Visit to the Australian Colonies* are useful; J. B. Walker's *Early Tasmania* is a careful study of early discoveries; for recent years and descriptive matter the *Handbook of Tasmania*, published in 1914, and many pamphlets issued by the Government Tourist Bureau, are worth consulting.

Tasmanian Devil. See DASYURE.

Tasman Sea, the name accepted by the Admiralty in 1891 for the sea between New Zealand and the islands to the north-west of it on the one hand, and Australia and Tasmania on the other.

Tassie, JAMES (1735-99). See GEM.

Tassisudon, summer capital of Bhutan (q.v.).

Tasso, BERNARDO, now chiefly remembered as the father of the great Torquato, was, however, held in high esteem as a poet in his own day. Born at Venice in 1493, he belonged to an illustrious family of Bergamo, who had held the administration of the posts in Italy and other countries, and hence show in their armorial bearings a post-horn and the skin of a badger (*tasso*), of which fur the post-horses' frontlets were made. Bernardo, left an orphan, studied at Padua, where he gained the friendship of the famous Cardinal Bembo, the then oracle of literary taste, and, becoming secretary of Guido Rangone, was sent to France (1528). Here he entered the service of Renée, daughter of Louis XII. of France, wife of Ercole II. d'Este, reigning Duke of Ferrara, and mother of the Alfonso and Leonora d'Este whose influence was to be so great on the future destiny of Bernardo's famous son. A few years later we find him in the service of Sanseverino, prince of Salerno, whom he followed in many travels, joining with him the expedition of the emperor, Charles V., against the Tunisian pirates in 1535, and visiting Spain, Flanders, and France a second time.

Bernardo's literary productions had been chiefly lyrical, of the bombastical and hyperbolic type affected by the imitators of Petrarch; he had followed the movement made at this time to adapt Italian verse to Latin metrical forms. Sanseverino settled on him a pension and allowed him to retire to Sorrento, there to dedicate himself to the composition of an epic poem, the subject of which was the Amadis of Gaul and his adventures, as described in the admired Spanish romance by Ordenez de Montalvo (published about 1492). Bernardo married, probably in 1536, Porzia de' Rossi, belonging to a noble family from Pistoja in Tuscany. In 1537 a daughter, Cornelia, was born to them, and in 1544 their only son, Torquato, the future great poet. Bernardo and his wife lived in perfect peace and unity, until in 1547 their prosperity came to a sudden end. Their protector Sanseverino resisted the attempt of the imperial viceroy to establish the Inquisition in Naples, fell into disfavour with the emperor, Charles V., and, joining the French king, was outlawed and had his estates confiscated. Poor Bernardo, who had followed his patron, was included in the same sentence. His wife and children took refuge in Naples with relatives; his little son was sent to him in Rome in 1554. For some years Bernardo led a wretched life there, still more embittered by the loss of his beloved wife, who died—perhaps by poison—in sorrow and poverty in Naples, 1556. He found a refuge later at the court of Urbino, where he finished his epic, *L'Amadigi*. Bernardo went to Venice to superintend the publication of his great work (4to, 1560), but it did not bring him the fame he had hoped. The last years of Bernardo's life were passed in the service of Duke

Guglielmo Gonzaga of Mantua, who made him podesta of Ostiglia. Here, on the 4th September 1569, he ended his long and troubled career, breathing his last in the arms of his beloved son. Bernardo's chief work, *L'Amadigi*, is now entirely forgotten; it is one of the many imitations of Ariosto's romantic epic, but exaggerated and inflated in style and unreal in sentiment; the verse, however, is skilful and melodious. He began another epic, *Floridante*, finished by his son, and published in 1587. Besides his numerous lyrics (2 vols. 1749) he left a copious and interesting correspondence.

See his Letters as edited with biography by G. Campori (Bologna, 1869); the *Lettere inedite*, by Portioli (Mantua, 1871); and Solerti's Life of his son (1895).

Tasso, TORQUATO, son of the preceding, was born at Sorrento, near Naples, 11th March 1544. He was one of the greatest of Italian poets, though belonging to a time of decadence, to that later 16th century which saw the decline of art and literature, and religious and political liberty in the peninsula crushed under the power and bigotry of Spain. After his father was exiled Torquato lived with his mother, the exemplary Porzia de' Rossi, in Naples, and received his earliest instruction at the Jesuit school there. In 1554 he joined his father in Rome, never again seeing his unfortunate mother, who died, broken-hearted, two years later.

He showed great precocity in his studies, read Latin and Greek fluently at an early age, and composed with ease both prose and verse in Italian. He shared his exiled father's wandering life; increasing his store of learning under his careful supervision at Pesaro, Urbino, and Venice. In 1560 Tasso was sent to study law and philosophy at Padua, and while there composed and published his first work, a romantic poem in twelve cantos, *Rinaldo*, which he dedicated to the Cardinal Luigi d'Este. In 1565 Tasso entered the service of this cardinal, and by him was introduced to the splendid court of his brother, Alfonso II. d'Este, reigning Duke of Ferrara. The youthful poet was appreciated and encouraged by the sisters of the duke—Lucrezia, afterwards Duchess of Urbino, and Leonora—two princesses renowned even amongst the cultured women of that day for their many brilliant gifts. Amid such congenial surroundings Tasso began his great epic poem and masterpiece, *La Gerusalemme Liberata*.

In 1571 he accompanied the Cardinal d'Este to France, and was received with favour by Charles IX. and his mother, Catharine de' Medici; and he was warmly welcomed by his brother-poets, chief amongst whom was Ronsard. On his return to Italy in the following year Tasso became definitely attached to the service of Duke Alfonso at Ferrara. This court had been the scene of the earliest revival of the profane drama in Italy towards the end of the 15th century, and it was for this celebrated stage that Tasso wrote in 1573 his beautiful pastoral play, *Aminta* (1581). The perfection of its style, moulded on classic models, and the melody of its verse won for this exquisite dramatic poem a wide popularity and many imitators. Tasso completed his great epic in 1575, and (like his father before him) submitted it before publication to the judgment of the distinguished savants and critics of the day. Their fault-finding (sometimes just, but pedantic and mixed with religious scruples) and Tasso's replies (never rebellious, and generally yielding, though always full of judgment and fine literary taste) are all recorded in his correspondence and in his *Apologia* of the poem. These conflicting considerations and discussions coming after his long poetical labours seem to have unhinged his sensitive and highly-strung mind, and in 1576 he

showed the first signs of the mental disorder which darkened all his later days. He became suspicious, melancholy, and particularly oppressed by the idea that he had offended against the church and been denounced to the Inquisition. On the 18th June 1577 Maffeo Veniero writes to the Grand-duke of Tuscany: 'Of Tasso I give you news that yesterday evening he was imprisoned for having, in the chamber of the Duchess of Urbino, drawn his knife on a serving-man, but he was arrested rather because of his disorder and to cure it than as a punishment. He is of a strange humour, believing himself to have sinned as a heretic, and also has the fear of being poisoned.'

After this outbreak the succeeding years of his life are one long chronicle of mental struggles and sufferings of every kind. His first confinement lasted only a few days, and he shortly afterwards fled from Ferrara. Wandering through Italy on foot, he made his way to Naples, where he was affectionately cared for by his sister, Cornelia; but even here he found no rest. He travelled to Rome, and northwards through the principal towns until he reached Turin, on foot and so poorly accoutred and strange in appearance that the guards refused him admittance until recognised by a former friend as the great poet. He was then honourably entertained by the Duke Carlo Emanuele of Savoy. His great longing was to return to Ferrara, the scene of his early triumphs and brightest memories, and in 1579 he seized the occasion of Duke Alfonso's second marriage to present himself anew at that court. He met with a cold reception, and deeply wounded by some real or imagined slight he broke in public into furious invectives against the duke, his courtiers, and all the world. On the 15th March of the same year he was confined by order of the duke in the hospital of St Anna in Ferrara, and there he remained a prisoner for seven years. During these miserable years he produced many noble verses and philosophical dialogues, and a vigorous defence of his *Jerusalem*, the publication of which, without his leave and with many errors, had sorely grieved him. His many piteous letters of appeal to his friends and patrons, from the pope downwards, for release from prison give a most complete and heart-rending picture of his sufferings at this time. The sad figure of the good, gentle, and great poet in a madhouse, while his famous epic was delighting Italy and all Europe, is one of the most pathetic in literary history, and one which may well interest posterity, even without the romance of his supposed passion for the Princess Leonora, a passion so often alluded to by later poets (especially Goethe, Goldoni, and Byron). There seems to be no positive proof that the unhappy poet nourished any other sentiment for the princess than that of the respectful devotion, admiration, and gratitude natural towards such a patroness. Certainly no manifestation of presumptuous love for the princess was the cause of his imprisonment; all contemporary accounts of his state point to his insanity, bearing the character of religious mania. But doubtless whatever may have been the nature of his feelings to Leonora her death in 1581 must have been a new grief to him. During her fatal illness Tasso writes from prison to her chaplain: 'If my Lady Leonora is better, as it comforts me to believe, and I greatly desire, humbly kiss her hands in my name, most reverend father, letting her know that I have grieved much for her illness, the which I have not bewailed in verse, because of I know not what tacit repugnance of my mind.'

Duke Alfonso had been repeatedly petitioned to set Tasso free. The cruel contrast between his fate and the daily growing fame of his great poem

(which had been reprinted six times in a few months) had greatly excited popular interest. At length in July 1586, by the intercession of the Prince Vincenzo Gonzaga, Tasso was liberated, and at once left Ferrara, never to return. He followed his new patron to Mantua, where he remained a year, and where he wrote a tragedy, *Torrismondo*, his only and not very successful effort of that kind. Broken in health and spirits, he began again his restless wanderings from town to town, spending, however, most of these later years in Rome and Naples, where he tried in vain to recover from his mother's relatives some part of her inheritance, or from the government his father's confiscated estates. He was, however, helped and protected by many kind friends and patrons eager to show honour to so great and unfortunate a genius. He busied himself in rewriting his great epic, according to the modifications proposed by his numerous critics; he tried to observe more strictly the classic unities and historical accuracy, to remove profane episodes and to treat more of religion and theology. The result, a poor spectre of his living masterpiece, even the style and verse being inferior, was published under the name *Gerusalemme Conquistata* (Rome, 1593, in 4to), and dedicated to Tasso's latest patron, Cardinal Cinzio Aldobrandini, nephew of Pope Clement VIII. By this pope he was summoned to Rome to be crowned on the Capitol as poet-laureate, like Petrarch. The ceremony, however, never took place, for on Tasso's arrival in the papal city his already weakened health became worse, and he retired to the care of the monks of Sant' Onofrio, a quiet convent on the Janiculum, where, resigned and peaceful, he breathed his last on the 25th April 1595.

Tasso, although not the last great poet that Italy has produced, is certainly the last whose influence made itself felt throughout Europe, and his *Jerusalem* is the culminating poetical product of his age, as Dante's *Divine Comedy* and Ariosto's *Orlando* are of the two preceding centuries. In our own literature we find traces of his influence notably in Milton. His great poem is, like himself, a typical product of his time, with its blind idolatry of classic forms conflicting with newly-revived religious superstition and bigotry, but exempt from the current defects of hypocrisy, affectation, and licentiousness. As Settembrini says: 'One thing Tasso had, which few in his time possessed, a great heart, and that made of him a true and great poet, and a most unhappy man.' The sincere fervour of his piety and purity of his life are testified by his own writings and by his contemporaries. Tasso's intention was to create in his *Jerusalem* a great religious epic, his theme was to be the triumph of the warriors of the Cross in the first Crusade, and his hero was to be Godfrey of Bouillon, their commander, his material to be taken from *Historia belli sacri verissima*, by Tyrius (Basel, 1559-64). With the history of his nominal hero the poet has entwined fictitious characters and episodes, and it is these creations which give vitality to his work. The melodious verses, in which he has sung the loves of the fair Erminia and the warlike Clorinda and the beauty and wiles of the enchantress Armida, still live on the lips of the Italian people—verses whose authorship seemed to the diseased conscience of poor Tasso a sin to be repented.

Tasso's earliest biographer was his personal friend, the Neapolitan G. Manzo, the same Manzo whom Milton visited in Naples, and to whom he dedicated a Latin poem. This friend thus describes Tasso's appearance (*Vita di T. Tasso*, 1619): 'He was of tall stature and well proportioned, his complexion of perfect whiteness, the

colour of his thick hair and beard between dark and fair, his head large, his forehead square, his eyebrows and lashes black, his eyes large and blue, his nose aquiline, his lips thin and pale, and his limbs so agile that he yielded to none in fencing, riding, and jousting.' More complete than any biography is the picture which is given of his outer and inner life in his copious correspondence in his dialogues and various prose-works, where he reveals himself as a most facile and eloquent prose-writer.

Among Tasso's many commentators and critics we find his great contemporary, Galileo (see the *Scritti di Critica letteraria di Galileo*, Turin, 1889). The earliest complete edition of the *Gerusalemme Liberata* is that of Bonna (Ferrara, 1581, 4to); modern reprints are those at Modena (1868) and at Florence (1889). Translations of the *Jerusalem* have been made into many languages; in English the most famous is that of Fairfax (1600; new ed. by H. Morley, 1891); others are by Bent, Broadhead, Robertson, Smith, Wiffen, and Sir J. K. James (1868; new ed. 1884). Serassi's was long the standard biography (Rome, 1783, 4to). See also Bassano's *Studi su T. Tasso* (1880); Guasti's edition of Tasso's letters and prose writings (1854-57); D'Ovidio, *Saggi Critici* (1879); Corradi, *L'Infermità di Tasso* (1881); the *Lives by Black* (1810), Dean Milman (1850), Miss Hasell (Foreign Classics series, 1882); and Boulting's *Tasso and his Times* (1907). The last named, it should be added, closely follows the *Life* (3 vols.) by Professor Solerti in the monumental edition of the *Opere* (1895-99); and this *Life* and edition have now been recognised by the best authorities as indispensable aids to all study of Tasso.

Taste, one of the special senses (see SENSATION). The parts of the mouth affected by sapid substances are the surface and sides of the



Fig. 1.

A Filiform Compound Papilla, magnified 300 diameters:

a, artery; *v*, vein; *c*, capillary loop; *e*, epithelium; *f*, hair-like processes at the apex.

tongue, the roof of the mouth, and the entrance to the pharynx. The mucous membrane is invested by stratified squamous epithelium, which, over the surface of the tongue, covers little vascular

projections termed papillæ. One can see the papillæ of the sides and upper part of the tongue with the naked eye, as little sharp or rounded projections; the latter, thickly clustered at the tip and sides, may appear, if the system is out of order, as little red points like those of a strawberry. In the cat tribe the papillæ are hard and curved backwards into the mouth, so that the animal can use the tongue as a scraper to remove the flesh from the bones of its prey. The pointed papillæ are termed 'filiform,' and one is represented in fig. 1, while a rounded papilla is seen in fig. 2. They are essentially the same in structure, differing alone in shape and size, and, were the figures drawn to some common scale, fig. 2 would have to be three or four times as big as it is. At the back of the tongue are some eight or ten papillæ of quite a different nature, called 'circumvallate.' They are arranged to form a V with its angle pointing backwards. These are hardly papillæ at all, but may be looked upon rather as tiny patches of mucous membrane

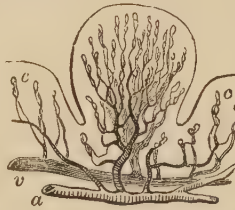


Fig. 2.—A Fungiform Papilla, with the capillary loop of its simple Papillæ injected:

a, artery; *v*, vein. Around the base there is often a groove, which is here shown; as also the capillary loops, *c*, *c*, of two of the neighbouring simple papillæ (magnified 18 diameters).

The taste-bulbs open each by a little pore into the trench, and into the deeper part a nerve enters in the way represented in fig. 3. The cask is probably for the protection of the sensory cells which it contains, and one of which is drawn in *d*, fig. 4. These cells are much elongated, and end each in a tiny bristle which projects with those of their companion cells from the little pore into the trench, and is here moistened by the juice of Ebner's gland and whatever sapid substance may be present. The impressions which these sensory cells receive from the bristles, say by the action of a bitter like 'hops,' is carried by the delicate nerve which starts from the opposite end of the cell out of the taste-bulb directly to the brain. Within each taste-bulb are other cells (*e*, fig. 4), which separate and support the sensitive cells, and are similar to analogous structures seen in the sensory epithelium of the eye, and nose, and ear.

While it is almost certain that these taste-bulbs are organs of taste, it is not equally certain that other parts are not involved. The reason for this belief is that in the front and sides of the tongue these taste-bulbs are few in number, while



Fig. 3.—A Semi-diagrammatic View of a Circumvallate Papilla:

a, body of papilla; *b*, Ebner's glands opening into the bottom of the trench; *c*, taste-bulbs with the taste nerves leaving them.

in these regions taste sensations are pretty acute. It is therefore not improbable that the nerves which abundantly pass into the epithelium of the tongue end in other ways, but unfortunately we are at present much in the dark concerning their exact method of termination. It is to be noted



Fig. 4.

a, taste-bulb with stave-like epithelial jacket out of the opening of which the sensory hairs (b) project; c, the nerve passing to taste-bulb; d, a sensory cell taken from a taste-bulb, showing the sensory hair and its fine nerve; e, a supporting cell.

taste, and after about four months the corresponding buds disappear, their elements being replaced by ordinary epithelial cells.

Having sketched the mechanism concerned in the production of taste sensations, we can now turn to the discussion of the many interesting facts which may be observed when this mechanism is called into play. In the first place, it may be remarked that substances capable of dissolving in the juices of the mouth are alone tasted. Marble, wood, flint, are devoid of taste, and so is pure starch; these are all of them quite insoluble in water. By the aid of various means we can convert the last-named substance into a very soluble 'dextrine,' yet this is tasteless. Another chemical product of the starch is a soluble substance termed 'dextrose,' which has a sweet taste and is commonly termed 'grape-sugar.' These examples will serve to illustrate the general fact that substances to be tasted must be in solution, though not all soluble substances are capable of giving rise to this sensation. It is a matter of general experience that, if a substance like sugar be simply placed in the mouth and allowed to dissolve, its taste is only faintly evident. If, however, the juices of the mouth, sweetened by the sugar, be rubbed into the mucous membrane by moving the tongue against the palate, the sensation is greatly intensified. One invariably 'smacks the lips' in trying to appreciate the qualities of a taste, and obtains in this way its maximum effect.

A fact that is hardly known by the laity is that most of the so-called tastes are really 'smells.' Sugar, salt, quinine, and some acids are devoid of smell; we could not distinguish them except by the tongue itself, and we have in these the prime taste sensations of sweet, salt, bitter, and acid. Meat, wines, and fruit are smelt, not tasted, and a bad cold dulls our appreciation of these articles of diet. To the prime taste sensations already mentioned may be added perhaps alkaline, astringent, and metallic tastes, but when all is told this organ yields us rough results when compared with smell, sight, or hearing, whereby hundreds and thousands of shades of quality are readily perceived in the odour of flowers, the lights from coloured objects, and the sounds from an orchestra. The various taste sensations are not equally produced on stimulating the whole of the gustatory area, and indeed each taste seems to have some special locality at which it is most acutely felt. If we take a piece

of quassia or a hop-leaf and chew it, we shall at first be unconscious of taste, and it is only when the juice of the mouth laden with these bitter principles passes to the back of the mouth that the taste is felt at all. This is why we drink beer in the draught, and do not sip it like wine. The sweet or acid wine is tasted best by the front part of the tongue, while the bitter beer is only appreciated as it is going down the throat. As in the other senses, anything that stimulates the gustatory nerve gives rise to a sensation; and although sapid particles effect this best of all, electrical or even mechanical stimuli have some effect. If we place a piece of zinc and copper on the tongue, and join them so as to give rise to a feeble current, or still better, if a slight interrupted electrical current be passed through the mucous membrane of the tongue, metallic saline tastes are produced. These are possibly due to electrolytic changes and not to direct stimulation, though this is less likely to be the case with the induced currents, equally powerful in the production of sensation. It is often stated that a sharp tap on the tongue produces a sweet or saline taste; this is, however, an experiment which often fails. If we rub the back and side of the tongue with the finger tip we shall hardly fail to notice a bitter taste, and it is probable that we shall question the cleanliness of the finger used. A scrupulously cleaned glass rod gives rise, however, in equal measure to the same sensation, and we are forced to conclude that the mechanical stimulus of the rod calls forth that taste which has its seat in the back of the mouth and tongue.

In daily life we make a distinction between the sapid substances based on the affective impression they make upon us rather than on the quality of their tastes, and thus we discriminate between agreeable, indifferent, insipid and disagreeable tastes. Agreeable and disagreeable substances excite different expressional movements of the facial muscles, the former tend to be kept longer in the mouth, the latter to be spat out or swallowed quickly; indifferent and insipid substances produce no facial movements, or at most arouse an expression of indifference or slight disgust. These reactions are involuntary, and may be considered as instinctive reflexes. In addition to the four primitive tastes—sweet, bitter, acid, and salt—we commonly speak of many other tastes such as alkaline, metallic, astringent, acrid, sharp, aromatic, fatty, slimy, dry, &c., but these on analysis are compound, and consist of several elementary constituents in which the sense of taste is mingled with olfactory sensations, and with tactile, thermal, and pain sensations of the mucous membrane of the mouth. In testing the sense of taste the tongue should be protruded and drops of the solution to be tested applied with a camel's hair brush to the different parts, the subject of the experiment signifying his sensations by signs, for if he withdraws the tongue to speak, the material gets widely spread. The more concentrated the solution, the larger the surface acted on, and the more intense the taste. Some tastes are perceived more rapidly than others; saline tastes the most rapidly of all. The solution is best to be about body temperature, as very high or very low temperatures deaden the sense. If we make of substances belonging to each of the four elementary groups solutions that will arouse equal sensations we cannot distinguish between the sensations aroused by hydrochloric, nitric, sulphuric, acetic, and oxalic acids. The same applies to bitter substances such as strychnine, quinine, morphine, picric acid, &c., and also to sweet solutions like sugar, glucose and lactose. Many facts point to the conclusion that the varieties of gustatory, like those of cutaneous sensation, are

due to the stimulation of different end-organs, while investigation of the papillæ shows that they present marked functional differences. Cocaine abolishes especially the bitter taste, and gymnemic acid (prepared from the leaves of the plant *Gymnema sylvestre*) abolishes the sweet taste, leaving the salt and acid tastes almost untouched. The four primary tastes are discontinuous qualities, which cannot be arranged in series like musical tones of different pitch. But however they may differ among themselves, they all have something in common which distinguishes them collectively from every other category of sensation, and which strongly suggests that all tastes are to be regarded as different qualities of one and the same modality of sensation, i.e. of one sense. This view is supported by the phenomena of *contrast* and of *compensation*. The former is illustrated by the fact that after excitation of the tongue with dilute sulphuric or hydrochloric acid distilled water is perceived as a sweet fluid, and the latter by the use of sugar to compensate for the bitter taste of coffee and the acid taste of lemonade, although it does not produce a new taste; both tastes persist, and there is a mixed or more agreeable sensation experienced. A still better example is seen on mixing weak solutions of sugar and salt in a certain ratio, the result being an insipid alkaline taste recalling neither sugar nor salt. The effect is lost in more concentrated solutions. It is by these effects of compensation of different tastes, as well as by the varied association of gustatory with tactile, thermal, and olfactory sensations that the flavour of nauseous medicines is corrected, and the different ingredients of food materials are so combined as to convert the four primary tastes into innumerable complex flavours.

We are almost entirely ignorant of the chemical or physical properties which enable certain substances to be tasted and others not. Taste and smell are two specific and closely allied senses which may be termed *chemical senses*, because the adequate stimuli for both consist in special chemical substances, which are soluble in water. They often function together. They are specially co-ordinated for the control and selection of foods and beverages, their position at the entrance to the alimentary tract enabling them to act together for this purpose.

Tatars (incorrectly TARTARS), originally certain Tungusic tribes in Chinese Tartary, where they are recorded in the annals of various dynasties under the names first of *Tatan* and later of *Tata*. Before Genghis Khan's time we read of the White and the Wild—including the Water and the Black varieties; but Genghis Khan's particular tribal brand fell under the Black Tata appellation, until he united the others and himself chose the special name of Mêng-ku (Mongol), which had already existed locally for centuries (see MONGOLS). The ultimate or remote origin of the word *Tatan* appears to be eponymous, having reference to a conquering Tungusic chief of the 3d century A.D. named *Tatun*. The word Tatar was extended to those hordes which were the terror of the European middle ages, the word Mongol never having been accepted in Europe. The name, originally Turkish and Persian *Tatar* when it approached western Europe, was doubtless changed to Tartar, either consciously or unconsciously, because they were supposed to be like fiends from hell (Gr. *tartaros*, 'hell'): this fanciful appellation has its origin in a letter to his mother by Louis IX. of France previous to marching against the other infidels in the Holy Land. The term is used loosely throughout Europe to this day for tribes of mixed origin in Tartary, Siberia, and the Russian steppes, including Kazan Tatars, Crim Tatars, Kipchaks, Kalmucks, &c., and has

no definite ethnological meaning. In the classification of languages 'Tartarie' is used of the Turkish group. See TURKS, MONGOLS, and TURANIANS; and Parker, *A Thousand Years of the Tartars* (1925).

TARTARY is the name under which, in the middle ages, was comprised the whole central belt of central Asia and eastern Europe, from the Sea of Japan to the Dnieper, including Manchuria, Mongolia, Chinese Turkestan, Independent Turkestan, the Kalmuck and Kirghiz steppes, and the old khanates of Kazan, Astrakhan, and the Crimea, and even the Cossack countries; and hence arose a fanciful distinction of Tartary into European and Asiatic. But latterly the name Tartary has often had a much more limited signification, including only Chinese Turkestan and Western Turkestan.

Tate, SIR HENRY, Bart. (1819-1899), English sugar magnate, art patron, and public benefactor, was born at Chorley, Lancashire, and entered the sugar trade in Liverpool. After the adoption of a new invention in 1872, he developed a huge business in cube sugar, migrating to London in 1880. Of the large fortune which he accumulated he gave liberally to various institutions, including the university of Liverpool, but he is especially remembered for his gift to the nation of the National Gallery of British Art (the 'Tate Gallery') at Millbank, London. The gallery, containing amongst others over sixty pictures from Sir Henry's valuable private collection, was opened in 1897 and has been extended several times since that date.

Tate, NAHUM, was son of Faithful Tate, D.D., and was born in Dublin in 1652. He had his education at Trinity College, Dublin, succeeded Shadwell as poet-laureate in 1692, is described by Oldys as 'a free, good-natured, fuddling companion,' and died August 12, 1715, in the precincts of the Mint at Southwark, then a sanctuary for debtors. His writings include ten dramatic pieces, one of them an adaptation of *King Lear*; *Panacea*, or a *Poem on Tea*; various birthday odes, and an elegy on the death of Queen Mary; *Miscellanea Sacra*; the *Innocent Epicure*, or *Art of Angling*. But his name survives from the Second Part of *Absalom and Achitophel* (revised by Dryden), and the metrical version of the Psalms, executed in conjunction with Nicholas Brady (q.v.). Completed by 1696, it slowly made its way into general use in the Church of England, supplanting Sternhold (q.v.) and Hopkins. The work as a whole was poor, but portions are not without poetic quality. The *Supplement to the New Version* (1703) was most probably the work of Tate alone; one thing in it, 'While shepherds watched,' has travelled over the Christian world.

Tatian, a Christian apologist born early in the 2d century (110, Zahn), was an Assyrian by birth, studied Greek philosophy, and wandered as a sophist round the Roman world, but about 150 at Rome was won to Christianity by the simple charm of the Old Testament Scriptures and the example of the purity and courage of the Christians. He became a disciple of Justin, in whose lifetime he wrote his *Oratio ad Græcos*, a glowing and uncompromising exposure of the faults of heathenism as compared with the new 'barbarian philosophy.' After Justin's death (166) Tatian fell into evil repute for heresies, and he retired to Mesopotamia, probably Edessa, writing with characteristic fearlessness and vigour treatise after treatise. He was certainly infected with Gnostic notions of the universe, the supreme God, the demiurge, and the world of æons; but the notions of his which gave most offence were his excessive asceticism, his rejection of marriage and animal food, and adoption of the practices of

the Encratites. His name became a synonym for all manner of dangerous and unsettling tendencies, and his doctrines were assailed in turn by Irenæus, Tertullian, Hippolytus, Clement of Alexandria, and Origen. Neither the place nor date of his death is known, but it took place perhaps at Edessa, and probably about 180. Of his writings a great part has perished, yet one maintained a place of importance in the Syrian Church for two hundred years, and supplies one of the most interesting chapters in the history of sacred literature. This was the *Diatessaron*, a gospel freely constructed out of the four gospels known to us, not a harmony in the modern sense, but a kind of patchwork gospel, its principle *amalgamation not comparison* in Lightfoot's phrase. This may have been written in Greek and in Syriac. There is no mention of the *Diatessaron* in any Latin writer before the middle of the 6th century, when Victor of Capua attributes an anonymous gospel harmony he had found to Tatian. Of Greek writers the first to mention it is Eusebius. Epiphanius says, 'the *Diatessaron* gospel is said to have been composed by him [Tatian]. It is called by some the gospel according to the Hebrews.' But on Syrian soil in Theodoret, bishop of Cyrrhus, near the Euphrates, we first find (453) an explicit account of the book: 'He [Tatian] composed the gospel which is called *Diatessaron*, cutting out the genealogies and such other passages as show the Lord to have been born of the seed of David after the flesh. This work was in use not only among persons belonging to his sect, but also among those who follow the apostolic doctrine, as they did not perceive the mischief of the composition, but used the book in all simplicity on account of its brevity. And I myself found more than two hundred such copies held in respect in the churches in our parts. All these I collected and put away, and I replaced them by the gospels of the four evangelists.' Thus we see that in the 5th century this work was used in the Syrian churches as the form in which the gospel was read, and further back still we find evidence of its use in the 3d-century *Doctrine of Addai*, and in the *Homilies of Aphraates* (fl. 340) and the famous Ephraem Syrus. Bar-Salibi, a Syrian bishop (12th cent.), distinctly states that Ephraem wrote an exposition of Tatian's *Diatessaron*. This survives in an Armenian version (perhaps 5th cent.), with which the Latin harmony of Victor of Capua, as found in the *Codex Fuldensis*, is substantially identical. In 1881 Zahn published his masterly monograph on Tatian's *Diatessaron*, containing a reconstruction of the text from the Latin, based on Ephraem's Commentary, on the quotations in Aphraates, and occasional parallels with the *Codex Fuldensis*.

Harnack thus sums up the conclusions that may be drawn from what may be considered as proved: (1) In Tatian's time there was still no recognised N.T. Canon, and the texts of the gospels were not regarded as inspired; (2) about 160 our four gospels were already in existence and authoritative, and the fourth on an equality with the three synoptics; (3) the text of the gospels in 160 was substantially the same as it is now, save that intentional changes and interpolations were made later, as the passage about the church being built upon Peter the rock.

See J. H. Hill, *The Earliest Life of Christ: The Diatessaron of Tatian* (translation and notes, 1893); Zahn, *Forschungen zur Geschichte des neutestamentlichen Kanons* (1881-91), and *Geschichte des newest. Kanons* (1891); *Texte und Untersuchungen zur Geschichte der altchristlichen Literatur*, by O. von Gebhardt and A. Harnack (Bd. iv. 1888); E. Schwartz's *Texte und Untersuchungen* (1888); the work by Hemphill (Dublin, 1888); the Study by Rendel Harris (1890); relevant

articles in *Ency. Brit.*, Herzog-Hauck's *Real-Encyclopädie*, and *The Catholic Encyclopedia*. For translations, see the *Ante-Nicene Christian Library*. Dr Rendel Harris in *Perfection according to the Saviour* (1924) claims to have traced one of the lost treatises.

Tatius, ACHILLES, one of the Greek romancers, seems to have written in the 3rd century A.D., or early in the 4th. He belonged to Alexandria, and was much influenced by the rhetorical school of poetry, which owned Nonnus as its master. Suidas tells us that he became not merely a Christian, but a bishop, after writing his romance of *Leucippe and Cleitophon*, but the accuracy of this may well be doubted. It is possible also that he was the author of treatises on etymology and astronomy. His romance comes next to the *Theagenes and Chariclea* of Heliodorus in time, and perhaps in merit. The author describes himself as gazing at the picture of Europa in the temple of Venus in Sidon, when he is accosted by Cleitophon, who straightway tells him his whole adventures in eight books. The plot is sadly lacking in probability, and grows positively wearisome towards its long drawn out conclusion. Its artistic development is marred by the introduction of much irrelevant discourse on painting, sculpture, and natural history, and moreover much of this is mere wordy rhetoric. The delineation of character is feeble to a degree—the hero a mere shadow of a man, uninteresting in everything save devotion to his mistress, who is much better drawn in every respect. Still the dawn of love in Cleitophon's heart is well described, and the doubts and fears characteristic of the passion are well realised, and reveal a striking knowledge of the human heart. Many of the situations are worse than indelicate, but the morality of the purpose, so characteristic of the Greek romances even in their indecencies, is evident throughout. The Greek is elegant, yet unaffected.

Editions are in the *Erotici Scriptores Graeci* by Hirschig, Le Bas, and Boissonade (Paris, 1856), and Hercher (Leip. 1858-59); also separately, by F. Jacobs (Leip. 1821), and by Gaselee (with translation 1917). There is a French translation in Ch. Zévort's *Romans Grecs* (Paris, 1856); an English, by the Rev. R. Smith (1855). See A. Chassang, *Histoire du Roman dans l'Antiquité Grec. et Lat.* (Paris, 1862); E. Rohde, *Der griech. Roman und seine Vorläufer* (Leip. 1876); and Dunlop's *History of Prose Fiction* (vol. i.), edited by Henry Wilson (1888).

Tatra. See CARPATHIANS.

Tattersall's, a celebrated mart in London for the sale of racing and other high-class horses, and one of the principal haunts of racing men, so called from Richard Tattersall (1724-95), a native of Hurstwood in Lancashire, who came early to London, entered the service of the second Duke of Kingston, and ultimately became an auctioneer. In 1766 he took a ninety-nine years' lease from Lord Grosvenor of premises in Hyde Park Corner, and after its expiry Tattersall's was removed to Knightsbridge Green (1867). In 1779 Richard Tattersall bought the famous horse Highflyer of Lord Bolingbroke for £2500, and named his house at New Barns, near Ely, Highflyer Hall. Here he was often visited by the Prince of Wales from Newmarket. The prince was also a joint-owner with 'Old Tatt' in the *Morning Post*, and lost thereby £10,000, which was paid to Tattersall's heirs in 1810. See *Memories of Hurstwood* (Burnley, 1889), by Tattersall Wilkinson and J. F. Tattersall.

Tatu, a term imported into European languages in the 18th century, derived from Tahiti *tatau*, from a root *ta*, 'to strike.' In its strictest sense the word refers to skin marks produced by puncture with a needle or pointed instrument, followed by the introduction of a pigment which

gives visibility and permanence to the designs. This type is in the main a feature of bodily decoration among peoples of medium pigmentation, such as the Polynesians; but it is also recorded among full-blooded negroes, despite the inconspicuous result; for the Kru of Liberia have a blue mark down the forehead, and some of the Bauchi tribes of Nigeria also rub in a blue pigment; but it must be noted that it is not possible to class either case with typical tatuing, because the skin is opened by cutting. It must, however, be noted that moko, the type of tatu in use in New Zealand, was produced by cutting grooves in the skin with a kind

of chisel; so deep did it penetrate that a smoker's cheek might be perforated so that the smoke issued through the orifice. In a secondary sense the term tatu has been used of other modes of decorating the body, such as the production of raised scars (keloids), widely spread in Africa, body painting either with coloured pigments, as among the Red Indians, or with vegetable juices, as in Africa, both of course more or less



Tatued Maori Chief.

temporary; finally may be mentioned, though it is not alluded to as tatu, the custom of using white pigment or chalk, the former as a world-wide element in initiation rites, the latter, especially in Africa, for religious or magical purposes.

The body marks produced in these various ways served a great variety of purposes. Yellow or white paint may be a sign of mourning—i.e. of separation from the profane world, of which the initiation rites are another example (see TABU). The marks may also be almost purely decorative, or, at least, become so, and serve the object of attracting the other sex; it is certain that this is the case with the tatu of Polynesia, but it must be remembered that the same is true, to a large extent, of the effect produced by any kind of fashionable deformation. It may be noted in passing that, at least in the eyes of Europeans, another effect of body tatu is to remove the impression of nakedness, even when clothing is wholly absent; but this can hardly be a primary purpose, if only because, especially among the darker skinned peoples and those accustomed to nudity, habituation makes even the European observer unconscious of the lack of clothing. Another purpose served is to cause fear in an enemy or to indicate deeds of valour already performed. The more permanent forms are also used to indicate the tribe or clan of the wearer, a point of some importance in Africa, perhaps, in the days of slavery. They may also indicate certain offices or grades or a certain status; thus the son of an Ibo chief at Aguku received diagonal scars across the face fourteen days after birth; in America the keepers of the tribal pipes had a special tatu design, to which was added a skull when he cut off the head of an enemy; the Eskimo whaler keeps a tally of his kills by tatu marks on cheek, chest, or arms. Wholly different again is the use of one or other method as a remedy for bodily ailments or as a love charm. Again, as an identity mark tatu of some kind may be held to be a necessity in the future life, without which the lot of a man will be evil. In China one kind of punishment is to tatu the offender, and in Samoa

the criminal had to submit to the tatuing of his nose.

There is a good deal of variation according to age, sex, &c., both as regards the kind of design and the part of the body selected for it. The Maori woman was tattooed on the chin only; but the moko of the male covered the whole face as well as other parts of the body; in Central Polynesia, on the other hand, the face was left untouched. It is worthy of note that tatu was frequently used on parts of the body concealed by clothing. From this and many other facts it is clear that it was not originally decorative but had ritual significance. It was, for example, obligatory on the Marquesan warrior and chief to receive tatu marks; only the tattooed might partake of the cannibal feasts in former times. Among the Kayan of Borneo the operation may not be performed in seedtime nor if a corpse is in the house; while it is in progress the males of the family wear a special garment and remain indoors; the operation must be performed in a special hut; the operator observes many ritual prohibitions; he has a tutelary spirit, and he may not begin his functions till his children are grown up. The tattooed Kayan woman may not eat monitor lizard; nor may her husband before the birth of the first child. Similar rules are found in other areas; in New Ireland the subject is isolated before the operation is begun; before his moko is completed the Maori might not use his hands to put food into his mouth, for his head had acquired a sacred character (see TABU).

Tatu proper is found in many parts of the world, and at present there is no evidence to prove that the practice spread from a single centre; it is found in North and South America, Polynesia, Melanesia and Micronesia, Indonesia, India, parts of Africa, east Asia, &c.; it is well known in modern Europe, but probably only as a borrowed practice, though Herodotus records that Thracian women were tattooed as a mark of nobility; it is probable that body decoration of some sort was known in Gaul and Britain. Tatu proper seems to have been practised by the Nubians in 2000 B.C. and possibly in Egypt; it was in use in south China in 1100 B.C.

W. Joest, *Tätuiere*, is mainly concerned with the technique of the operation; von den Steinen, *Die Kunst der Marquesaner*, deals also with tatu in other areas; W. G. Robley, *Moko*, contains a good deal of information on Maori tatu; and see W. D. Hamby, *History of Tatooing* (1925).

Tauchnitz, KARL CHRISTOPH TRAUGOTT, a famous German printer and bookseller, was born at Grossparden, near Leipzig, October 29, 1761. Bred a printer, he set up in 1796 a small printing business of his own in Leipzig, with which he shortly after conjoined publishing and typefoundry, and all his enterprise only added to his prosperity. In 1809 he began to issue editions of the Greek and Latin classics, the elegance and cheapness of which carried them over the learned world. He was the first to introduce (1816) stereotyping into Germany, and he also applied it to music. On his death, 14th January 1836, the business was continued by his son, KARL CHRISTIAN PHIL. TAUCHNITZ (1798-1884).—A nephew of the elder Tauchnitz, BARON CHRISTIAN BERNHARD VON TAUCHNITZ, born at Schleinitz, 25th August 1816, also founded in 1837 a printing and publishing house in Leipzig. In 1841 he began his well-known collection of 'British Authors,' of which 2600 volumes appeared within the first fifty years. The enterprising publisher was ennobled in 1860, and made a life-peer in 1877, and died Aug. 13, 1895. His son BARON BERNHARD VON TAUCHNITZ succeeded him, and died in 1921.

Tauler, JOHANN, German mystic, was the son of a wealthy citizen of Strasburg, where he was

born about 1300. His education was entrusted to the Dominicans in Strasburg and Cologne. When Tauler was twenty-four years of age the clergy of his native city, where he then lived, were prohibited from performing the religious services in consequence of a papal interdict having been launched against Strasburg, because it took a different side from the pope in a disputed imperial election. Tauler, however, and his colleagues continued to officiate. But the heads of the order forbidding them to do so, the magistrates banished the Dominicans from the city. For some seven years or so Tauler found refuge in Basel, where coming in contact with the Friends of God, a sort of free association for deepening religious life, his views underwent a great change. Some ascribe this 'conversion' to Nicholas of Basel; others discredit the fact altogether; whilst others again admit it, but dispute the identity of the agent. At all events, from this time forward Tauler became the centre and source of the quickened religious life in the valley of the middle Rhine, his reputation as an eloquent and earnest preacher spreading far and wide. His banishment over, he returned to Strasburg, and is believed to have stayed behind there during the Black Death, to minister to the sick and sustain the courage of the living. He died in 1361. Prior to his conversion Tauler seems to have been a disciple of Master Eckhart (q.v.), at whose feet he probably sat when a young student, and thus he belongs to the Mystics (see MYSTICISM). The change that took place in him at Basel turned his thoughts from speculative thinking to pious exhortation and practical doing; and it is this note of sincere practical piety that especially distinguishes his *Sermons*, which are reckoned amongst the finest in the German language.

See K. Schmidt, *Johann Tauler* (1841); two works by Denifle (1877-79); one by Siedel (1911); Preger's *Geschichte der Deutschen Mystik* (vol. iii., 1893); Miss Winkworth, *Tauler's Life and Sermons* (Lond. 1857).

Taunton, a pleasant, well-built town of Somersetshire, in the fair and fertile valley of the Tone ('Taunton Deane'), 45 miles S.W. of Bristol. Here about 710 Ine, the West Saxon king, built a fortress, which, passing with the manor to the bishops of Winchester, was rebuilt by Bishop William in the first quarter of the 12th century. Added to in the 13th and 15th centuries, this castle received Perkin Warbeck (1497), and was held by Blake (q.v.) during his famous defence of the town (1644-45). In its great hall, fitted up now as a museum, Judge Jeffreys opened the 'Bloody Assize,' hanging 134 and transporting 400 of the inhabitants of Taunton and the neighbourhood who had accorded Monmouth an enthusiastic welcome (1685); and here too Sydney Smith made his 'Mrs Partington' speech (1831). The church of St Mary Magdalene has a noble Perpendicular tower 153 feet high (c. 1500; rebuilt 1858-62); and other buildings are the Elizabethan shire-hall (1858), the municipal buildings (formerly the grammar-school founded by Bishop Fox in 1522), King's College school (1880), Independent college (1847-70), Wesleyan Institution (1843), Huish schools (1874), Bishop Fox's girls' school, hospital (1809-73), barracks, &c. Formerly one of the great 'clothier towns' of Somerset, Taunton now has shirt, collar, glove, and silk manufactures, with a large agricultural trade. It was thrice chartered (1627, 1677, 1877) as a municipal borough, and had two members till 1885, one till 1918. Pop. (1921) 23,223. Extension of boundaries added about 1000 in 1924.

Taunton, capital of Bristol county, Massachusetts, at the head of navigation on Taunton

River, 34 miles by rail S. of Boston. It contains a fine park, Bristol Academy (1792), a court-house, city hall, a state lunatic asylum, and numerous foundries and cotton-mills, locomotive and copper works, shipyards, and manufactories of bricks, nails, jewellery, &c. Taunton was settled from Taunton in England in 1637. Its first minister was William Hooke, who afterwards married Cromwell's cousin, and became his chaplain. Pop. (1920) 37,137.

Taurus Mountains. See HESSE-NASSAU.

Taupo, LAKE, a beautiful lake in the middle of North Island, is the largest (238 sq. m.) in New Zealand. Its greatest depth is 534 ft. The volcanic cliffs of its western shore reach 1000 feet sheer at Karanghape Bluffs. There are hot springs in the lake; and towards the south-east is the island of Motutaiko, apparently an extinct volcano. The Waikato enters the lake at its southern corner and leaves it at its north eastern.

Taurida, a former government of South Russia, bounded on the E., S., and SW. by the Sea of Azov and the Black Sea, and including the peninsula of the Crimea (q.v.). It is now divided between the republics of Ukraine and Crimea.

Taurus, MOUNT. See ASIA MINOR.

Tautog (*Tautoga onitis* or *americana*), a fish of the family to which the Wrasse (q.v.) belongs, found in the North American seas, and in great request for the table. It attains the weight of 12 or 14 lb. Its colour is black on the back and sides; the belly is whitish; each jaw has a double row of strong conical teeth; the face is covered with a scaleless integument. It is also called Black-fish and Oyster-fish.

Tautpheus, BARONESS (1807-93), the daughter of James Montgomery of Seaview, Co. Donegal, married in 1838 an official at the Bavarian court. She wrote a series of novels in English, mainly pictures of South German life, manners, and history, including *The Initials* (1850), *Cyrilla* (1853), *Quits* (1857), and *At Odds* (1863). Florence Montgomery (q.v.) was her niece.

Tavastehus, or HÄMEENLINNA, a town of Finland, capital of the province of Tavastehus (or Häme). The first Finnish railway was constructed in 1862 between Tavastehus and Helsingfors (66 miles). Pop. of town, 7000; of province, 370,000.

Tavern. See INN, LICENSING LAWS.

Taverner, JOHN, 16th-century English composer, was organist at Boston, and then at Christ Church, Oxford, shortly after its foundation, and died probably before the accession of Edward VI. His compositions—motets and masses for Roman Catholic ritual—are notable.

Tavernier, JEAN BAPTISTE, BARON D'AUBONNE, a celebrated French traveller, was the son of an Antwerp Protestant engraver who had settled in Paris, and was born there in 1605. The conversation of the savants who frequented his father's shop made him a traveller at fifteen, and by the age of twenty-two he had seen France, England, the Low Countries, Germany, Switzerland, Poland, Hungary, and Italy. His *first journey* to the East lasted from about the beginning of 1631 to the summer of 1633, by Constantinople to Persia, thence by Aleppo and Malta to Italy. The *second journey* (1638-43) was from Marseilles to Alexandretta, across Syria to Ispahan, thence to Dacca, Agra, Surat, Goa, and Golconda; the *third* (1643-49), through Ispahan, much of Hindustan, Batavia, and Bantam, whence to Holland by the Cape and St Helena; and in the *fourth* (1651-55), *fifth* (1657-62), and *sixth* (1663-68) many districts of Persia and India were visited, the outward route being generally by way of Syria and the

Arabian Desert, and the return one by Asia Minor. Tavernier invariably travelled as a dealer in precious stones and other valuable articles of small bulk, and the great profits he realised strongly impressed upon him the advantages of regular commerce between Europe and the East. He was well received by most of the eastern potentates—the Shah Abbās II. in 1657 gave him a robe of honour and made him his jeweller in ordinary, and the Great Mogul Aurungzebe kept him to see his annual festival in 1665. Louis XIV. gave him 'letters of nobility' in 1669, and next year he bought the barony of Aubonne near Geneva. In 1684 he started for Berlin to advise the Elector of Brandenburg in his projects for eastern trade. Next year he sold his estate, but it is quite unlikely that he was thrown into the Bastille after the revocation of the Edict of Nantes. He sent his nephew to India with a valuable cargo, but is supposed to have been defrauded by him. In 1687 we find the veteran traveller obtaining a passport in Switzerland, next year he appears to have been at Copenhagen, and in February 1689 he arrived in Russia, where he died at Moscow before the close of the year. His famous *Six Voyages* was published in 1676; the complementary *Recueil* in 1679. Tavernier traversed the plains of Troy, and passed the ruins of Persepolis without even a flutter of interest, and partly perhaps from this habit of mind his statements are accurate and truthful beyond the measure of travellers. But the chief value of his book lies in the fullness and accuracy with which are detailed the nature and state of oriental commerce, the chief markets and commercial routes, the precious stones found, and the various systems of coinage. Editions of the *Travels* are of 1810 (7 vols.) and 1882 (abridged).

See *Travels in India*, trans. by Dr V. Ball (2 vols. 1890), and Charles Joret, *Jean Baptiste Tavernier d'après des Documents Nouveaux* (1886).

Tavira, a seaport of Portugal, on the Sequa, 20 miles NE. of Faro. It has sulphur-baths, sardine and tunny fisheries, and a pop. of 11,000.

Tavistock, a pleasant market-town of Devon, 11 miles N. of Plymouth and 31 (by rail 40) SW. of Exeter, lies in a trough of the hills on the Tavy's left bank, with Dartmoor stretching away from it to the eastward. An old stannary town, till 1885 governed by a portreeve, it is the centre of what not many years ago was a great mining district; and it sent two members to parliament till 1867, then one till 1885. Two gateways, a porch, and the refectory are the chief remains of its once magnificent Benedictine abbey, founded in 961 by Ordgar, ealdorman of Devon, and father of the infamous Elfrida. It was rebuilt between 1285 and 1458, was the seat of a very early printing-press, and had a revenue of £902 at the dissolution in 1539, when it was conferred on the first Lord Russell, remaining still with his descendant, the Duke of Bedford. The parish church (1318) is a fine structure, with a west tower (106 feet) resting on arches. Tavistock has also a guildhall (1848), corn-market (1839), covered markets (1863), statues of the seventh Duke of Bedford by Stephens (1864) and Drake by Boehm (1883), a very fine one presented by the ninth Duke, and the Kelly College (1877), founded by Admiral B. M. Kelly. Drake and William Browne were natives, Pym and William Lord Russell members; and the Right Hon. W. H. Smith was educated at the grammar-school. Pop. 4300.

Tavoy, the chief town of a district in Tenasserim, Burma, on the left bank of the Tavo River, 30 miles from its mouth; pop. 25,000.

Tax is a term defined by Bastable as 'a compulsory contribution of the wealth of a person or body of persons for the service of the public powers.'

On this view, generally accepted nowadays, taxation, or the levying of taxes, is regarded as an affair of government (central or local). Taxation thus forms one important department of public finance, and stands in close correlation with the other, namely, expenditure. The funds normally at the disposal of the state do not all come from taxation. The state may borrow at home or abroad. Again, its revenue is often derived in part from property held and managed by public authorities: the silver mines of Laurium belonged to the Athenian republic; and in the middle ages the king of England drew a large income from his crown-lands. Or it may come in part from payments for services performed—from the fees paid by suitors in the courts, the profits of the post-office, &c. If an adequate income could be obtained from these sources, it would not be necessary to levy taxes at all; but no modern government has been able to subsist without taxation.

In England the pressing needs of the central government in the 17th century resulted in the gradual formation of a regular tax-system to replace the former one of customs duties and spasmodic levies. As the needs of government have increased the subject of taxation has necessarily been complicated with that of the desirable extent of state activity. If this is to be a minimum, taxation will be required to defray only the necessary expenses of government. But the trend of modern thought in England is towards what has been called the 'principle of maximum social advantage,' which implies that the state may tax its members and spend the proceeds as long as the gain to society as a whole is greater than would have resulted from reliance on private expenditure. Old Age Pensions, National Health Insurance, Unemployment Insurance, &c., illustrate this principle in practice.

Adam Smith's four canons of taxation, at least a *point de départ* for most subsequent studies on taxation, set forth the general principles to be applied by a taxing authority. Taxes should be certain and not arbitrary, levied with a consideration for the convenience of the contributor, and economical in their collection; it is not wise to allow the expenses of collection to eat up the tax. They ought to be just; that is to say, the sacrifice demanded from the individual citizen should be proportioned to his means. This statement, however, is ambiguous. On the one hand it is held that equality is sufficiently attained by taxing all incomes in the same proportion; on the other hand is the argument for graduated or progressive taxation, which would tax large incomes at a higher rate than small ones, the rates increasing as the amount assessed increases. Schemes of this kind are attended by considerable practical difficulties; for high taxes lead to evasion and concealment, and rich men may even be tempted to remove themselves and their capital to another country. But the progressive principle has nevertheless gained much favour with statesmen. The chief object to be kept in view is the raising of the revenue required for public purposes, but taxation may be used for other ends. For example, taxes on intoxicating liquor and other luxuries are often defended on the ground that they discourage and restrict the sale of the articles taxed. Protectionists advocate high customs duties for the purpose of excluding foreign goods from competition with native industry. There are also those who think that taxation may be used to correct social inequalities and effect a redistribution of wealth. But taxation so utilised is apt to rouse greater difficulties than it solves.

Taxes are direct or indirect. 'A direct tax is one which is demanded from the very persons who,

it is intended or desired, should pay it. Indirect taxes are those which are demanded from one person in the expectation and intention that he shall indemnify himself at the expense of another' (J. S. Mill). But the distinction is merely one of convenience. Income-taxes are the most noteworthy direct taxes, and customs and excise duties the most prominent indirect ones. Historically the movement has been towards an increased use of direct taxation. Direct taxation, though apt to be inquisitorial, is preferable, because it is levied on a definite assessment, and can be adapted to the taxpayer's means. Indirect taxation is more automatically raised; labouring people especially object to be called upon to pay money, while they are hardly conscious of the large contribution they make to the revenue in the shape of tea-duty and tobacco-duty. But if customs duties are to be productive, articles of common use must be taxed and the poor are apt to be heavily burdened. The extent to which luxuries can be taxed and a reasonable revenue obtained depends on their 'elasticity,' and the possibilities of smuggling. With all taxes a point of great importance is the ultimate incidence. A duty on tea for example is levied on the importer who, by raising the price of his tea, attempts to 'shift' as much of the tax as he can on to the consumer. The argument for the *single tax* (*impôt unique*) of the Physiocrats assumed the ultimate shifting of all taxes on to the landlord, and proposed to simplify taxation by levying one direct tax on him at the outset. Henry George (q.v.) proposed a single tax on the rent of land. Besides the taxes imposed by a central government local authorities are usually permitted to levy Rates (q.v.) and duties. In some countries octroi or import duties are paid on goods brought into a town; but the octroi is even more objectionable than a duty on foreign produce, inasmuch as it tends to discourage trade between different parts of the same country.

In taxation, as in other matters, the nations of modern Europe have followed closely the precedents of the Roman empire. The revenue of the emperor was raised by means of a tributum or land-tax, customs duties varying from one-fortieth to one-eighth of the value of goods imported, excise duties on certain trades, and a tax on legacies and successions. On the fall of the empire the prevalence of feudal ideas led to a complicated system of territorial exactions; the towns were able to purchase their freedom, but the peasantry were grievously burdened. The formation of strong national governments brought little relief to the people, except when, as in England, there was a representative body strong enough to limit the demands of royal power. France under Louis XIV. may be quoted as a typical example of the evils caused by unjust taxation, unjust exemption of privileged classes, and a bad system of collection; the taxes were farmed out to private speculators, and the necessities of life were rendered outrageously dear; the salt-tax especially is always named among the worst abuses of the old régime. The economists of the 18th century recalled the minds of statesmen to true principles, while practical reformers like Turgot showed them 'how to pluck the goose without making it cry.' The revolt of the English colonies in America (a revolt caused by an impolitic attempt to tax self-governing communities without their consent), the abolition of feudalism in France at the Revolution, and, still more, the close study given to questions of efficiency and justice in taxation by countless statesmen and economists since the end of the 18th century—all these factors have brought it about that the revenue laws of civilised countries have been greatly altered and improved. But there

cannot be said to exist a uniform system of taxation. Historical conditions, the extent of civilisation, the temperament of the people, all react on the character of taxation and produce as many systems as there are nations.

For particulars of the revenue of modern governments, see the *Statesman's Yearbook* and the works there referred to, and taxation is dealt with in most of the standard text-books on political economy. Among English books the best are C. R. Bastable, *Public Finance* (3d ed. 1903); G. Armitage-Smith, *The Principles and Practice of Taxation* (1906); J. A. Hobson, *Taxation in the New State* (1919); B. W. Adkin, *Local Taxation* (1919); Sir J. C. Stamp, *The Fundamental Principles of Taxation* (1921), *Wealth and Taxable Capacity* (1922); H. Dalton, *Public Finance* (1923). There are American books on finance and taxation by Plehn (1886), Adams (1898), Seligman (1892, 1894, 1895, 1911), Lutz (1924). In French see the works of De Parieu, Garnier, Leroy-Beaulieu, and Jéze, also the *Dictionnaire des Finances* (1894); and, in German, books by Schäffle, Schmoller, Stein, Wagner, Béla Foldes, &c.; in Italian by Cossa, Einaudi, Graziani, Pantaleoni. See for the historical side of the subject in England: S. Dowell, *Taxes and Taxation in England* (4 vols. 1884); S. C. Buxton, *Finance and Politics* (2 vols. 1888); E. Cannan, *The History of Local Rates in England* (2nd ed. 1912); W. Kennedy, *English Taxation, 1640-1799* (1913); also works noted at POLITICAL ECONOMY, and the articles on Aids, Benevolence, Budget, Corn Laws, Customs, Excise, Free Trade, Income-tax, Land Laws, Legacy, National Debt, Poor-law, Protection, Rates, Smuggling, Tariff, Tonnage and Poundage, &c.

Taxation of Costs. See COSTS.

Taxidermy, the name given to the art of putting up natural history specimens in the dried state. It includes the skinning and stuffing of fishes, reptiles, amphibians, birds, and mammals; also the preserving, drying, and setting up of insects and other invertebrata. But it does not properly comprise the making of wet zoological preparations which are to be preserved in spirits; nor, strictly speaking, does it include the articulating of skeletons, although this is usually treated of in books on taxidermy.

For the skinning of animals a few tools, such as scalpels, scissors, and forceps, are required. Incisions must be made in certain directions. Care has to be taken not to stretch the skin in detaching it from the body, and it is necessary to avoid soiling the plumage of birds or the hair and fur of mammals with blood or grease. The skull and certain wing and leg bones are left in their place to preserve as perfectly as possible the form of these parts in case of the skin being afterwards mounted. Considerable difference of opinion has arisen as to the best treatment for preserving or, as it is sometimes called, poisoning skins. Arsenical soap is still largely used. It commonly consists of arsenious acid 1 oz., white soap 1 oz., carbonate of potash 1 drachm, distilled water 6 drachms, and camphor 2 drachms. To preserve bird skins some prefer to use some such preservative powder as the following: pure tannin 1 oz., red pepper 1 oz., camphor 1 oz., burnt alum 8 oz., all pounded together. This suffices for birds, but for mammals a more satisfactory powder is formed by mixing burnt alum 1 lb. and saltpetre $\frac{1}{2}$ lb. These powders should be applied to the inner surface of the skin when it is moist. A non-poisonous preservative soap of the following composition has been recommended for birds and small mammals: chalk $2\frac{1}{2}$ lb., soft soap 1 lb., chloride of lime 2 oz., tincture of musk or eucalyptus oil 1 oz. But as it is difficult to prevent a little free chlorine escaping from chloride of lime, there must be some risk of corroding or rotting skins by the use of this mixture. These dry powders should be well rubbed, and the soapy mixtures carefully brushed, into the wet surface

of skins. An alcoholic solution of corrosive sublimate is a good preservative for skins, but it is very poisonous. For cleaning feathers, and especially those that are light coloured, powdered plaster of Paris is very effective. Wherever bird skins or the fur-covered skins of mammals are kept camphor or naphthaline should be present. The latter is more obnoxious to destructive moths than the former, as it has a powerful and peculiar odour. Benzine is also very useful. Butterflies, moths, and other insects require to be kept in drawers or boxes of a peculiar construction to prevent the escape of the vapour of camphor or other preservative.

Before the taxidermist can engage successfully in the processes of stuffing, modelling, and mounting an animal he requires some training in anatomy and modelling, and a knowledge of the external forms of animals, as well as some acquaintance with their habits. He cannot be a master of the art unless he has the artistic faculty in a high degree. Some of the finest specimens of the taxidermist's art are in the display of the British fauna at the Natural History Museum at South Kensington. Another most interesting display is that of Irish fauna in the Museum of Science and Art, Dublin, arranged on the 'regional' principle. How far taxidermy can be reckoned anything more than a 'tentative art' is an open question. The improvement in technique of recent times would seem to augur well, yet it has to be remembered that the taxidermist is handicapped by the ephemerality of his work in comparison with sculpture, paintings, &c.

See *Methods of the Art of Taxidermy*, by Oliver Davie (1892); *Practical Taxidermy*, by Montagu Browne (1884; 3d ed. revised by G. E. Bullen, 1922); *Field Ornithology*, by Coues (1890); and *Taxidermy*, by W. T. Hornaday (1891).

Taxila, the most populous and wealthy city of India at the time of Asoka (q.v.), was situated in the district of Rawalpindi in the Punjab.

Tay, a river of Scotland, draining nearly the whole of Perthshire, and pouring into the North Sea a greater bulk of water than any other British river, rises on Benloy, on the Argyllshire border, at an altitude of 2980 feet. Thence it winds 118 miles east-north-eastward, south-south-eastward, and eastward—for the last 25 miles as a tidal estuary, $\frac{1}{2}$ mile to $3\frac{1}{4}$ miles broad, which separates Perth and Forfar shires from Fife. In the first 25 miles of its course it bears the names of Fillan and Dochart; it then traverses Loch Tay, and it afterwards passes Aberfeldy, Dunkeld, Stanley, Perth, and Dundee. Its principal affluents are the Tummel (58 miles long, and sometimes regarded as a northern head-stream), Isla, Almond, and Earn. The Tay is one of the most beautiful of Scottish rivers, and it is unrivalled for its salmon-fisheries. Vessels of 200 tons can ascend as high as Perth, but even to Dundee the navigation of the firth is much impeded by shifting sandbanks.

LOCH TAY lies 348 feet above sea-level, extends $14\frac{1}{2}$ miles NE. from Killin to Kenmore, is $\frac{3}{4}$ to $1\frac{1}{2}$ mile broad, 508 feet deep (average, 200 feet), and covers over 10 square miles. It is a magnificent Highland lake, flanked on the north-west by Ben Lawers (4004 feet), and containing near its foot a wooded islet, with a fragment of an Augustinian priory, founded in 1122 by Alexander I., who here buried his queen, Sibylla.

See DUNDEE (for the Tay Bridge), RANNOCH, EARN, PERTHSHIRE, &c., and works there cited, with J. Geddie's finely illustrated monograph on the Tay (1892).

Taylor, JOHN JAMES, an eminent Unitarian divine, was born at Newington Butts, 15th August 1797, son of a minister in London, next at Nottingham. He studied at Manchester New College (which was located at York 1803-40), at Glasgow

University, and again at York, was ordained to Mosely Street Chapel at Manchester in 1821, and became professor of Ecclesiastical History in 1840 on the return of the college to Manchester. He spent a year (1834-35) in study at Göttingen and Bonn, removed with his college to London in 1853, becoming principal as well as professor, was joint-minister with James Martineau of Little Portland Street Chapel (1858-60), and died 28th May 1869. He wrote much for the *Prospective Review*, which passed in 1855 into the *National Review*, and made way in 1864 for the *Theological Review*, a list of as many as 102 books, discourses, and articles being appended to the collection of his *Letters*, edited by J. Hamilton Thom (2 vols. 1872).

Of the books the chief were *A Retrospect of the Religious Life of England* (1845), which Martineau styles 'the most charming of ecclesiastical histories'; *Christian Aspects of Faith and Duty* (1851); and *An Attempt to ascertain the Character of the Fourth Gospel* (1867).

Taylor, ALFRED SWAINE (1806-80), was born at Northfleet, and for forty-six years was professor of Medical Jurisprudence (on which he published a standard manual) at Guy's Hospital. He also lectured on Chemistry and wrote on poisons.

Taylor, BAYARD, an American author and traveller, was born, of Quaker and German ancestry, at Kennett Square, Chester county, Pennsylvania, 11th January 1825. Having received a common school education, he was apprenticed at seventeen in a printing-office, in 1844 published *Ximena*, a volume of poems, and started on a pedestrian tour of Europe, and in 1846 published *Views Afoot, or Europe seen with Knapsack and Staff*. After his return he edited a country newspaper, then went to New York, and obtained a post on the *Tribune*. As its correspondent he made extensive travels in California and Mexico, recorded in *El Dorado* (1850), and up the Nile, and in Asia Minor, Syria, across Asia to India, China, and Japan—recorded in his *Journey to Central Africa and Land of the Saracen* (1854), and *Visit to India, China, and Japan* (1855). Later explorations are recorded in *Northern Travel* (1858), and *Travels in Greece and Russia* (1859). In 1862-63 he was secretary of legation at St Petersburg; in 1874 he visited Iceland. In May 1878 he became ambassador at Berlin, where he died 19th December of the same year. His principal reputation, however, was as a poet. His works include *Rhymes of Travel* (1848); *Book of Romances, Lyrics, and Songs* (1851); *Poems of the Orient* (1854); *Poems of Home and Travel* (1855); *The Poet's Journal* (1862); *Poems* (1865); *The Masque of the Gods* (1872); *Lars* (1873); *The Prophet, a Tragedy* (1874); *Home Pastorals* (1875); *The National Ode* which he was chosen to deliver at the Centennial Exhibition (1876); *Prince Deukalion*, a drama (1878); and an admirable translation of *Faust* (1870-71). He also wrote several novels, the best *Hannah Thurston* (1863) and *The Story of Kennett* (1866). See his *Life and Letters* (2 vols. 1884).

Taylor, BROOK, mathematician, was born of good family at Edmonton in Middlesex, August 18, 1685, and studied at St John's College, Cambridge. In 1715 he published his *Methodus Incrementorum Directa et Inversa*, the foundation of the Calculus of Finite Differences. Herein also is the formula which, as 'Taylor's theorem,' will keep his name from ever being forgotten. In 1716 he visited Paris and was warmly received by the French savants. From 1714 till 1718 he acted as secretary to the Royal Society. His last years were given to speculations in philosophy and religion, and were darkened by the early deaths of two successive wives. He himself died December 29, 1731. Other works were a *Treatise on Linear Perspective* (im-

proved ed. 1719) and the posthumous *Contemplatio Philosophica* (edited by his grandson, Sir W. Young, with Life, 1793). Several short papers may be found in the *Phil. Trans.* (1713-23).

Taylor, SIR HENRY, poet, was born, the son of a gentleman-farmer of unusual culture, at Bishop-Middleham in Durham, October 18, 1800. At fourteen he went to sea as midshipman, but was happy to obtain his discharge after nine miserable months, and two years later was given a clerkship in the Storekeeper-general's Department. After four years' service, including a few months in Barbadoes, he lost his post through internal official rearrangements, and returned to his father's house, Witton Hall, to spend two years of uninterrupted quiet and study. He began to write for the *Quarterly*, and in 1823 settled in London, having been appointed through the influence of Dr (after Sir Henry) Holland to a clerkship in the Colonial Office. Here he laboured for forty-eight years under as many as twenty-six secretaries of state, retiring only in 1872. He declined in 1847 the post of permanent under-secretary in succession to Sir James Stephen, and in 1869 was made K.C.M.G., partly for his public services, partly for his literary work—the latter also acknowledged by the D.C.L. degree at Oxford in 1862. His last days were spent at Bournemouth, and here, March 27, 1886, he ended a long and happy life, the happiness of which was in great measure due first to his admirable step-mother, later to his equally admirable wife, Alice Spring Rice, a daughter of Lord Monteagle. Taylor wrote four tragedies in the Shakespearian manner: *Isaac Commenus* (1827), *Philip van Artevelde* (1834)—an immediate success, *Edwin the Fair* (1842), and *St Clement's Eve* (1862); and one romantic comedy, *The Virgin Widow*, afterwards entitled *A Sicilian Summer*. In 1845 he published a small volume of lyrical poetry, and in 1847 *The Eve of the Conquest and other Poems*. His work in prose embraced *The Statesman* (1836), a collection of Baconian discourses on official life and the methods of managing men, for which, as he himself says, 'Pragmatic Precepts' would have been a better title; *Notes from Life* (1847)—one of its essays, *The Life Poetic*, mainly a eulogy of Southey; and *Notes from Books* (1849), half made up of two articles on Wordsworth. Last came his interesting *Autobiography* (2 vols. 1885), admirably written, full of genial observation, and not marred at all by the pardonable egotism of age and merit. It contains a fine series of pen-portraits of such contemporaries as Wordsworth, Southey, Scott, Sydney Smith, Mill, Sir James Stephen, Spedding, Carlyle, Tennyson, and Aubrey de Vere. It was supplemented by his only less delightful *Correspondence* (1888), a selection of 202 letters, edited by Professor Dowden, including also letters to Taylor, from Wordsworth, Southey, Stephen, Mrs Norton, Macaulay, Spedding, Tennyson, Aubrey de Vere, Gladstone, Dr John Brown, and Swinburne. A uniform collected edition of his works had appeared in 5 vols. in 1878.

Taylor, ISAAC, writer of many books on religious and philosophical subjects, was born at Lavenham in Suffolk in 1787. His father, Isaac Taylor the first (1759-1829), was originally a London engraver, but in 1796 became Independent minister at Colchester, in 1811 at Ongar in Essex, and published a score of volumes. Charles Taylor (1756-1821), editor of Calmet's *Bible Dictionary*, was an uncle, and two sisters were Jane Taylor (1783-1824), author of the *Contributions of Q.Q.*, and Ann Taylor (Mrs Gilbert of Nottingham, 1782-1866; *Autobiography*, 1871), joint-authors of the famous *Hymns for Infant Minds* and *Original Poems*. After a course of study he settled down

to a busy literary life at Ongar, where he died, June 28, 1865. As early as 1818 a writer in the *Eclectic Review*, he lived to contribute to *Good Words*—a period of over forty years. In 1862 he was granted a Civil List pension of £100. Of his many books the most important were the *Natural History of Enthusiasm* (1829), *The Natural History of Fanaticism* (1833), *Spiritual Despotism* (1835), *Physical Theory of Another Life* (1836), and *Ultimate Civilisation* (1860).—His eldest son, ISAAC TAYLOR, was born at Stanford Rivers, May 2, 1829, had his education at Trinity College, Cambridge, took orders, and after acting as curate in London and elsewhere, and as vicar of St Mathias, Bethnal Green (1865-69), and Holy Trinity, Twickenham (1869-75), was presented to the rectory of Settrington in Yorkshire in 1875, and collated to a canonry of York in 1885, becoming dean two years later. His *Words and Places* (1864) made him favourably known as a philologist, whilst his great work, *The Alphabet, an Account of the Origin and Development of Letters* (2 vols. 1883; new ed. 1899), brought him a wide reputation. Other publications are *The Family Pen; Memorials of the Taylor Family of Ongar* (2 vols. 1867); *Etruscan Researches* (1874); *Greeks and Goths, a Study on the Runes* (1879); *The Origin of the Aryans* (1890); and *Names and their Histories* (1896)—besides contributions to the learned journals, and philological articles in former editions of this work. He died in October 1901.

Taylor, JEREMY, the glory of the English pulpit, was the third son of a Cambridge barber, and was born very probably in that town, and baptised in the Holy Trinity Church there on 15th August 1613. At thirteen he entered Caius College as a sizar, graduated B.A. in 1630-31, and, according to his friend and successor Bishop Rust, was thereafter chosen fellow of his college. At any rate he became M.A. in 1633, about the same time being admitted to holy orders, and soon after he attracted the notice of Laud, who had a regard for learning, if none for liberty, and was preferred through his influence to a fellowship at All Souls in Oxford (1636). He became also chaplain to the archbishop, and in 1638 was presented by Bishop Juxon to the rectory of Uppingham. About this time Wood tells us he was suspected by watchful zealots of a concealed attachment to the Romish communion, whether from his ascetic notions of piety, his veneration for antiquity and love for the picturesque aspects of religion, the favour of Laud, or his friendship with the learned and pious Franciscan friar, Francis a Sancta Clara [Christopher Davenport]. Taylor married Phoebe Landisdale, or Langsdale, in 1639; his second wife, Joanna Bridges, was believed by Bishop Heber, chiefly on the somewhat questionable authority of the MS. of Mr Jones, a descendant of Taylor's, to have been an illegitimate daughter of Charles I. when Prince of Wales. His *Episcopacy asserted against the Acephali and Aërians New and Old* (1642) scarcely gave promise of his future powers, but gained him the empty honour of a D.D. degree. During the struggle Taylor is supposed to have accompanied the royal army as a chaplain, but about the close of 1643 we find him living with his mother-in-law and children, and embarrassed by poverty. Heber thought his first wife was already dead, and that soon after this time he married his second, and retired to her property at Mandinam in Caermarthenshire. It seems probable, however, that his first wife did not die till 1651. At any rate, after the downfall of the cause he found a shelter in Wales, and for some time he joined in keeping a school at Newton Hall in the parish of Llanfihangel. Here he found a kind patron in Richard Vaughan, Earl of Carbery, then living at the family seat of

Golden Grove, immortalised in the title of Taylor's still popular manual of devotion (1655). His second countess was Alice, daughter of John Egerton, first Earl of Bridgewater, and the original of the 'lady' in Milton's *Comus*. During the last thirteen years (1647-60) of Taylor's enforced seclusion appeared all his great works, some of these the most enduring monuments of sacred eloquence in the English language. The first was *The Liberty of Prophecy* (1647), a noble and comprehensive plea for toleration and freedom of opinion, far above the ideas of its age, and even of its author in his turn of triumph. Here he takes the Apostles' Creed as the minimum standard of Christian communion, the only necessary terms of such being those dogmas that are capable of being propounded *infallibly*; that is, from Scripture, in the due exercise of Reason, all such errors as may arise being necessarily venial, when not wilful. 'Heresy is not an error of the understanding, but an error of the will,' to which proposition Coleridge aptly adds its converse, 'faith is not an accuracy of logic, but a rectitude of heart.' 'Those creeds are best which keep the very words of Scripture; and that faith is best which hath greatest simplicity; and it is better in all cases humbly to submit, than curiously to inquire and pry into the mystery under the cloud, and to hazard our faith by improving our knowledge.' He next passes in review the alleged special sources of authority in religious opinion: Scripture, Tradition, Ecclesiastical Councils, the Pope, and the Fathers, finding all save Scripture, interpreted by an enlightened reason, insufficient and contradictory. With regard to civil government he lays down broadly the principle that it is not concerned with opinions, however false or absurd, unless these tend directly to the prejudice of government as such, thus demanding the widest toleration for honest opinion ranging from Anabaptism to Popery. The second edition (1659) closes with the celebrated story of Abraham and the idolatrous traveller.

In 1650 followed the *Life of Christ, or the Great Exemplar*—an arrangement of the facts in historical order, interspersed with prayers and discourses on topics suggested by the narrative. That same year appeared *The Rule and Exercises of Holy Living*, followed in 1651 by its counterpart, *The Rule and Exercises of Holy Dying*, together forming to generation after generation the choicest classic of English devotion. The twenty-seven *Sermons* for the summer half-year were published in 1651; the twenty-five for the winter half-year in 1653. These, with the discourses in the *Life of Christ* and many passages in the *Holy Living* and *Dying*, contain the richest examples of their author's characteristically gorgeous eloquence. The polemical and practical treatises are more subdued in style, though still figurative and allusive far beyond the measure even of his contemporaries; but here he gave full reins to an imaginativeness unmatched alike in range of illustration and in opulence of language. The solemn music of his words, the rich beauty of the imagery in his incidental metaphors, the tenderness, passion, colour, and force, if not precision, of phrase combine to place these writings by themselves on a level scarce attained by all the Asiatic eloquence of Chrysostom.

The more formal treatises were *An Apology for Authorised and Set Forms of Liturgy against the Pretence of the Holy Spirit* (1646); *Clerus Domini, or a Discourse of the Divine Institution, Necessity, Sacredness, and Separation of the Office Ministerial* (1651); *The Real Presence and Spiritual of Christ in the Blessed Sacrament proved against the Doctrine of Transubstantiation* (1654); *The Unum Necessarium, or the Doctrine and Practice of Repentance* (1655), a

treatise with a decided taint of Pelagianism, where the theologian had ventured beyond his depth, and which involved him in a cloud of controversy; *The Worthy Communicant* (1660); *Defence and Introduction to the Rite of Confirmation* (1663); *The Dissuasive from Popery* (1664); and the famous *Ductor Dubitantium, or the Rule of Conscience in all her General Measures* (1660), the most learned and subtle of all his works, which he himself counted on as the foundation of his fame. Intended as a complete handbook of Christian casuistry and ethics, it labours first to establish a system of morality on the basis of the will of God revealed to us through Conscience, distinguishing with greater subtlety than security the right or sure conscience, the conscience confident in error, the probable or thinking, the doubtful, and the scrupulous conscience. Under the 'probable' head he gives a magnificent sketch of the different probabilities on which a faith in Christianity is founded. The second book discusses the obligations of conscience in relation to the law of nature and the law of Christ, closing with a splendid peroration on the measures and motives of a Christian's duty. In the third book he passes to human positive law alike of church and state, and in the fourth—the best part of the whole—he closes with a discussion of the nature and causes of good and evil, and the efficient and final causes of human actions. But Taylor is much more a rhetorician than a thinker or even a theologian, and his imagination too often carries him at a leap from an illustration to an argument, from an analogy to a conclusion. Distinctions without a difference, inconsistencies, sophistries, and prolixity are foibles that too easily beset his argument, and go far to mar the effect of vast erudition, subtlety of thought, and dazzling eloquence. Besides the real bases of the controversy have shifted far from the 17th-century landmarks, and much of his subtlest argument is to modern men a mere beating of the air. Nor is he altogether free from the special sin of casuistry in its narrowest sense—he maintains that private evil may be done for the public good, that in controversy it is allowable to employ arguments and authorities we know to be invalid, and he is able to justify on moral grounds the fraudulent Israelitish borrowing from the Egyptians. He is besides much too slavish in his respect for authority and tradition, but, as Coleridge says well, Jeremy Taylor 'would have been too great for man had he not occasionally fallen below himself.'

During the troubles Taylor was thrice imprisoned, once for the preface to the *Golden Grove*; the last time in the Tower for an 'idolatrous' print of Christ in the attitude of prayer in his *Collection of Offices* (1658). He occasionally visited London, where he numbered among his friends John Evelyn, to whom he wrote many admirable letters still extant, as well as Boyle, George Berkeley, afterwards first Earl of Berkeley, and Wilkins. In 1658 he was given by the Earl of Conway a lectureship at Lisburn in Ireland, and at the Restoration he was made bishop of Down and Connor, to which was added the administration of the see of Dromore. By Ormonde's recommendation he was elected vice-chancellor of the university of Dublin, and in February 1661 he was admitted a member of the Irish privy-council. There were many stubborn Presbyterians in his diocese who mocked at his authority, and tormented his gentle spirit, but we need not believe that the plot to take his life existed anywhere else than in his active imagination. In his first visitation he ejected thirty-six of them from their churches, but neither severity nor gentleness could prevail to force a form of religion upon an unwilling people. His last years were clouded also by domestic sorrows. His eldest son,

an officer in the army, was killed in a duel; the second passed from Trinity College to become the favourite companion and secretary to Buckingham, and died a few days before his father. The three daughters of his second wife alone survived him. He died at Lisburn after a ten days' fever, 13th August 1667, and was buried in the choir of the cathedral at Dromore, largely rebuilt by his own munificence.

Jeremy Taylor's beauty of person corresponded to the beauty of his character and the large charity of his temper. Good portraits are abundant, several he himself gave as frontispieces to his writings; one of the best hangs in All Souls College, Oxford. Bishop Heber endorses Parr's description of Hooker as the object of our reverence, Barrow of our admiration, but Jeremy Taylor of our love. He was above all things a preacher, and that especially of personal holiness. The thread of ideas is ever clear and simple underneath all his exuberant fullness and the stately march of his sentences, and though it is difficult to conceive of a congregation capable of following his argument and illustration in their full detail, all the haste and indistinctness of argument, the quaint, pedantic, and even grotesque irrelevances of illustration are fused together into harmony in the orator's glowing earnestness and fire. No poet ever excelled Jeremy Taylor in exquisite feeling for the sights and sounds of nature; he has no rival in lofty and impassioned prose save Milton alone—'Most eloquent of divines,' says Coleridge, 'had I said of men, Cicero would forgive me, and Demosthenes nod assent.'

The first collected edition of his works was that of Bishop Heber, with an excellent Life (15 vols. 1820-22); a revised edition by the Rev. C. P. Eden (10 vols. 1847-54). See Coleridge's *Literary Remains*, vol. iii. (1838); Tulloch's *Rational Theology in England in the Seventeenth Century*, vol. i. (1872); Dean Farrar in *Masters in Eng. Theology* (1877); Bishop Barry in *Classic Preachers of the Eng. Church*, series ii. (1878); the *Quarterly Review* for July 1871; and Gosse's study in the 'English Men of Letters' series (1904) and W. J. Brown's in the 'English Theologians' series (1925).

Taylor, JOHN, the 'Water-poet,' as he styled himself, was born at Gloucester in 1580, and became a waterman on the Thames, but was pressed into the naval service and served at the siege of Cadiz. He collected for many years for the lieutenant of the Tower his perquisite of wine from all ships which brought wine up the Thames. When the rebellion broke out in 1642 Taylor left London for Oxford, where he kept a public-house, which he afterwards gave up for another in London, and here he hawked the doggerel which he wrote. He performed some fantastic feats of rowing, but the chief event of his life was his journey on foot from London to Edinburgh (14th July—13th August 1618). Ben Jonson thought the Water-poet's intention was to burlesque his own journey, yet when he met him at Leith he gave him a piece of gold to drink his health in England. Taylor described his journey in his *Penniless Pilgrimage* (1618); other books of the same kind were his *Travels in Germanie* (1617) and *The Praise of Hempseed*, a story of a voyage from London to Queenborough in Kent in a brown paper boat (1618). He died in 1654. Taylor's works were published under the title of *All the Workes of John Taylor the Water-poet, being sixty and three in number* (1630, folio). His poems are not destitute of natural humour, abounding with the low, jingling wit which prevailed in the reign of James I., and which too often bordered upon bombast and nonsense. Allibone's *Dictionary* contains a list of 138 articles written by the Water-poet. The best reprint of his works is a complete edition issued by the Spenser Society (1868-78).

Taylor, NATHANIEL WILLIAM, preacher and theologian, was born at New Milford, Connecticut, 23d June 1786, studied at Yale, became pastor of a Congregational church at New Haven in 1812, and in 1822 became professor of Theology in Yale College, where he taught until his death, 10th March 1858. In numerous sermons, lectures, and essays he maintained what from his pastoral charge became known as the 'New Haven theology,' long assailed as heretical. This system, a softening of the traditional Calvinism of New England, maintained the doctrine of natural ability, and denied total depravity; sin is a voluntary action of the sinner; but there is, derived from Adam, a *bias* or *tendency* to sin, which is not itself sinful. His works were edited in 5 vols. by his son-in-law, Dr Noah Porter (1858-59).

Taylor, PHILIP MEADOWS, Indian administrator and author, was born at Liverpool 25th September 1808, held a mercantile post in Calcutta, but obtained a commission in the army of the Nizam of Hyderabad, whom he served from 1826 as administrator of various large territories, one of them the tributary state of Sherapur. In this capacity he showed marvellous insight, tact, and kindness, establishing order and justice in place of mere barbarous tyranny, and maintained peace during the mutiny of 1857. The British government gave him charge of some of the ceded districts; in 1866 he retired colonel and C.S.I.; and he died at Mentone, 13th May 1876. He left vivid pictures of Indian history, life, and manners in his romances, *Confessions of a Thug* (1839; new ed. 1858); *Tippoo Sultaun* (1840); *Tara* (the story of Sivaji, 1863); *Ralph Darnell* (1865); *Seeta* (1873); and *A Noble Queen* (1878). See his *Story of my Life*, edited by his daughter (1877; new ed. 1920).

Taylor, ROWLAND, Marian martyr, was a native of Rothbury in Northumberland, and studied at Cambridge, taking his LL.B. in 1530 and LL.D. in 1534. Cranmer, to whom he was domestic chaplain, gave him the rectory of Hadleigh in Suffolk (1544), and he subsequently became archdeacon of Exeter (1551) and a canon of Rochester. Under Mary he was imprisoned as a heretic for more than a twelvemonth in the King's Bench, and on 8th February 1555 was burned near Hadleigh. See Cooper's *Athenæ Cantabrigienses* (1858).

Taylor, THOMAS, 'the Platonist,' was born in London, 15th May 1758, went three years to St Paul's School, next studied mathematics and classics under private teachers, but, betwixt an imprudent marriage and the pinch of poverty, found it impossible to realise his dream of completing his studies at Aberdeen with a view to the ministry, and entered Lubbock's bank as a clerk. But he still found six hours in every day for study, and at length left his desk to teach private pupils and fill the office of assistant-secretary to the Society for the Encouragement of Arts, &c. During his last forty years he lived in a small house at Walworth, immersed in Plato and the Platonist philosophers, and partly supported by a gift of £100 a year from Mr Meredith, a retired tradesman with ideas, and there he died, 1st November 1835. His fifty works include translations of the Orphic Hymns, and parts of the works of Plotinus, Proclus, Pausanias, Apuleius, Maximus Tyrius, the Greek mathematicians, Iamblichus, Hierocles, Porphyry, &c., besides complete translations of Plato (nine, however, of the Dialogues by Floyer Sydenham, 5 vols. 1804) and Aristotle (11 vols. 1806-12). Mr W. E. A. Axon in a biographical and bibliographical sketch (privately printed, 1890) gives a list of forty-eight books, but does not include *The Spirit of All Religions* (Amst. 1790), which expresses his strange polytheistic creed.

Taylor, Tom, journalist and playwright, was born in 1817 at Sunderland, and passed from the Grange School there in 1831 to Glasgow University, and thence in 1837 to Trinity College, Cambridge, where he graduated as third classic in 1840, and was elected to a fellowship. Professor for two years of English language and literature at University College, London, he was called to the bar of the Inner Temple in 1845, for a short time travelled the northern circuit, and from 1850 to 1872 was first assistant-secretary and secretary to the Board of Health, and then secretary to the Local Government Board. From about 1846 onwards he wrote or adapted upwards of a hundred pieces for the stage, of which may be mentioned *Our American Cousin*, *Still Waters Run Deep*, *The Ticket of Leave Man*, and *Twixt Axe and Crown*. He also edited the autobiographies of Haydon and Leslie, completed the latter's *Life and Times of Reynolds*, translated *Ballads and Songs of Brittany* (1865), and in 1874 succeeded Shirley Brooks as editor of *Punch*. He died at Wandsworth, 12th July 1880.

Taylor, William, 'of Norwich,' was born there in 1765, the only son of a rich Unitarian merchant, and was educated at Palgrave by Mrs Barbauld's husband. At fourteen he entered his father's counting-house, but next year was sent on the first of two visits to the Continent, where he mastered French, Italian, and, more especially, German. The French Revolution at once indoctrinated him with democratic ideas and began the ruin of his father's business, which by 1811 was completed by American 'repudiation' and a stock-broker's bankruptcy; Taylor had meanwhile turned wholly from commerce to literature. His is the credit of introducing to English readers the poetry and drama of Germany, mainly through criticisms and translations contributed to periodicals, and collected in his *Historic Survey of German Poetry* (3 vols. 1828-30). Other works by him were *English Synonyms Discriminated* (1813) and a *Life of F. Sayers, M.D.* (1823). He died at Norwich in March 1836. George Borrow, his pupil in German, has sketched in *Lavengro* his philosophy, scepticism, and inveterate tobacco-smoking; and his correspondence with Southey, Scott, Mackintosh, and Godwin is given in the memoir of him by Robberds (2 vols. 1843). See also the (German) monograph on him by Georg Herzfeld (1897).

Taylor, Zachary, a distinguished general and twelfth president of the United States, was born in Orange County, Virginia, 24th September 1784. His father had been a colonel in the war of independence, and removed to Kentucky in 1785, settling near Louisville. Here Zachary lived on a plantation until 1808, when he entered the army as lieutenant. In 1812 as captain he commanded Fort Harrison on the Wabash, and in September with only fifty men, two-thirds of whom were on the sick-list, successfully defended that post against a large body of Indians. After further service on the north-western frontier Taylor became major, but at the close of the war being reduced to a captaincy he resigned his commission. He was soon reinstated and again employed against the Indians, and in 1832 fought with Black Hawk, the noted chief of Illinois. In 1836 Taylor, now colonel, was ordered to Florida, where previous commanders had suffered in reputation from their vain attempts to subdue the troublesome Seminoles. Taylor had the good fortune to defeat the savages at Okeechobee Swamp on Christmas Day 1837, and thus won the brevet of brigadier-general. In 1840, being placed in command of the army in the south-west, he removed his family to a plantation at Baton Rouge, Louisiana.

When Texas was annexed in 1845 its western

boundary was not defined, and Mexico still claimed the uninhabited district between the Rio Grande and the Nueces. Taylor, being ordered to defend Texas from invasion, sailed from New Orleans to Corpus Christi, where he gathered a force of 4000 regulars. Though well aware that President Polk wished him to occupy the disputed district, he would not cross the Nueces until express orders came in March 1846. He then marched to the Rio Grande and erected Fort Brown opposite the Mexican town of Matamoros. The Mexicans ordered him to retire, and upon his refusal crossed the Rio Grande to drive him out. Their action enabled President Polk to declare that the United States had been invaded, and to call for volunteers to repel the foe. But the battles of Palo Alto and Resaca de la Palma on the 8th and 9th of May drove the Mexicans back, and Taylor following seized Matamoros. The volunteers did not come to his aid until September, when he marched to Monterey, and after a severe struggle captured it on the 24th. After seven weeks' vain waiting for more troops the march was resumed. The city of Victoria was occupied on December 29, but the line of communication was found too long for the meagre force, while Polk's Democratic administration, fearing the rising fame of Taylor, who was a Whig, crippled him by withholding reinforcements.

Taylor was already falling back to Monterey when his regulars were taken from him to form part of the new expedition under General Scott. Santa Anna, the ablest Mexican general, learning of Taylor's weakened condition, believed that with his 21,000 veterans he could crush the 5000 American volunteers. After a march of hundreds of miles, he overtook Taylor near the mountain-pass of Buena Vista. Availing himself of its natural advantages, Taylor on the 22d of February 1847 completely repulsed the Mexicans with a loss thrice as great as his own. In the following November General Taylor returned home and was received with enthusiastic expressions of popular favour. In June 1848 the convention of the Whig party, passing by its great political leaders, selected him as the candidate for the presidency. A few Free Soilers refused to support him as being a slaveholder, but his character, indicated by the sobriquet of 'Rough and Ready,' endeared him to the masses. He was triumphantly elected in November and inaugurated in the following March. The fierce struggle over the extension of slavery to the newly-acquired territory had begun. The congress was Democratic and opposed the admission of California as a free state, while the president favoured it. To avert the threatened danger to the Union Henry Clay introduced his famous compromise, which called forth a stormy discussion. Taylor remained firm and impartial, though his son-in-law Jefferson Davis was the leader of the extreme pro-slavery faction. Before a decision was reached in congress President Taylor died suddenly of bilious fever, 9th July 1850.

General Taylor was of medium height, stout and swarthy. He was plain in manners and speech, and careless in dress; he rarely wore uniform, and often sat sideways on his horse. His ability as a commander is shown by his unvarying success in battle, and is attested by General Grant, who served under him as lieutenant. Though Taylor had taken little part in political strife, he carried off the prize which great party leaders failed to win. As president he showed himself a true promoter of his country's welfare. There are Lives by Frost (1848), Fry and Conrad (1848), and O. O. Howard (1892).

Tayport, a watering-place and police-burgh of Fife, on the Firth of Tay, opposite Broughty-Ferry (q.v.); pop. 3300.

Tchad, LAKE. See TSAD.

Tchaikovsky. See TSCHAIKOVSKY.

Tchegov, Tchekhov, Tchekhoff. See CHEKHOV.

Tchelyuskin. See CHELYUSKIN.

Tcherkask (Old Tcherkask), a town of South Russia, formerly the capital of the Don Cossacks, on the right bank of the Don, 12 miles S. of Novotcherkask (q.v.); pop. 15,000.

Tcherkasky, or TCHERKASK, a town of Ukraine, 90 miles by rail SE. of Kieff, on the Dnieper; pop. 32,000.

Tcherkesses. See CIRCASSIANS.

Tchernavoda, a town of Rumania on the Danube, connected with Kustendji by rail, and having over the Danube a great steel cantilever bridge 2878 metres long; pop. 5000.

Tchernigoff, or CHERNIGOV, a town of Ukraine, 85 miles NE. of Kieff; pop. 37,000.

Tchernozem. See BLACK EARTH.

Tchernyshevsky, NIKOLAI GAVRILOVITCH (1828-89), nihilist. See NIHILISM.

Tchita. See CHITA.

Tea (*Camellia theifera*, Griff.) is a plant of the genus *Camellia* (q.v.), by some placed in a separate genus *Thea*, of the family Theaceæ or Ternstroemiaceæ. There are two well-known varieties: (1) *C. theifera*, var. *assamica*, or Assam tea; and (2) *C. theifera*, var. *sinensis*, or China tea. The Assam variety, known as 'indigenous' tea, is a tree of vigorous growth attaining a height of 30 to 40 feet, with a leaf from 8 to 10 inches in length. The China variety is a comparatively



China Tea (*Camellia theifera*), young shoot with flowers: a, fruit. (Bentley and Trimen.)

stunted shrub, though hardier, growing to a height of 12 to 15 feet, with a rounder leaf about 3½ inches in length, and calyx covered with soft short hairs. There is no evidence that tea is wild in any part of China or anywhere else except in the forests of Assam; some think that the Chinese variety is the indigenous, changed by climate and cultivation. These two varieties have resulted in a hybrid which combines the hardy character of the China with the other features of the indigenous, now largely cultivated on the hills

of India and Ceylon, and known as 'hybrid Assam.' At low elevations where the climate is tropical the indigenous, or a hybrid nearly approaching it, is preferred. The hybrids vary much in productiveness, and the planter is careful in selecting a good strain, which grows and foliates freely without seeding. The branches are smooth. The leaves are serrated, have a bright shining upper surface, and, while young, a hairy under surface. They are rather thin, but often tough and leathery. In the substance of the leaf are located large smooth cells containing an essential oil, of great importance to the flavour of the tea. The flowers are often handsome, usually white, and are about 1½ in. in diameter; sometimes solitary, sometimes clustered in masses; they have very short flower-stalks or no stalks at all. The fruit is rather short, of a leathery or woody consistency; dry, not fleshy. Inside it is divided into three, four, or five three-celled chambers. Linnaeus gave the name *Thea sinensis* to the Chinese variety, but afterwards made two species, *T. bohea* and *T. viridis*, under the impression that black and green tea were the products of different plants. Robert Fortune (q.v.), the botanist, was the first to show that both kinds of tea were made from the same shrub. *T. bohea* and *T. viridis* are names now applied respectively to the China and Assam varieties. The Chinese name for tea is *tcha*, in the Fuh-kien dialect *té* or *teh*.

The tea-plant is not particular as to soil, but it succeeds best on new forest-land containing plenty of humus. It will flourish in all parts of the tropical and subtropical zones where the rainfall is not less than 70 inches and evenly distributed throughout the year. In Ceylon (lat. 7° N.) it grows from sea-level to an altitude of 7000 feet. At a low elevation the growth of the plant is more rapid, but in time the high-grown tea seems to produce as much leaf as the average of low-country estates, while the tea is of more delicate flavour, though inferior in strength. At Dárjiling (27° 3' N. lat.) it grows at 7000 feet above sea-level. In China and Japan it is cultivated to the 40th degree N. lat. Tea also grows in Java, Sumatra, Nyasaland, Georgia (Caucasus), northern Siam, Kenya, and Natal, and attempts have been made to introduce the plant into Brazil. A point of some importance in the distribution of the industry is that tea-growing requires abundant cheap labour. Thus a country where labour is dear cannot for long compete with one where labour is cheap. In Natal, for instance, tea-growing is being abandoned owing to the high cost of labour, and in the United States, for a similar reason, tea culture never progressed past the experimental stage. Indeed, the labour difficulty is at present confronting the Indian industry.

Cultivation.—The clearing is made by cutting the undergrowth with heavy socket-knives, after which the forest-trees are felled and the largest branches lopped; six weeks afterwards the wood is burned. Tea is planted in rows from 3½ to 5 feet apart, with a similar distance between the plants; 4 × 4 feet being a favourite distance, which gives 2722 plants to the acre. The tea-seed is soaked in water, and planted in shaded nursery beds; when the plants are about 4 inches high they are transplanted to the holes in wet weather during the monsoons. When plants are scarce the seed may be sown at stake in the holes, but nursery plants are generally preferred. The clearing is roaded and drained as soon as possible. On the rich deep soils of Assam manuring is not practised. In Ceylon the favourite manures are cattle-dung, castor-cake, bones, nitrogenous manures, and those which contain potash. When the plants have been in the ground about fifteen

to eighteen months they are cut down to 10 or 12 inches; this makes them spread, and strengthens the growth of the branches. In about two months the more vigorous shoots are nipped back below the second leaf, thus taking off the terminal leaf-bud and first and second leaves, which makes the axillary bud at the base of the third leaf develop a fresh shoot. At first plucking is rather a matter of pruning than of gaining leaf, but as the trees become stronger the plucking becomes more regular and heavier. At about three years the bush is again cut down to some 15 inches flat across, so as to leave two joints of new wood above the last pruning. In subsequent prunings all bark-bound wood must be removed, along with whippy branches which do not 'flush' or develop fresh shoots. The plucking is done with the thumb-nail, and the leaf must on no account be torn off. Only the youngest and most tender leaves are plucked; and the younger the leaf, the finer the tea. The largest leaves used are never more than 2½ inches long. The estate must be plucked in regular rotation every ten days or a fortnight. When tea is flushing well a good coolie can bring in from 20 to 30 lb. of green leaf in a day.

In China the system of tea cultivation is very different from that practised in India and Ceylon, the use of machinery still being very exceptional. There are no large estates, the tea being grown in small fields and gardens, often situated on hillsides. The leaf is plucked from the latter part of April to the end of October, the small farmer importing coolie labour for the purpose from the more populous districts. The grower does not manufacture the leaf himself, but sells it green in the local market at the nearest head village. The green leaf is bought by the agents of Chinese capitalists, who have hongcs where they manufacture and pack the leaf. Finally the hong-man ships the tea in boats, and sends it down the rivers. Until 1919 exported tea was subject to an export duty which through time proved exceedingly oppressive.

Chinese teas may be classified thus: Monings or black leaf teas are grown in the north of China, and shipped from Hankow and Shanghai. They come from the following districts: Ningchow (mostly bought for Russia), Kintuck, Keemun (shipped chiefly to England), Kutoan, Ichang, Oopack, Oonam, Oonfa, Ly Ling, Cheong-sow-kai, Hohow, Siangtam. Green teas are shipped from Shanghai, and consist of Gunpowder, Imperial, Hyson, Young Hyson, and Twankay. Kaisows or Red-leaves are grown farther south, and are shipped from Fu Chow. The different kinds, which take their names from the districts in which they are grown, are Seumoo, Panyong, Paklum, Pakling, Padrae, Saryune, Suey Kut. From Fu Chow are also shipped Souchongs, which are a distinct kind from Congous, and are principally drunk in Germany and Austria. Fancy teas, consisting of Oolongs, Flowery Pekoes, and Scented Orange Pekoes, are exported from Fu Chow. Canton exports Congous called New-makes, Scented Capers, and Scented Orange Pekoes. The perfume of the scented varieties usually comes from aromatic leaves—jasmine, gardenia, &c.—used in the manufacture.

Manufacture.—The first process is to spread the green leaf thinly on hessian trays in the withering house, where it is exposed to a free current of air—a very important operation, which takes from 12 to 48 hours. Withering is assisted by fans which circulate currents of dry air. When the leaf is tough and flaccid, like an old kid glove, it is ready for rolling. The old or Chinese system of rolling was to place the withered leaf on a table

where it was rolled by hand to and from the coolie till the juice was expressed and the leaf well twisted; this took about 20 minutes to do. The Chinese accomplish this partly by the dirty process of treading. Now this process is performed by machinery, and in India and Ceylon tea is not manipulated after plucking. In the tea-rolling machines in general use in India and Ceylon, the leaf is rolled between two superposed plates of hard wood or polished granite, actuated by cranks which give them a compound circular or eccentric motion. These machines are capable of taking a charge of 240 to 300 lb. of withered leaf; they are driven by steam, water, or electric power, effect great saving in labour, do the work more thoroughly, and ensure perfect cleanliness. Some planters sift the rolled leaf through sieves with ¼-inch meshes and re-roll the leaf which is too large to pass through. Considerable diversity of opinion exists as to whether tea should be rolled lightly or hard: the former gives a prettier tea with more of the golden 'tip'; the latter gives a stronger liquor, and the tea keeps better. The rolled leaf is now ready for fermentation, an operation requiring close attention. It is placed in drawers or on tables and covered. The state of the weather hastens or retards the process; in hot dry weather the leaf will be sufficiently fermented or oxidised in 20 minutes, in cold wet weather it may take hours. When the leaf assumes a bright copper colour it must be fired; over-fermentation is a fatal error. The difference between black and green teas is simply this: if the tea is fired immediately after rolling it is green tea, if it is fermented it becomes black tea. In green tea, also, the fresh leaves are steamed instead of being withered. The old system of firing was to have iron gauze trays fitting over V-shaped chula furnaces about 30 inches high, and to dry the tea over charcoal fires. Now drying is done quicker and better by machines for the purpose, such as the 'Sirocco' or Venetian, consisting of a stove portion and drying chamber, through which a powerful air-current passes; and by this means the wet leaf is dried thoroughly in 6 to 8 minutes. Various machines are in use. After firing the manufacture is complete, and the tea is what is known as 'unassorted,' which contains all the different grades into which tea is usually separated. In this state it is a most excellent tea for drinking, but it is customary to sort it into different grades before sending it to market. The old system of doing this was by using hand sieves of different sizes. The 'dust' was taken out by the finest sieve; the 'broken pekoe' or finest and youngest leaf by the next; the 'pekoe' by a sieve with wider meshes; the 'pekoe souchong' by the next larger; if 'souchong' is made a still larger meshed sieve is employed. Sorting by hand sieves is still done in small factories, but combined sorting and cutting machines are used in the larger factories. Before the final packing the tea is taken from the bins in which it is kept and re-dried to expel any moisture which it may have absorbed from the atmosphere. It is then weighed into lead-lined chests, half-chests, or boxes, and soldered up, the name of the garden is stencilled on the packages, and it is exported as soon as possible to prevent loss of flavour. Chests usually contain 100 lb. of tea, half-chests from 45 to 60 lb., and boxes 20 lb. The 'brick tea' prepared at Hankow for overland exportation to Russia is made of tea-dust steamed and pressed into cakes, which occupy only one-sixth of the bulk of loose tea. A coarser kind, made of tea-leaves, stalks, and refuse of the tea-dust cakes, is sent to Mongolia, where for use it is boiled with mutton fat and butter. Pickled tea is used for chewing by the Siamese, and eaten with fish by the Burmese.

History.—Fable has it that the Chinese drank tea in the time of the Emperor Chi Nung (2737 B.C.), and it is mentioned in a work edited by Confucius about 500 B.C. Its early use is thought to have been medicinal, but when a certain Lo Yu wrote a dissertation on tea in 780 A.D. it was well established as a popular beverage. Various forms of brick tea seem to have been in very common use about the 9th century. Tea first became known to Europeans about the end of the 16th century. Small quantities were brought by the Dutch East India Company to England early in the 17th century, but it was not till about the year 1657 that it began to be used as a beverage, when Garraway opened a tea-house in Exchange Alley; the price then was from £10 to £5 per lb. Pepys, writing on 28th September 1660, says: 'I did send for a cup of tee (a China drink) of which I had never drank before.' Two years later he writes: 'Home, and there find my wife making of tea, a drink which Mr Pelling the Potlicary tells her is good for her cold and defluxions.' Until 1834, when it lost the monopoly of the eastern trade, the English East India Company was the sole legitimate importer of tea. In 1678 the Company imported 4713 lb.; in 1725 370,323 lb. were drunk in England; in 1740 the prices ranged from 7s. to 24s. per lb. Social reformers and others came to regard tea-drinking among the lower classes as a vice to be eradicated. Cobbett called it a 'troublesome and pernicious habit.' Nevertheless it continued to spread. In 1801 the consumption was 23,730,150 lb. Since 1840 the consumption in the United Kingdom has been (1840) 32,000,000 lb., (1860) 77,000,000, (1880) 158,571,000, (1900) 249,792,087, (1920) 392,339,000; and it increased from 1'22 lb. per head in 1840 to 8'42 in 1919. From early times tea has been a ready subject for revenue-seeking statesmen. It was taxed in China in the 8th century A.D. As regards England, one of the excise duties granted to Charles II. in 1660 was one of 8d. per gallon on infused tea. In 1693 the duty became 5s. per lb., and in 1745 was lowered further. The tea duty, a customs duty since 1834 and levied specifically since 1836, has been gradually lowered from 2s. 1d. (+ 5 per cent.) per lb. in 1840 to 4d. (general rate, 1924), although it was raised to 1s. during the Great War. Great Britain easily holds the first place among the tea-consuming nations of the world. It is followed at a long distance by the United States, Australia, Canada, Irish Free State, Holland, Russia, New Zealand, South Africa, and Germany, all these being in order of the amount of imports. London was for long the great entrepôt of the tea trade, and although much is now done by direct shipment from tea-growing to tea-consuming countries, London, with its famous Mincing Lane auctions, is still the principal tea-mart of the world.

China has always been the foremost tea-producing country; its yearly output, estimated roughly, is from 700 to 900 million lb. The Chinese established a tea staple at Canton early in the 18th century. All foreign trade in tea was done here through the native Hong or Merchant Guild, but trade became freer after the Opium Wars (see CHINA). Shanghai and Foo Chow are now also centres of export. But the greatly increased demand for the stronger Indian teas has reduced the export tea trade of China to relative unimportance. Tea is said to have been introduced into Japan from China in the 9th century A.D. The use of machinery is making but slow headway in the industry, so that Japanese tea is expensive. The present acreage is about 110,000, and yearly output about 80,000,000 lb., nearly all green tea. About one-third is exported, mostly to the United States and Canada. Oolong tea, which looks like

black tea and tastes like green, comes largely from the island of Formosa.

About 1820 the plant was discovered wild in Assam, and was again noticed in 1823. The attention of the East India Company having been called to the expediency of introducing tea into India, a commission was sent to China in 1834 for this purpose. It was, however, recalled when Dr Griffith and Dr Wallish proved tea to be growing wild in Upper Assam between the Naga and Mishmi mountains on the upper part of the Brahmaputra River. The same year the Company commenced the industry at Kumaon with plants brought from China. In 1835 the first garden in Assam was opened at Luckimpore. The first pound of Indian-grown tea was sent to London in 1836; in 1839 280 lb. were for sale there, the prices ranging from 16s. to 34s. per lb. In 1840 the Assam Tea Company was started, and the first garden of indigenous tea was planted in 1840. The value of the variety was gradually recognised; though large quantities of China plants and seed were imported in 1848 and 1851. The industry in its early days passed through many vicissitudes, but the perseverance of those engaged in the cultivation was attended by success, Indian tea now constituting 60 per cent. of the English consumption, and China tea only 3 per cent. There were in 1924 about 710,300 acres under tea cultivation in India, the leading districts being Assam (397,000), Bengal (175,500), Bihar and Orissa (2100), United Provinces (6000), Punjab (9700), Madras (41,600), Tripura (2800), Travancore (46,700). The export of tea from India in 1924-25 was 355,652,000 lb., of which about six-sevenths went to the United Kingdom.

Tea was introduced into Ceylon in 1839, but it was not till 1874-75 that the cultivation became common. On the failure of coffee from the 'leaf disease' fungus about 1881 and onwards there was a rush into tea, and the staple cultivation of the colony was changed. In 1867, 10 acres were under tea; in 1877, 2720 acres; in 1891, 223,000 acres; in 1924, 418,000 acres. The exports were (1873) 23 lb.; (1877) 2105 lb.; (1880) 162,575 lb.; (1884) 2,392,973 lb.; (1888) 23,820,723 lb.; (1890) 45,390,000 lb.; (1924) 205,000,000 lb. As in Southern India, there is no winter in Ceylon and vegetation receives no check, hence tea is made more or less in every month of the year. (See CEYLON.) The Dutch introduced tea into Java about 1827 and the industry is now of considerable importance, especially since the substitution of India for China seed. In 1924 220,000 acres were under tea, and 105,000,000 lb. were produced. Tea growing in Sumatra dates only from 1910, nevertheless there is now an annual production of 18,000,000 lb. The industry was started in Natal in 1877 and, after initial set-backs, gave great promise at the beginning of the present century. But the supply of labour has proved an obstacle, and attentions are being turned rather to sugar than tea.

China teas were formerly much adulterated with foreign leaves, various mineral substances, sand, quartz, Prussian blue, gypsum, magnetic oxide of iron, soapstone, &c. These were cleverly made up with starch so as to resemble the various kinds of tea, and were known as 'lie tea.' Infused tea-leaves, redried, were also commonly used. Thanks to the care taken in the laboratory at the London Custom House, adulteration may be said to be a thing of the past to the English consumer (see ADULTERATION).

Chemistry.—As a beverage, the refreshing qualities of tea are well known. It exhilarates the system, dispels fatigue and sleepiness, and stimulates the mental powers. These properties are

generally believed to be due chiefly to the active principle theine. Tea is also held to be rich in the water-soluble vitamin B (see VITAMINS). As a beverage it is in great favour with weak and old persons, also among the poor, who find that by using tea they consume less solid food. But if tea is used to excess it produces flatulent indigestion, increased pulsations of the heart, and nervousness; the imagination is excited, and sleeplessness follows. These conditions cause a certain degree of fatigue, which induces the patient to have recourse to tea again to brace up the system, as drunkards resort to spirits in the morning for a similar purpose. It is difficult to determine how much tea can be safely drunk daily, the effects on different constitutions being unlike. Theine (see CAFFEINE) occurs very irregularly in tea, but is found to a greater degree in Indian and Ceylon than in China and Java teas, as is shown in analyses by Dr Paul and Mr Cownley (*Pharmaceutical Journal*, November 19, 1887, and July 26, 1890). From these analyses it appeared that the theine in different kinds of dry Ceylon tea varied from 4.89 to 2.57 per cent., in Indian tea from 4.89 to 3.86, and in Chinese tea it ranged from 3.78 to 2.42.

Tannin is an important constituent of tea, which gives the astringent properties to the infusion. It is generally admitted by chemists that tannin to a great extent regulates the commercial value of tea. Those teas which are rich in tannin give a stronger and darker liquor, and are consequently in greater demand. Tannin precipitates both albumen and peptone, and in this way doubtless hinders digestion. It also stops secretion from the mucous membrane, and so retards the pouring out of the digestive products; otherwise it probably has no effect, when given in small doses as in infusions of tea, on normal persons. When tea is allowed to stand five minutes before pouring off the infusion, which is the time allowed by tea-tasters, probably only one-fifth of the tannin is extracted. But when allowed to stew a long time, as is too often the case in poor households, a much larger percentage of tannin is extracted. Though Indian and Ceylon teas contain more tannin than China teas, it does not follow that the drinker of the former absorbs more tannin into his system than the drinker of the latter, as much less Indian tea is required to make a cup of tea. The percentage of gluten in tea is of little importance. Sometimes the results of analysis are stated for gluten and at other times for albumen, of which it is a form. Albumen (and gluten) is, however, rendered insoluble by boiling water, and so probably remains entirely in the tea leaves. If any were dissolved in the infusion it would probably become a food, like white of egg, fibrin, and other albumens. The following plan of tea-making for household use is worth attention. Bring the water to the boil, but do not let it boil longer or the water hardens. Use a liberal quantity of tea, and pour over it as much water as you consider will make all the tea you require. Let it stand for three minutes and pour into a fresh (warmed) teapot. Five minutes is the longest time the water should remain on the tea (see FOOD).

An important by-product of tea in China and Japan is the oil expressed from the seeds. The oil is used in toilet preparations, for burning, and other things. Hankow is the centre of the Chinese trade.

The name tea is extended to infusions of the leaves of many other plants throughout the world. By far the most important is Paraguay tea (see MATÉ) made from the leaves of *Ilex paraguayensis*; from *Ilex Cassine* (see HOLLY) the North-American Indians used to make a drink called Yonpon, and in India Lemon Grass (q.v.) is sometimes used.

Bourbon tea is distilled from the leaves of the *Angræcum fragrans* (see ORCHIDS), and the South African Bushman tea from *Catha* (q.v.) *edulis*. See also CAJEPUT, LEPTOSPERMUM, SAGE.

See *The Tea Cyclopædia* (1881); Johnston's *Chemistry of Common Life* (new ed. 1879); W. G. Stables, *Tea, the Drink of Pleasure and Health* (1883); A. M. and J. Ferguson's *Tropical Agriculturist, Tea Culture and Preparation, Tea-plucking Illustrated* (Colombo, various years); and Rutherford's *Ceylon Tea-planter's Notebook* (1889); D. Crole, *Tea: its Cultivation and Manufacture* (1897); A. C. Kingsford and M. Kelway Bamber, *Report of the Tea Industries of Java, Formosa, and Japan* (1907); A. Ibbetson, *Tea from Grower to Consumer* (1910); A. S. Judge in the *Bulletin of the Imperial Institute*, vol. xviii. (1920); C. Bald, *Indian Tea* (1923); R. O. Mennell, *Tea: An Historical Sketch* (1926).

Teak (*Tectona grandis*), one of the most valuable timbers known, is the wood of a large deciduous tree (family Verbenacæ) with leaves from 10 to 20 inches in length, and from 8 to 15 inches in breadth. The tree, which grows best in a dry tropical climate, has small white flowers in panicles. It is found in Central and Southern India, except on the east coast, and there are extensive forests of it in Burma and Siam. It extends also into Java and some neighbouring islands. The annual output at present is about 260,000 tons, of which 225,000 tons come from Burma. In India growing teak is placed under the management of a conservator of forests, and very little is now exported from that country, the demand for the wood being greater than the supply. The wood, highly prized for its great durability, is of a quiet yellow colour, tending to brown, and like many other kinds of timber has a characteristic odour. It is classed as a hardwood, though it is only of medium hardness, taking, however, a good polish; and it is straight grained and strong. Although easily worked when not long cut down, it readily blunts tools after being kept some length of time. Its average specific gravity when dry is about .585. Teak does not shrink much in seasoning, and it is believed to expand and contract less by differences of temperature than most woods. Unless very thoroughly seasoned it has some tendency to split, and this is perhaps its chief defect. It is much less resinous than some other well-known hardwoods, such as mahogany and rosewood, but it is usually said to contain an aromatic essential oil which prevents iron in contact with it from becoming rusted, and for this reason it has been used for the backing to the armour-plates of ships of war. A sticky elastic extract, to some extent resembling india-rubber, is obtained from teak by treating the wood with naphtha or ether. It is probably this which is the real cause of the wood preventing iron from rusting. The pores of the wood are sometimes filled with a white substance, calcium phosphate. There is a high percentage both of this and of silica in the ash of teak, and this no doubt explains why carpenters and other tradesmen consider it gritty. White ants rarely attack the wood if it is sound, but nevertheless logs of it are often badly eaten by the teredo. Teak wood varies considerably in quality even when perfectly sound.

In India teak is used for all kinds of work where strength and durability are required, such as for building ships, houses, and bridges; also for the construction of railway carriages and furniture. In England it is employed in shipbuilding, and to some extent for architectural purposes, such as shop fronts, as well as for furniture. It has numerous minor applications. The leaves of the tree yield a red dye. Being of large size they are used in India for plates and for thatching. The import of teak into Great Britain has decreased very much

during the present century. In 1900 the imports into Great Britain were 63,080 loads, while in 1922 they only amounted to 19,963 loads.

African teak (*Oldfieldia africana*) is imported from the west coast of Africa; it is also a valuable timber, but less so than true teak.

Teal (*Nettion*), a genus of small, widely distributed, fresh-water Ducks, rather silent, and chiefly nocturnal, feeding on water-plants, seeds, insect-larvæ, worms, and the like. The down-lined nest is usually at some distance from water, among herbage or heather; there are eight to ten usually greenish eggs. The Common Teal (*Nettion crecca*),



Common Teal (*Nettion crecca*), male and female.

a beautiful bird, breeds abundantly throughout the British Islands and Europe, and ranges from the Azores, over Asia, to Alaska. The affection of the mother for the brood reaches a high level. In America it occurs as a wanderer, the common representative of the genus being the closely allied Green-winged Teal (*Nettion carolinense*), which has occurred twice or thrice in Britain. There are many other species, and nearly allied is the Garganey (*Querquedula circia*) of local occurrence in Britain.

Tears usually consist of pure water, with saline traces; but in cases of poisoning may show the poison, and in diabetes become saccharine like the other secretions. The lachrymal apparatus is described at EYE. Serving normally to moisten eyeballs, eyelids, and inside of the nose, they are regularly secreted in normal quantities, and disappear by the duct into the nose. Where there is spasmodic contraction of the muscles about the eye, as in fits of coughing, yawning, or immoderate laughter, the tears are squeezed out from the eyelids and run down the cheeks. In man they are also the natural outcome of strong emotion, and are secreted in greatly increased quantity; they much more constantly accompany crises of fear, anxiety, grief, affection, and keen joy than physical pain. Old age is comparatively tearless. Some animals, especially deer, are credited with weeping tears of grief. Darwin says few animals shed tears at all; he failed to notice weeping in monkeys, but records Emerson Tennent's opinion that elephants weep with sorrow, as supported by the keepers of tame elephants. See Darwin's *Expression of the Emotions* (1873).

Teasel (*Dipsacus*), a genus of plants of the family Dipsacaceæ. This family consists of herbaceous and half-shrubby dicotyledons, with opposite or whorled leaves, and flowers in heads or whorls, surrounded by a many-leaved involucre. There are about five genera and 150 species comprised in the family, all natives of the temperate parts of the Old World. In the genus *Dipsacus* the flowers are serrated from each other by long, stiff, prickle-pointed bracts. The only valuable species of the family is the

Fuller's Teasel, or Clothier's Teasel (*D. fullonum*), a native of the south of Europe, naturalised in some parts of England. It is a biennial, several feet high, with sessile serrated leaves, the stem and leaves prickly; and with cylindrical heads of pale or white flowers, between which are oblong, acuminate, rigid bracts, hooked at the point. The heads are cut off when the plant is in flower, and are used in woollen factories, and by fullers and stocking-makers, for raising the nap on cloth. No mechanical contrivance has yet been found to equal teasel for this purpose, to which the hooked points, the rigidity, and the elasticity of the bracts are admirably adapted. The heads of teasel are fixed on the circumference of a wheel or cylinder, which is made to revolve against the surface of the cloth. Teasel is cultivated in many parts of Europe, and is imported into Britain, but is cultivated to some extent in England, particularly in Somersetshire and Yorkshire. The seed is sown in March, on well-prepared, strong, rich land, and the plants thinned out to a foot apart; in August of the second year the heads are ready to be cut. The flowers of teasel abound in honey, and the seeds are used for feeding poultry. The root was formerly in use as a diuretic and sudorific.



Fuller's Teasel (*Dipsacus fullonum*):
a, a bract.

Teb, EL, 50 miles SSE. of Suakin, was the scene, on 29th February 1884, of General Graham's defeat of Osman Digna's forces, that victory being preceded by Baker Pasha's defeat near Tokar (4th February), and succeeded by the second British victory of Tamanieb (13th March).

Technical Education, of such a kind as best to fit the youth of the country for their work in after life, is especially necessary in the case of those on whose work depends the material welfare of the nation—artisans, foremen or employers, farmers or merchants or commercial travellers. The public interest in the subject was aroused by the fact that in 1881, when a Royal Commission was appointed to consider the question, education in Britain was in this respect very much behind that provided in such countries as France, Germany, and the United States of America.

The methods of technical education are necessarily different in different countries. On the Continent the growth of the industrial system has accompanied or rather followed that of the technical schools. These have thus been able to render very great direct assistance to the industries; while even the injurious effect of compulsory military service has been much diminished by the inducement to higher technical study involved in the offer of a shortened period of service to students who have passed successfully through a technical

school. In Britain long-continued industrial supremacy has led to a well-developed industrial organisation in which the old opportunities for the trade education of apprentices in the workshops have largely disappeared, and their place is only now being filled by outside teaching. In Britain, moreover, the difficulty of reorganisation is increased by the power of trade societies, which insist upon the letter of the apprenticeship period although its spirit is gone.

In the earlier stages of education the aims and the conditions are practically the same in all countries. The subjects of instruction and the methods of teaching must be such as will best train the intelligence, the observing and reasoning powers, and pave the way for manual dexterity. In the teaching of arithmetic every opportunity must be taken to connect figures with facts, and pupils must be accustomed to solve the simple problems of price and measurement that are of constant occurrence in daily life. English language and composition is not only valuable as a medium for literary culture, but it is technical in so far as it leads to the accurate description of an object, a process, or an event, or to the full understanding of such a description. Drawing offers a ready means of training the hand and eye; while modelling and the use of tools are valuable aids in this important relation. The accurate study of common things ought to form an essential part of the training of the pupils who have to acquire habits of inquiry; it is also the foundation of that familiarity with properties of materials which is the basis of good work in the industries. It is this study of common things which is known as 'Elementary Science' in school programmes. Throughout the elementary stage of education it is the method as much as the matter that constitutes the claim of the work to be described as technical.

In Britain the higher stages run along two parallel lines—the one for pupils who devote their time to systematic study, and for these the teaching is carried on in day classes; the other for pupils who spend the day in work in a trade workshop, in an office, or in the field, and for whom only the evenings are available for instruction in sciences—in the principles underlying their daily work and in languages. Considering day classes first, we find in every town of considerable size secondary schools adapted to the needs of boys from thirteen to sixteen years of age. In most of these adequate instruction is given in technical and commercial arithmetic, in mathematics, and in modern languages. In many towns there are also technical schools in which the training includes moreover free-hand and mechanical drawing, handicraft, and the branches of science that are likely to be of most advantage to the pupils—applied mechanics, steam, electricity for engineering students; chemistry and agriculture for agricultural students, and so on. The great majority of the pupils attending these schools pass from them directly to work, and continue their education by attendance at advanced evening classes, or by attending advanced day classes for a year or two after completing an apprenticeship. Some, however, give up a year or more, when they are from sixteen to eighteen years of age, entirely to study before taking up practical work. This course is followed mainly in industries such as engineering, mechanical or electrical, chemical or textile manufactures, or agriculture, where the processes involve applications of principles which can be fully understood only by those who have studied a fairly wide range of science. The advanced classes for the instruction of such students are to a large extent of a practical kind; much of the work is done in laboratories. All colleges for such work require fully equipped

chemical, physical, mechanical, and engineering laboratories, workshops for wood and iron, as well as a full complement of appliances for teaching art, the principles of agriculture, or such other departments of applied science as are required by the students in attendance. It is also desirable that the students should have facilities for continuing their language studies and for becoming familiar with book-keeping and commercial practice. After a course of study such as is provided in a technical college of this kind the students are in a position to benefit very readily by the experience they will have in the manufactory or office or on the farm. They will have thoroughly mastered the principles, and have learned something of the modes of their application, so that they enter upon their work with their eyes open alike to the possible causes of failure and to likely avenues of advance.

For the benefit of students who are unable to devote their entire energy to study up to the age of eighteen, or even up to sixteen, evening classes have been established throughout the country in which the work ranges through the standards described here as secondary and advanced. It is thus possible for a lad who leaves school for a trade at the age of thirteen or fourteen to continue his studies by attending evening classes, and he will find that by diligent work for four or five years he may complete the secondary stage of his education, while three or four more will enable him to become familiar with that theoretical knowledge whose applications he has been practising all these years. This prolonged course is required only for those who would fit themselves for any promotion that may be open to them; for the less ambitious a shorter course suffices. For all, however, it is now realised that what is first wanted is a thorough grasp of elementary principles such as will enable a man to make the most of the experience and deftness he acquires in the course of his practical work.

The scope of the technical education required for each of the thousand-and-one occupations of the day is, according to the British view, limited by the accepted conclusion that the best place for a young man to learn the practice of his trade or business is in the workshop or office, as the case may be. But while this is so it is also recognised that there are many matters of general knowledge essential to the due understanding of this practice, many questions of materials, design, principles, and methods which it is nowadays quite impossible for a beginner to be instructed in during business hours, and which can be both more economically and more efficiently taken in hand by an organisation specially charged with such work. A technical school may thus be complete without any teaching of a trade. In fact, in Britain, trade teaching in schools or colleges has been suggested only in the case of a few special industries, and to a certain extent in others for youths in exceptional circumstances.

On the continent of Europe and in America the provision for the technical education of workmen and foremen is not in most respects in advance of that now made in Britain. For masters and managers, however, there have been in active operation for many years numerous technical schools, supported almost entirely by the several states, housed in palatial buildings, equipped with costly and extensive laboratories and museums, and conducted by staffs of professors and teachers so numerous as to admit of the utmost subdivision of the subjects taught. Of the Continental schools, perhaps the best known is that of Charlottenburg, near Berlin.

The evening classes held under the auspices of the old Science and Art Department had done

something in the way of providing technical education in Britain; the system of examinations inaugurated by the City and Guilds of London Institute, and the technical colleges founded by it in the metropolis, had an even more direct and practical bearing on the solution of the problem. In 1889 came help from the legislature. In that year was passed the Technical Instruction Act, which empowered county and borough councils and urban sanitary authorities to levy a rate not exceeding 1d. in the £ to supply, or aid in supplying, technical education within their bounds; and a further stimulus was given to local authorities in the following year by permitting them to use for this purpose the residue of the beer and spirit duties which devolved upon them by the Local Taxation Act. Thus encouraged, many of the larger authorities undertook the work, and either built and equipped institutes for themselves (e.g. the large and handsome College of Technology at Manchester), or subsidised existing institutions. By the Education Acts of 1902 and 1903 the powers of these Technical Education Committees were transferred to the newly established Local Education Committees, which were made responsible for the supply and co-ordination of elementary, secondary, and technical education within their borders. In 1918 separate Education Acts for England and Scotland provided for the compulsory attendance of young persons (with certain exceptions) upon *day* continuation classes until they reached 18 years of age, thus greatly extending their opportunities for studies 'conducive to their efficiency in the employment in which they are engaged'; these powers, however, have been held in abeyance. Technical education of an advanced character is also provided in connection with most of the younger universities, such as those at Manchester, Liverpool, Birmingham, Leeds, Sheffield, &c., and at such institutions as the Imperial College of Science and Technology, London (arising from the fusion of the Central Technical College of the City and Guilds, the Royal College of Science, and the Royal School of Mines), the Royal Technical College, Glasgow, the Heriot-Watt College, Edinburgh, and the various Polytechnic Institutes in the metropolis.

As the outcome of the Agriculture and Technical Instruction (Ireland) Act of 1899, technical education in Ireland was administered by the specially constituted Department of Agriculture and Technical Education, but is now under the supervision of the governments of the Irish Free State and of Northern Ireland, the large and important Municipal College of Technology in Belfast being the most recent development; in Scotland, the work is carried on by the Local Education Authorities, by the universities, and in such institutions as those already alluded to.

See the Reports of the Commission above cited; the Reports of the U.S. Commissioner of Education, the *Proceedings of the International Conference* (1884); the prospectuses of the several technical schools; Butler, *Education in the United States* (1900); Paulsen, *German Education* (with bibliography, 1908); Sir Philip Magnus, *Educational Aims and Efforts* (1910); Board of Education, *Special Reports on Educational Subjects*; Reports of the Association of Technical Institutions and of the Association of Teachers in Technical Institutions; also the articles POLYTECHNIC, EDUCATION, ART (INSTRUCTION), SLOYD.

Technology, the systematic knowledge of the industrial arts, represented by innumerable articles in this work, such as those on spinning, weaving, calico-printing; the manufactures of cotton, woollen goods, silk; the production of the several metals, gas, sulphuric acid, bread, beer, wine, &c.

Teck, an ancient principality named from a castle on 'the Teck,' a limestone peak in the Swabian Alb, 20 miles SE. of Stuttgart. Held by various families from the 11th century on, it passed in 1498 to the Dukes of Württemberg. In 1863 the king of Württemberg conferred the principality on Duke Albert of Württemberg's son (1837-1900), who in 1866 married the Princess Mary of Cambridge. Their daughter, Princess Mary, became Queen of the United Kingdom in 1910, while their youngest son, the Earl of Athone, became Governor-general of South Africa in 1924. In 1917 the name of the house was changed to Cambridge. See L. Felberman, *The House of Teck* (1911).

Tecumseh (or *Tecumtha*; 1768-1813), chief of the Shawnees (q.v.), who headed the rising suppressed by Harrison in 1811, and passing into the English service, commanded the Indian allies in the war of 1812-13 with the rank of brigadier-general. He was killed fighting bravely at the Thames in Canada. See Lives by Eggleston (1878), and Raymond (1915).

Teddington, a town of Middlesex, on the left bank of the Thames, 1½ miles SW. of London. Adjoining is Bushy Park, with the National Physical Laboratory (1902). Pop. 21,200.

Te Deum, a majestic Latin hymn of the Western Church, so called from its first words. By an unsupported tradition it is ascribed to St Ambrose and St Augustine, and often called the Ambrosian Hymn; and by another to Hilary of Arles. The first actual reference to it is in the rule of Cæsarius, bishop of Arles in 502-540; it was certainly extant in the 5th century, and in its modern form was used by Hincmar of Rheims in the 9th century. The hymn in its current form consists of twenty-nine verses; the first twenty-one verses are uniform in the four oldest versions current, and it seems probable that verses 1-10 were a Greek hymn dating back to the 2d century. In the Anglican morning prayer it follows the first Lesson, except when the Benedicite is preferred as its alternative. It is frequently used also in the services of both Presbyterian and Congregationalist churches, and there are more than twenty metrical renderings of it in English hymnology.

See the Rev. John Julian's *Dictionary of Hymnology* (1892), and Prebendary Edgar C. S. Gibson in *Church Quarterly Review* for April 1884.

Tees, a river in the north of England, rising on Cross Fell, Cumberland, and flowing 70 miles eastward, mainly along the boundary between Durham and Yorkshire, till it falls into the North Sea, 4 miles below Stockton. Owing to works carried out since 1853 it is now navigable to that town for vessels of large burden, those works including the construction of two breakwaters at the mouth.

Teeth, hard bodies in the mouth, attached to the skeleton, but not forming part of it, and developed from the dermis or true skin. 'They present,' says Owen, 'many varieties as to number, size, form, structure, position, and mode of attachment, but are principally adapted for seizing, tearing, dividing, pounding, or grinding the food. In some species they are modified to serve as formidable weapons of offence and defence; in others, as aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for transport and working of building materials. They are characteristic of age and sex; and in man they have secondary relations, subservient to beauty and to speech. Teeth are always intimately related to the food and habits of the animal, and are therefore highly interesting to the physiologist; they form, for the same reason, important guides to the naturalist in the classification of animals.'

True teeth consist of one, two, or more tissues, differing in their chemical composition and in their microscopical appearances. 'Dentine,' which forms the body of the tooth, and 'cement,' which forms its outer crust, are always present; the third tissue, the 'enamel,' when present, being situated between the dentine and cement. The *dentine*, which is divided by Owen into hard or true dentine, vaso-dentine, and osteo-dentine, consists of an organised animal basis, disposed in the form of extremely minute tubes and cells, and of earthy particles.

The tubes and cells contain, besides the calcareous particles, a colourless fluid, which is probably transuded blood plasma, or *liquor sanguinis*, and contributes to the nutrition of the dentine. In hard or true dentine the *dentinal tubes* proceed from the hollow of the tooth known as the *pulp cavity*, in a slightly wavy course, nearly at right angles to the outer surface. 'The hard substance of the tooth is thus arranged in hollow columns, perpendicular to the plane of pressure, and a certain elasticity results from these curves; they are upright where the grinding surface of the crown receives the appulse of the opposing tooth, and are horizontal where they have to resist the pressure of contiguous teeth.

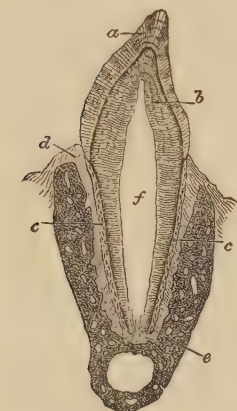


Fig. 1.—Vertical Section through a Tooth lodged in its socket:

a, enamel; *b*, dentine; *c*, crusta petrosa, or cement; *d*, lining of the cavity in the gum; *e*, bony socket in gum; *f*, pulp cavity.

The tubuli also receive the plasma transuded from the remains of the vascular pulp, which circulates by anastomosing branches of the tubuli through the dentine, maintaining a sufficient though languid vitality of the system. The delicate nerve-branches on the pulp's surface convey sensations of impressions affecting the dentine—sensations of which every one has experienced the acuteness when decay has affected the dentine, or when mechanical or chemical stimuli have "set the teeth on edge." When a part of the primitive vascular pulp from which the dentine is developed remains permanently uncalcified, red blood is carried by 'vascular canals' into the substance of the tissue. Such dentine is called *vaso-dentine*, and is often combined with true dentine in the same tooth, as, for example, in the large incisors of certain rodents, the tusks of the elephant, and the molars of the extinct megatherium. When the cellular basis is arranged in concentric layers around the vascular canals, and contains 'radiated cells,' like those of bone, this is termed *osteo-dentine*, and resembles true bone very closely. The *cement* always corresponds in texture with the osseous tissue of the same animal, and wherever it occurs in sufficient thickness, as on the teeth of the horse or ox, it is traversed like bone by vascular canals. Moreover, when the osseous tissue contains minute radiated cells, precisely similar cells are likewise present in the canals, and constitute its most marked characteristic. The relative densities of dentine and cement vary according to the amount of earthy matter. In the complex grinders of the elephant and some other animals the cement, which forms nearly half the mass of the tooth, wears down sooner than the dentine. The *enamel* is the hardest of all the animal tissues, and contains no less than 96.4 per cent. of earthy matter

(mainly phosphate of lime), while dentine contains only 72 per cent., and cement and ordinary bone only 69 per cent. of earthy matter.

In a few fishes the teeth consist of a single tissue—a very hard kind of non-vascular dentine. Teeth consisting of dentine and vaso-dentine are very common in fishes. Dentine and cement constitute the grinding teeth of the dugong. In the teeth of the sloth the hard dentine is reduced to a thin layer. 'The human teeth and those of the carnivorous mammals appear at first sight to be composed of dentine and enamel only; but their crowns are originally, and their fangs are always covered by a thin coat of cement. There is also commonly a small central tract of osteo-dentine in old teeth. The teeth called compound or complex in mammalia differ as regards their composition from the preceding only by the different proportion and disposition of the constituent tissues. Fig. 2 is a longitudinal section of the incisor of a horse; *d* is the dentine, *e* the enamel, and *c* the cement, a layer of which is reflected into the deep central depression of the crown; *s* indicates the coloured mass of tartar and particles of food which fills up the cavity, forming the "mark" of the horse-dealer.' Far more complex forms of teeth than this may be produced by peculiar arrangements, chiefly inflections, of the tissues (see LABYRINTHODONTS). Another kind of complication is produced by an aggregation of many simple teeth into a single mass, as in some fishes and a few mammals. The teeth of the Aard-vark (q.v.) are of this kind, each tooth being composed of a congeries of long and slender prismatic denticles of dentine, which are cemented together. In the elephant the compound molars belong to this class, the denticles being in the form of plates vertical to the grinding surface, and transverse to the long diameter of the tooth.

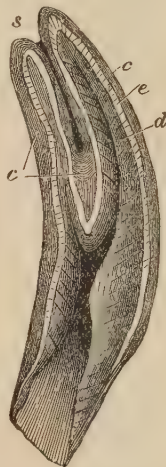


Fig. 2.—Longitudinal Section of the Incisor of a Horse.

The teeth of *fishes*, in regard to their number, form, substance, structure, situation, or mode of attachment, offer a greater and more striking series of varieties than do those of any other class of animals. In all fishes the teeth are shed and renewed, not once only, as in mammals, but frequently during the whole course of their lives. Tortoises and turtles, toads, and certain extinct Saurians are toothless. Frogs have teeth in the upper, but not in the lower jaw. Newts and salamanders have teeth in both jaws and upon the palate; and teeth are found on the palate as well as on the jaws of most serpents. In reptiles, as a general rule, the base of the tooth is anchored to the bone which supports it. The completion of a tooth is soon followed by preparation for its removal and succession, the faculty of developing new tooth-germs being apparently unlimited in this class. The extinct Odontornithes (q.v.) are the only birds with teeth. Of mammals there are a few genera and species devoid of teeth. The true ant-eaters, the pangolins, and the echidna are strictly toothless. The ornithorhynchus has horny teeth, and the whales have transitory teeth, succeeded in the upper jaw by whalebone. The Narwhal (q.v.) has a peculiar development. The elephant has never more than one entire molar, or parts of two, in use on each side of the upper and lower jaws; to which are added two tusks, which are modified

incisors, more or less developed, in the upper jaw. The boar's tusks are large and powerful canines. Some rodents have two grinders on each side of both jaws, which, added to the four cutting-teeth in front, make twelve in all; but the common number of teeth in this order is twenty, although hares and rabbits have twenty-eight each. The number of teeth, thirty-two, which characterises man, the apes of the old world, and the true ruminants, is the average one of the mammals. The dentition is often summarised as to the number and position of incisors, canines, molars, and premolars, thus: the *dental formula* of the typical mammal is *inc.* $\frac{2}{1}$, *can.* $\frac{1}{1}$, *pm.* $\frac{4}{4}$, *m.* $\frac{3}{3}$ = 44; or more briefly $\frac{2143}{1143}$. The absent teeth may be denoted by $\frac{0}{0}$ or by a blank. The dentition is indicated in the articles on the several animals where it is of interest (especially at HORSE), and in the articles on the great groups of animals (see, for example, CARNIVORA). It is only in the mammals that we have a well-marked division of the teeth into the four kinds of incisors, canines, premolars, and molars, each of which claims a brief description.

The *incisors*, or cutting-teeth, are situated in front, and possess a single conical root or fang, and a vertical crown bevelled behind, so as to terminate in a sharp cutting edge. These teeth are specially fitted, as their name implies, for cutting the food. In man there are two of these incisors in each side of each jaw (in the pre-maxilla). The permanent incisors, molars, and premolars are preceded by a set of deciduous or *milk* teeth, which are lost before maturity, and replaced by the permanent ones. In herbivorous animals they crop the herbage; in rodents (the rabbit, hare, rat, beaver, &c.) these teeth are very much developed, and differ from any other teeth occurring in mammals in this respect, that their growth continues throughout life; and if their length does not constantly increase, it is because their free extremity or edge

The *premolars* (known also as bicuspid and false molars) come next in order to the canines; they are smaller than the latter, and their crown presents two pyramidal eminences. In man there are two premolars in each half-jaw. Their function more nearly approaches to that of the true molars behind them than to that of the canines.

The *true molars* (or multicuspid) are placed most posteriorly. They are remarkable for their comparatively great size, the square form of the upper surface, on which are from three to five elevations or cusps, and for roots, which may number from 2 to 5. They appear first in the permanent set. In man there are three molars in each half-jaw, which are specially employed for grinding the food under the action of the muscles of the lower jaw. The posterior one is termed the wisdom tooth, from its being cut the latest.

The teeth are so admirably adapted for the special purposes which they are called upon to fulfil that it is generally easy, from a careful examination of them, to say to what class of animals they belong, and to draw various conclusions regarding the habits and structure of the class generally. Thus, in carnivorous animals the molars are not grinding-teeth, but present sharp cutting edges, and those of the upper and lower jaw overlap each other, resembling a pair of scissors in their action. In insectivorous animals the molars have a tuberculated surface, with conical points and depressions, so arranged as to lock into each other. In frugivorous animals, living on soft fruits, these teeth are provided with rounded tubercles, while in herbivorous animals they have a broad, rough surface, resembling a millstone.

There is also a close connection between the articulation or joint of the lower jaw and the nature of the food used by the animal. Thus, in purely carnivorous animals, in which the teeth simply tear and cut the food, no grinding motion is required, and the jaw is capable only of a simple hinge-motion in the vertical plane; while in herbivorous animals the joint is so constructed as to allow of extensive sliding and lateral motion of the lower molar teeth upon the upper. In man both the form of this articulation and the general character of the teeth point to an intermediate position in relation to food, and form a physiological argument for the mixed diet which general custom has decided to be most natural to our species.

See the articles CARNIVORA, DOG, RODENTIA, SKULL, for illustrations of teeth *in situ*; and besides general works on anatomy, human and comparative, Owen's *Odontography* (1845) and other works, and Flower's *Osteology of the Mammalia* (1886).

DISEASES OF THE TEETH.—Decay (*Caries*) is by far the most common of the diseases which affect the teeth, and consists in a gradual and progressive disintegration of the tooth-substance. Among the chief predisposing causes are hereditary defects of quality; imperfect calcification; pits and grooves in the enamel; overcrowding of the teeth, facilitating the retention of particles of food between them; constitutional disorders, chiefly those affecting the digestive organs; and debilitating causes generally. The exciting cause of caries has been proved by Professor Miller of Berlin to be due to the action of micro-organisms. According to him, 'the first stage of dental caries consists in the decalcification of the tissues of the teeth by acids which are for the greater part generated in the mouth by fermentation,' the agents concerned in the process being micro-organisms and the acid they produce—lactic acid.

Decay is rarely met with on smooth surfaces exposed to the friction of food and the direct washings of the saliva. It usually begins in some pit or groove in the enamel or between the teeth.

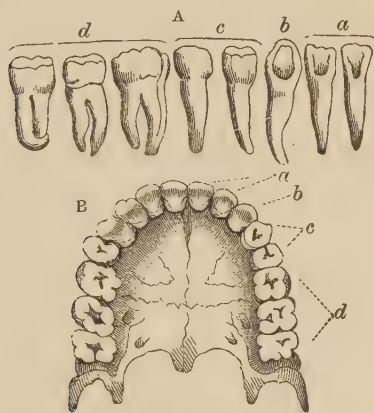


Fig. 3.

A, the separate human teeth as they occur in the half-jaw of the adult; B, the human teeth *in situ* in the upper jaw; a, a, incisors; b, b, canines; c, c, premolars; d, d, true molars.

is worn down by attrition as fast as they grow at the base from their roots.

The *canines* (so called from their prominence in the dog) come next to the incisors. Their crown is rather conical than wedge-shaped, and their fang sinks more deeply into the jaw than in the case of the incisors. In all carnivorous animals they are largely developed, being obviously formed for tearing the flesh of their prey. In man there is one canine tooth in each half-jaw; and there is never more than this number in any of the lower animals.

such points forming a lodgment for the development of the organisms. Once the enamel has been penetrated the decay proceeds more rapidly, spreading laterally beneath the as yet healthy enamel and towards the pulp. The more dense the structure of the tooth the more directly does the decay penetrate in the direction of the pulp, although its progress is not so rapid and its tendency to spread is less. Caries is most common in early life, by far the greater number of cavities making their appearance between the ages of six and eighteen. Its colour varies from pale brown to black, and generally the lighter the colour the more rapid is the decay. Pain may be felt soon after the enamel has been penetrated, or may be delayed until the nerve (pulp) has become almost or quite exposed; yet, strangely enough, it is sometimes altogether absent, particularly in very hard teeth. When the pulp has become nearly encroached upon, the patient's sensations will warn him against taking hot or cold, sweet or acid fluids. Ultimately the pulp becomes exposed, when the pain increases and may become very violent, especially if the nerve be pressed upon by food forced into the cavity by mastication. Should this take place the pulp becomes acutely inflamed and soon dies, when the pain may either cease or go on till an alveolar abscess is formed. The treatment of caries can only be undertaken by the dentist, and varies with the extent and character of the disease. See DENTISTRY.

Periostitis and Alveolar Abscess.—Periostitis is an inflammation of the membrane (periosteum) which covers the roots of the teeth and lines their sockets. It may be either general or local. When general the majority or all of the teeth are commonly involved. Periostitis of this type is usually due to constitutional causes (such as rheumatism), or the effects of some such agent in the system as mercury, or the presence of accumulated tartar about the necks of the teeth. When the disease is local—confined to one or two teeth—it may result from a blow or some such injury, or it may proceed from an inflamed pulp; but by far the most common cause is the presence of a dead nerve, the poisonous products of which are liable at any time to cause violent inflammation at the end of the root. Yet it is not uncommon to find that teeth whose pulp dies and whose substance gradually breaks down and decays away do not give rise to any trouble. When acute periostitis has fairly set in, it and its usual accompaniment, alveolar abscess, are perhaps the most painful affections to which the teeth are subject. The symptoms vary in intensity, though the characters remain the same. A dull aching pain is felt, and is relieved at first by pressure upon the affected tooth; as the inflammation increases in severity the tooth rises slightly in its socket, and becomes exquisitely painful when bitten upon; the gum around it becomes congested, and the throbbing pain is almost continuous.

Alveolar Abscess may be defined as a suppuration around the root or roots of a tooth. It is of two varieties, *acute* and *chronic*. Its causes are those of periostitis, which precedes it, the continuous and throbbing nature of the pain indicating the formation of matter (pus) within the surrounding bone. The face, with the glands about the neck, swell, and the glands exhibit tenderness on touch. The pent-up pus forces its way through the bone to reach the surface of the gum at the point of least resistance, which is most often opposite the end of the root or roots (this is popularly known as a 'gum-boil'). It occasionally finds its way along the side of the root, and discharges at the edge of the gum. Sometimes the discharge burrows downwards to find an exit on the face. This is almost peculiar to the lower teeth, and calls for removal of the

tooth affected. With the escape of pus by 'gum-boil' there is a marked abatement in the intensity of the pain, which generally disappears in a few hours and the swelling in a few days. If left to itself, however, the abscess soon assumes the chronic form, the tooth becoming almost if not quite comfortable. This condition may continue for an indefinite period, but there may also be a recurrence of the symptoms in a milder form. Not infrequently chronic abscesses occur without giving rise to any pain, the only evidence of their existence often being a small fistulous opening on the surface of the gum, from which from time to time pus discharges. Even this last may be wanting. If the abscess resist all treatment, the disease can be cut short by the extraction of the tooth, although many cases can be successfully treated and the tooth rendered permanently useful.

Exostosis is characterised by an increase in the thickness of the cementum, the external of the two hard tissues forming the roots of the teeth. Its forms vary from a small nodule or patch to a quantity sufficient to invest the entire root or roots of the same or adjoining teeth. It is most often caused by slight but continued irritation of the pericementum, or by rapid wearing of the masticating surfaces. Occurring as it sometimes does in teeth otherwise sound, its diagnosis is difficult; its presence may not be suspected till an attempt is made to extract the tooth, which, owing to the enlargement of the fangs, cannot even when loosened be removed without great difficulty. Exostosis may often cause neuralgic pains about the jaws.

Impaction and difficult Eruption of the Wisdom and other Teeth.—It is not uncommon to find certain of the temporary teeth firmly set in the adult jaw, and occupying the place of the permanent ones. In such cases the permanent tooth is usually present in the body of the jaw, but it has been retarded in eruption by being too deeply imbedded in the bone. Impaction may also be due to an abnormal direction of growth. Such teeth may appear late in life after all the others are lost, and the bone overlying them has been absorbed and so exposed them. When these cases do occur they are responsible for the popular but incorrect idea of a third set of teeth. An impacted tooth seldom gives rise to any trouble, unless it be an upper or lower wisdom, *particularly* the latter. The cutting of these teeth is sometimes accompanied by distressing symptoms which may be protracted for months or years, unless they are removed by extraction of the tooth. This condition is usually due to imperfect development of the jaw. The tooth usually takes its natural vertical direction, but, being wedged in between the tooth in front and the ascending portion of the jaw behind, only a small portion of the crown is visible. The overlying gum is apt to be bruised by the occlusion of the opposing tooth in the upper jaw; inflammation is thereupon set up, and being maintained by biting may extend to the surrounding parts. Swallowing becomes painful and the motion of the jaws restricted. When it is evident that there is insufficient accommodation in the jaw for the erupting tooth it should be removed.

Inflammation of the Gums, although not a disease of the teeth proper, is one of the most common causes of their premature loss. It may arise from constitutional causes—chronic dyspepsia, rheumatism or gout—or from the administration of such drugs as mercury or iodide of potassium. Most often, however, it results from the presence of tartar about the necks of the teeth, and lack of thorough cleansing. When due to constitutional causes, their appropriate remedies are called for; but when due to the presence of tartar, this deposit

should be carefully removed. See DENTISTRY (*Scaling*).

Absorption of the Alveoli.—The gradual wasting of the bone which surrounds and supports the roots of the teeth, accompanied by a simultaneous recession of the gums, is one of the changes which mark the approach of old age. This wasting may, however, occur in middle life without any visible cause, although the majority of such cases are due to chronic inflammation of the gums, with or without the deposition of tartar. Heredity, or the use of too hard a tooth-brush, may likewise be accountable. The teeth most affected are the front ones; but the reverse of this is not unusual. The gums, especially in front, gradually recede and lay bare the roots; the teeth now become loosened and finally drop out. The treatment consists in the removal of any obvious source of irritation.

Abrasion of the Teeth is a gradual loss of their substance from causes which are purely mechanical. The more common cause is a faulty occlusion of the jaws, but it is also produced by the improper use of the tooth-brush. When the result of mal-occlusion, it shows itself upon the grinding surfaces of the back teeth and the cutting edges of the incisors, which may become rapidly worn down almost to the gum, the rate of progress being frequently hastened by the common habit of grinding the teeth together. When caused by improper brushing it is seen on the front surfaces.

Diseases of the Antrum, while springing from other sources, are often caused by diseased teeth. The cavity in the bone of the upper jaw, known as the Antrum of Highmore, communicates by a small opening with the nose, and is sometimes the seat of inflammation set up by the presence of an abscess in connection with one of the back teeth, the roots of which project into it. The most common symptom of such a condition is an offensive discharge from the nostril of the affected side, increased in quantity when the patient lies down. The treatment is very tedious, much depending upon the age and general health of the patient; it consists in the removal of any diseased teeth from the affected side. This extraction may be followed by a discharge of pus; if not, an opening into the antrum should be made through the socket of one of the roots, and the cavity drained, suitable stimulating and disinfecting lotions being injected by means of a syringe till a healthy condition is established. Among the less common forms of disease which attack the teeth and gums are necrosis, dentigerous cysts, odontomes, epuloid and polypoid and other tumours of the jaws, and diseases of the tooth-pulp itself. These, however, are so comparatively rare as to be of no interest to the general reader.

The use of X-rays as an aid to diagnosis is one of the greatest advances in modern dentistry. Thus in a child the number and position of the permanent teeth can be determined before they are cut, and the treatment of irregularities of the teeth made much more certain. So, too, many diseased conditions can be recognised, such as caries, exostosis, absorption, abscesses, the extent to which pyorrhœa has developed, cysts, impacted teeth, and fractured and decayed roots that may be buried under the gums.

Toothache is not so much a disease as a symptom. Its chief causes are mentioned under *Caries* and *Alveolar Abscess*. The pain, which varies greatly in degree, character, and duration, depends largely upon its cause, and the health of the patient at the time of the attack. Only a transient uneasiness may in some instances be felt, and, as often, in others almost insupportable agony. If neuralgic in character it most frequently occurs in paroxysms at more or less regular inter-

vals. When toothache is due to caries with or without simple exposure of the pulp, the attack is brought on by taking hot or cold, sweet or acid fluids, and is seldom of long duration. To afford relief in such cases as these, gently wash out the cavity with a solution of carbonate of soda; then, drying it carefully with a piece of cotton-wool, take a very small pellet of wool dipped in eucalyptus oil and place it in the bottom of the cavity; over this place a piece of cotton-wool large enough to fill the cavity and saturated with the following solution: 1 drachm of mastic in 1½ ounce of Eau de Cologne. This should be changed daily. When the pain is caused by the forming of an alveolar abscess the tooth will be found insensitive to change of temperature but very susceptible to pressure. The patient now becomes feverish, and the pain, which is at first of a dull heavy character, becomes more intense, throbbing, and continuous, till pus has been formed and discharged through the gum. Provided the tooth is likely to prove useful and the patient cannot consult a dentist, the gum should be carefully painted with tincture of iodine, or the old-fashioned plan of placing a roasted fig over the root may be resorted to; at the same time it is well to give an aperient such as Epsom salts, followed by a full dose of quinine—6 to 8 grains for an adult. Great relief follows this treatment, which is, of course, only temporary. If an abscess shows signs of pointing upon the gums it may with advantage be lanced. Poulitices *must never* be applied to the face, for heat tends to draw the pus outwards. Abscesses in connection with the lower wisdoms often assume a very serious character unless cut short by extraction of the tooth.

Hygienic Care of the Teeth.—Many of the diseases of the teeth and gums might be prevented or greatly retarded by proper attention to the cleansing of these organs. The implements best fitted for this purpose comprise the quill toothpick, waxed silk thread and brushes, with suitable powders. The toothpick ought to be used after every meal, but it should be supplemented by the use, between the teeth, of floss silk, which will remove deposits accumulating where contiguous teeth touch. The brush is used to remove all deposits solid and mucous, and it gives the teeth a bright and polished appearance, especially if a good tooth-paste or powder is used at the same time. The mechanical friction also stimulates the gums to more healthful action. The teeth should be brushed twice daily, in the morning and in the evening. The manner of using the brush is more important than many people suppose. The general method is to brush horizontally, but a moment's reflection will show that this leaves untouched the very situations most in need of cleansing. The brush, used properly, should be pressed against the teeth and the handle rotated so as to make the bristles sweep vertically between and over them; this, coupled with an up-and-down motion, will thoroughly cleanse the interspaces; the inner surfaces of the back teeth are best cleaned in a like manner, while the corresponding parts of the upper and lower incisors are effectually reached by a vertical drawing movement. The brush should be of medium texture, and the bristles of unequal length, and not too closely placed. Over-brushing must be guarded against as carefully as under-brushing, lest the gums and the necks of the teeth be injured. During an illness these precautions are doubly necessary, as the corrosive effects of many medicines are then added to the evil results of a weakened vitality. The use of a glass tube in taking medicines that contain mineral acids and iron is usually supposed to be a sufficient precaution against the action of such

drugs upon the teeth, but this is quite erroneous; the only sure preventive being a weak solution of ordinary baking soda, with which the mouth should be rinsed after *every* dose. The choice of a tooth-powder should be left to the dentist, for many dentifrices which, no doubt, whiten the teeth do so by the action of some agent which is as deadly to the tooth-substance as to the impurities it is meant to remove. Charcoal (so much used) is quite unsuitable because of its gritty nature. As far as the ordinary individual is concerned, the use of brush and toothpick is the limit up to which one can take care of one's own teeth, so that a thorough examination of the mouth once or twice a year by a trustworthy professional man is necessary to check the diseases of the teeth before they have gone so far as to be irreparable. Especially should this be attended to in children. It is almost impossible to overrate the importance of following, at least in the main if not in detail, the hints given above, for when we consider that the teeth are placed at the very gateway of life, it is not surprising that their neglect should be answerable for many of the disorders of the system. And surely precaution is better than cure.

For a more detailed description of the diseases of the teeth, see the works of Tomes and Colyer.

Teething, the acquirement of teeth, especially of their first teeth, by children from about their seventh month onwards, may take place in strong children without any constitutional disturbance or ailment other than some local irritation or inflammation; many of the infantile diseases once credited to teething are really due to improper feeding (see INFANTS, FEEDING OF) and neglect of hygiene. But the time of teething is more or less a critical period, especially for the nervous system of the child, and is apt to be associated, especially in sensitive children or such as suffer from rickets, with restlessness, disturbed sleep, and even in some cases with Convulsions (q.v.), diarrhoea, and eruptions. Close attention to the general health is always necessary.

Tectotalism. See TEMPERANCE.

Tegern-See, a beautiful mountain lake, 3½ miles long, in the extreme south of Bavaria, 30 miles SE. of Munich; it is a much esteemed summer-resort.

Tegethoff, WILHELM, BARON VON, Austrian admiral (1827-71). See TACTICS.

Tegnér, ESALIAS, one of the most prominent of Swedish poets, was born at Kyrkerud, in the province of Vermland, on 13th November 1782, the son of a country pastor of peasant descent. The boy lost his father when only ten years of age, and owed his education as well as his support to the good-will of kind patrons. At seventeen he enrolled himself a student at Lund University, and graduated, as first student of his year, in 1802; a few months later he was appointed a lecturer in the faculty of philosophy. It was not until 1808 that he attracted any attention as a poet; but the stirring *War-song for the Militia of Scania* made his name known, and the patriotic appeal, *Seea* (1811), made it famous. In the following year he was chosen professor of Greek. The best creations of his poetic genius all belong to a comparatively short period of time (1817-25)—*Song to the Sun* (1817), *Epilogue on the Degree Day at Lund* (1820), *The Candidate for Confirmation* (1820), *Axel* (1821), and *Frithiof's Saga* (1825). After this he only wrote occasional pieces and a couple of incomplete poems of a more ambitious cast. In 1824, however, he had been called to undertake the onerous duties of the bishopric of Vexjö, and to those

duties he gave his strength, until symptoms of mental disease showed themselves (1840); he died 2d November 1846 (see SWEDEN). His work is distinguished by much of the transparent clearness, tranquil ease, and artistic finish that he admired so greatly in the ancient Greeks. At the same time he writes with the warm enthusiasm, the quick poetic feeling, the freshness and vigour of a modern over whom the inspirations of romanticism had passed. And, what has contributed not the least to make him a favourite, his verse is full of melody, rich in imagery, and moves with stately grace and dignity. *Frithiof's Saga*, a cycle of epics treating of old Scandinavian days, is his masterpiece; and notwithstanding certain obvious faults, it is a noble production, one of the most popular poems in Swedish, and a welcome addition to the translated poetry of every literature in Europe. *Axel*, a romance in verse of the time of Charles XII., is more unequal in execution; the other three poems mentioned rank higher than *Axel* in technique, but do not surpass its best passages in poetic insight and inspiration. Tegnér's collected works were published in 1847-50 (7 vols. Stockholm), and again in 1882-85 (8 vols.). The best life is that by his son-in-law, Böttiger, prefixed to the first edition of his collected works. See also monographs by Georg Brandes (1878), Kippenberg (1884), Christensen (1890), and Erdmann (1896). There are many translations. A selection of the best appeared in 1915 with an introduction by P. R. Lieder.

Tegucigalpa, the capital of Honduras, is situated in a fertile valley 3200 feet above the sea, on the river Choluteca, with mountains rising round about. The town has fine parks and buildings, and gold, silver, and mica are mined. Pop. 40,000.

Tehâma. See ARABIA.

Teheran, or TEHRAN, capital of Persia, 70 miles S. of the shore of the Caspian Sea. It stands on a wide plain, dotted here and there with mud-built villages, and pierced with many circular pits, which reach down to the great subterranean watercourses, on which, in this region, the life of animal and plant is altogether dependent. To the north runs in a general east and west direction the lofty range of the Elburz Mountains, rising in Demavend to the height of nearly 20,000 feet above sea-level. The old wall and ditch (4 miles long) were levelled in 1868, and the space thus gained made into a much needed circular road or boulevard. Fortifications, consisting of a bastioned rampart and ditch, were at the same time commenced on a much more extended scale. This enceinte, with its twelve gates and enclosing an area about 10 miles in circumference, was completed in 1873. The town rapidly extended beyond its old limits, more especially on the north side, where many fine streets, gardens, and buildings soon made their appearance, including several government buildings and those of the British Legation. The Shah's palace, entirely reconstructed since 1866, occupies the Citadel, and is both spacious and cheerful, its large courtyards being laid out with gardens and numerous fountains. Besides his town palace, the Shah has several others in the immediate neighbourhood, which he occupies at different seasons of the year. The foreign legations and rich natives are also in the habit of resorting in summer to the cool slopes at the foot of the Elburz, where many of them have commodious houses and fine gardens. Teheran is the commercial centre of Persia, although its manufactures are of little importance. The bazaars, some of which are very handsome structures, are filled with every kind of native and foreign mer-

chandise. From Teheran lines of telegraph radiate in almost every direction to the extremities of the kingdom, by far the most important being the lines of the Indo-European Telegraph Department and those of the Central Persia Telegraphs. In 1886 a short line of railway was constructed from Teheran to Shah Abdul Azim, a shrine and place of pilgrimage about 6 miles to the southward of the town. Tramways were also laid down in different parts of the city; and gas and electric lighting have been introduced. The population is about 350,000. In the vicinity of Teheran are the ruins of Rei, the *Rhages* of the Book of Tobit, known in the time of Alexander the Great under the name of *Ragæ* and the birthplace of Harûn-al-Raschid. See PERSIA, and works there cited.

Tehuantepec, a picturesque town of Oaxaca, Mexico, 10 miles above the mouth of the river Tehuantepec, with 10,000 inhabitants (mostly Indians) within its municipality. The isthmus on which it stands is only 120 miles wide, and a

canal here between the two oceans has been dreamt of ever since Cortes's day. A concession was granted and an Anglo-American company formed in 1850; but the political insecurity of the country and the construction of the Panamá railway combined to bring it to an end. An interoceanic railway company founded in 1879 also allowed its concession to lapse; Captain Eads's ship-railway remained a project only; but an ordinary railway was opened in 1894, and again (after rebuilding) in 1907.

Teignmouth (pron. *Tinnmouth*), a seaport and watering-place of Devonshire, 12 miles (by rail 14) S. of Exeter, stands on the north side of the pretty estuary of the Teign, which is spanned by a wooden bridge (1827), 557 yards long. Burned by the Danes in 970, by the French in 1338 and 1690, it has a grassy promenade, the Den or Dene, a pier, a public market, baths, St Scholastica's Abbey for Benedictine nuns (1865), &c. Potters' clay is dug locally. Pop. 11,000.

END OF VOL. IX.



